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Rugby injury in Kingston, Canada: A ten-year study

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Abstract

Rugby is a high-contact sport with an elevated risk for injury. While many studies have examined the epidemiology of rugby injury, there are no surveillance-based injury studies from North America. The objective of this study was to profile the scope and nature of injuries experienced during the sport of rugby. We analyzed emergency department injury surveillance data over a decade (1993 – 2003) from the Kingston sites of the Canadian Hospital Injury Reporting and Prevention Program. Rugby injuries were examined by mechanism, nature and anatomical site of injury, with stratification according to sex and age. A total of 1,527 injuries was observed (mean of 153 per year). Results show the tackling phase of play accounted for the highest number of injuries (506/1,527; 33.1%). The most common natures of injury were sprains and strains (426/1,527; 27.9%), while the leading anatomical location of injury was the face (294/1,527; 19.3%). Target patterns of injury were identified as priorities for prevention, based on injury frequency and severity.

Key words: *emergency department, injury, rugby, sport, surveillance*

Introduction

Rugby is a full-body contact sport that is popular internationally, second only to soccer in its number of participating nations.[1] The sport involves two teams of 15, who are divided for the most part into "forwards" (i.e., the bigger, stronger players) or "backs" (the faster, more agile ones). The aim of rugby is to get the ball across the opposing team's goal line using a series of plays and maneuvers, many of which involve player-to-player contact. Due to this high level of contact, there has been reported a notable incidence of injury associated with the sport.[2-4]

A number of international studies have examined the incidence of rugby injury, providing insights into the associated health burden. The most common element of rugby play resulting in injury is the tackle phase,[3,5-7] including both receiving a tackle and attempting one. The majority of reported injuries are sprains or strains.[2-5] Those observed to be at greatest risk for injury are senior male forwards,[3,5,9] and as player age increases, so does the incidence of injury.[3,4,6,10] The majority of rugby injuries occur during the second half of play, when players are more fatigued.[5] Protective gear (e.g., scrum caps, support sleeves—neoprene sleeves that fit over parts of limbs) is effective in preventing minor injuries, but has not been shown to provide significant protection from other forms of injury, such as concussion.[11,12]

Most existing studies of rugby injury have focused on premier levels of play. Injuries associated with women's rugby have rarely been considered, despite the fact that the number of women involved in the sport has risen.[3] Few studies have examined more general populations of players, including those in North America. Hence, there are significant gaps in this area of sports injury literature.

Our research setting in Kingston, Ontario is a site of the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP), an emergency-department-based injury surveillance program.[13] We used this opportunity to conduct one of the first North American studies of rugby injuries within a geographically defined population. The objective of this epidemiological study was to describe the injury patterns experienced by male and female sub-elite rugby players. The analysis specifically focused on mechanisms leading to injury, the natures of injuries experienced and common anatomical sites associated with injury. Observed patterns were examined by age and sex. Our hope was that this study would contribute to a better understanding of rugby injuries and their determinants, which in turn would inform prevention efforts.

Methods

Injury surveillance

CHIRPP is an ongoing national injury surveillance program that operates in the emergency departments of selected Canadian hospitals.[13] This program was implemented in ten Canadian pediatric hospitals in 1990 and has since been expanded to include four general hospitals. For each visit to the emergency department, the patient or accompanying person completes a one-page self-administered CHIRPP questionnaire which compiles information on mechanisms, circumstances and factors leading to injury. Clinical information is abstracted from the patient's medical chart by a research nurse and coded to reflect information contained in the hospital discharge summary.

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Regional injury surveillance in Kingston

Kingston is a Canadian city in eastern Ontario with a population of about 146,000 (2001 Census of Population).[14] Kingston General and Hotel Dieu hospitals have the only two emergency departments in Kingston. Since 1993, injury data from these hospitals have been collected and entered into the national CHIRPP database. The Kingston site is unique among the CHIRPP surveillance sites because of its complete community coverage.

Rugby in Kingston and area

The Kingston area is home to one local rugby club, known as the Kingston Panthers. It is comprised of three men's teams, and one team each of "old boys" (age > 34), juniors and women. The club itself is a member of the Eastern Ontario Rugby Union, which is a division of the Ontario Rugby Union. In June 2006, there were a total of 120 players registered. Competitive rugby is also played at the high school and university levels. There are nine high schools and two universities in the Kingston district that offer a rugby program. Each high school generally has a team each for juniors, seniors and girls. Together, the universities field seven teams (five male, two female). The total number of area players registered with local clubs and schools is estimated at approximately 1,000, and the population at risk includes local participants and visiting players who might present to the Kingston hospitals for emergency medical care.

Case identification and data abstraction

Records of injuries to male and female rugby participants were abstracted from the Kingston CHIRPP dataset (from September 1, 1993 to August 31, 2003). Cases were included if 1) sport code = "rugby" and/or 2) the text description of injury event included the word "rugby". All potential cases were reviewed and any cases that were obviously not related to participation in the sport were deleted. These included 1) miscoded cases; 2) spectators injured while watching rugby; or 3) variations of rugby that were not true to the sport (i.e., rugby basketball). Cases that were younger than 14 years of age (N = 2) were excluded from the analyses.

Available CHIRPP descriptors included the nature of injury, its anatomical site and discharge disposition. Text descriptions of circumstances surrounding each injury event were used to classify the mechanism of injury according to the element of play: 1) *tackling phase*; 2) *collision* (general category that included body-to-body contact on the field, excluding intended tackles and contact on the ground); 3) *contact on the ground* (general category that included body-to-body contact on the ground); 4) *falls*; 5) *running or maneuver*; 6) *hit with body part* (unintentional or undirected contact with another player's body lead to the injury); 7) *kicked* (injury inflicted when a player attempts to kick the ball, but another player is unintentionally kicked instead); 8) *foul play* (any *intentionally* inflicted injury to another player); 9) *hit by ball*; or 10) *other* mechanism. To ensure consistency of coding by mechanism, a random sample of 30 cases was examined and coded by three raters, all of whom were blinded to the coding of their fellow raters. There was perfect agreement in 28/30 cases and imperfect agreement in the other two (e.g., only 2/3 raters coded the case identically). The two cases were resolved by consensus. This level of agreement was considered sufficient to indicate a high level of reliability.

Analysis

Frequencies of various classifications of player injury were reported. Cross-tabulations were used to describe the mechanisms, natures and anatomical sites of injury by age group and sex. The dataset also allows up to three natures and anatomical sites of injury to be specified for each patient encounter. Only the first nature and its corresponding anatomical site were used in the following analyses as they represent the diagnosis most responsible for the visit. Records were divided into four age groups (14-16, 17-19, 20-24, ≥ 25 years) defined to correspond to different levels of play in Kingston. Chi-square analyses were used to investigate the statistical significance of any observed differences between groups. "Target injury events" that provided insights for prevention were identified, based upon two criteria: 1) the specific pattern of rugby injury occurred frequently, as indicated by the proportion of the case series that the pattern comprises (> 5%), and 2) the consequences of the specific pattern of injury were generally serious, as indicated by the proportion (> 10%) of the injuries associated with the pattern, requiring hospital admission or treatment with follow-up.

Ethics approvals for CHIRPP and this analysis were granted by the Queen's University Health Sciences Research Ethics Board.

Results

General distribution of rugby injuries

A total of 1,527 rugby injuries were observed from September 1, 1993 to August 31, 2003. The number of rugby injuries presenting to the emergency department ranged between 132 and 170 (mean 153) per year. However, we did not observe any pattern or significant temporal trend over the study period. The mean age of injured players was 20.0 years (SD 5.3). The overall sex ratio was 2.4:1 (male:female).

Mechanisms of injury

Overall, the tackling phase accounted for one third of all rugby injuries in the case series (506/1,527; 33.1%). This phase includes both being tackled (370/1,527; 24.2%) and attempted tackling (136/1,527; 8.9%). Collisions (389/1,527; 25.5%) and contact on the ground (158/1,527; 10.3%) were the other leading mechanisms (Table 1). Leading mechanisms of rugby injury did not differ between males and females, however the proportion of collisions that were experienced by males was significantly higher (27.3% male vs. 21.0% female; $p < 0.05$), while the proportion of injuries resulting from contact on the ground (14.9% vs. 8.5%) and being hit by the ball (4.1% vs. 1.4%) was significantly higher among females ($p < 0.01$). Mechanisms of injury did not vary substantially by age group (data not shown).

TABLE 1
Description of rugby injuries in Kingston, Canada, by age, sex and injury mechanism (1993–2003)

	Male		Female		Total	
	N	%	N	%	N	%
Age groups						
14-16 years	**228**	**21.0**	**101**	**22.8**	**329**	**21.5**
17-19 years	**348**	**32.1**	**210**	**47.4**	**558**	**36.5**
20-24 years	**335**	**30.9**	**114**	**25.7**	**449**	**29.4**
≥ 25	**173**	**16.0**	**18**	**4.1**	**191**	**12.5**
Mechanism of injury						
Tackling (all phases)	351	32.4	155	35.0	506	33.1
Being tackled	254	23.4	116	26.2	370	24.2
Attempted tackle	97	8.9	39	8.8	136	8.9
Collision	296	27.3	93	21.0*	389	25.5
Contact on ground	92	8.5	66	14.9**	158	10.3
Fall	77	7.1	28	6.3	105	6.9
Running/Maneuver	62	5.7	28	6.3	90	5.9
Hit with body part	65	6.0	19	4.3	84	5.5
Kicked	49	4.5	15	3.4	64	4.2
Foul play	31	2.9	4	0.9	35	2.3
Hit by ball	15	1.4	18	4.1**	33	2.2
Mechanism not specified	46	4.2	17	3.8	63	4.1
Total	**1,084**	**100.0**	**443**	**100.0**	**1,527**	**100.0**

* p-value chi-square test < 0.05
** p-value chi-square test < 0.01

Natures of injury

Tables 2 and 3 present the distribution of the natures of injuries most often experienced by rugby participants, by age and sex. Sprain/strain was diagnosed in 27.9% of presentations; superficial injuries (22.6%), fractures (15.4%) and open wounds (14.6%) were also common. The proportions of sprain/strain (154/443; 34.8%) or superficial injuries (123/443; 27.8%) among women were significantly higher than among men ($p < 0.01$). Among males, the proportion of open wounds (202/1,084; 18.6%, $p < 0.001$) was significantly higher than that observed among females (21/443; 4.7%). When examined by age, a test for linear trend in proportions indicated that superficial injuries were significantly higher in younger participants than they were in their more senior counterparts with the opposite trend observed with open wounds ($p \leq 0.01$). Neurotrauma, which includes the diagnoses of concussion (N = 71), spinal cord injury (N = 2) and minor closed head injury (N = 76) accounted for 9.8% of injuries overall. Higher proportions of neurotrauma, in particular concussion/spinal injury, were seen among younger players.

The CHIRPP coding for nature of injury contains a category for "multiple injuries of more than one nature", but there were no such instances in our dataset. In our case series, there were 89 cases with a second site of injury specified and six cases with a third. Forty percent of these second or third natures were coded as "superficial" and there were no significant differences in proportions of these cases among sex or age groups (data not shown).

Anatomical sites of injury

Leading anatomical sites of injury among males were the face (247/1,084; 22.8%), head (148/1,084; 13.7%) and the arm (111/1,084; 10.2%). Anatomical sites of injury among females were more evenly distributed: Ankle (54/443; 12.2%), arm (50/443; 11.3%), and face and head (both 47/443; 10.6%) were leading sites. Males were significantly more likely to suffer a facial injury (22.8% males vs. 10.6% females; $p < 0.001$) and less likely to suffer an ankle injury (8.8% males vs. 12.2% females; $p < 0.05$) or neck injury (3.3% males vs. 7.4% females; $p < 0.05$). Some variations in anatomical sites of injury were observed by age, with 14-to-16-year-old players experiencing fewer facial injuries and more lower extremity injuries than their older counterparts (Table 4).

Discussion

This epidemiological study examined acute injuries experienced by rugby participants in Kingston and area in the hopes of providing objective data for prevention. This study is important because it represents a large contemporary analysis performed on a geographically distinct and general pop-

TABLE 2
Frequency and nature of rugby injuries in Kingston, Canada, by sex (1993–2003)

	Male		Female		Total	
	N	%	N	%	N	%
Sprain/Strain	272	25.1	154	34.8**	426	27.9
Superficial	222	20.5	123	27.8**	345	22.6
Fracture	172	15.9	63	14.2	235	15.4
Open wound	202	18.6	21	4.7***	223	14.6
Neurotrauma	112	10.3	37	8.4	149	9.8
Concussion/Spinal injury*	58	5.4	15	3.4	73	4.8
Minor head injury*	54	5.0	22	5.0	76	5.0
Dislocation/Separation	79	7.3	23	5.2	102	6.7
Other	25	2.3	22	5.0	47	3.1
Total	**1,084**	**100.0**	**443**	**100.0**	**1,527**	**100.0**

*diagnostic subgroup of Neurotrauma
**p-value chi-square test < 0.01
***p-value chi-square test < 0.001

ulation. Such fundamental research can assist in the design of prevention methods to reduce the high incidence of injury associated with rugby participation.

In order to put our results into context, comparison with existing biomedical literature is warranted. Leading types of injury reported in our case series included sprains and strains, head and neck injuries, and injuries experienced while tackling or being tackled. This is consistent with much of the existing literature,[e.g., 1,3,7,8] with the exception that injuries to the lower limb were the leading type of injury observed in Clarke et al., and Sparks. This difference is likely attributable to differences in data collection. Ours was an emergency-department-based case series, while the comparative published studies have been based upon medical records compiled by sports teams during practices and league matches. Differences in injury patterns experienced by males and females possibly reflect suspected variations in the types and intensity of physical contact experienced by male and female players. Males were significantly more likely to sustain injuries following collisions and larger proportions of their injuries were open wounds, often to the face. Females were significantly more likely to sustain injuries during contact on the ground or from being hit by a falling player. They also reported significantly more sprains/strains (e.g., ankle, neck) and superficial injuries.

TABLE 3
Frequency and nature of rugby injuries in Kingston, Canada, by age (1993–2003)

	Age groups (years)										
	14-16		17-19		20-24		≥ 25		Total		
	N	%	N	%	N	%	N	%	N	%	Trend*
Sprain/Strain	98	29.8	165	29.6	109	24.6	54	28.3	426	27.9	0.21
Superficial	83	25.2	137	24.6	94	20.9	31	16.2	345	22.6	0.01
Fracture	69	21.0	68	12.2	62	13.8	36	18.8	235	15.4	0.36
Open wound	22	6.7	61	10.9	103	22.9	37	19.4	223	14.6	< 0.01
Neurotrauma	41	12.4	62	11.1	32	7.1	14	7.4	149	9.8	0.01
Concussion/Spinal injury**	29	8.8	25	4.5	12	2.7	7	3.7	73	4.8	< 0.01
Minor head injury**	12	3.6	37	6.6	20	4.5	7	3.7	76	5.0	0.61
Dislocation/Separation	13	4.0	43	7.7	30	6.7	16	8.4	102	6.7	0.10
Other/Unspecified	3	0.9	22	3.9	19	4.2	3	1.6	47	3.1	
Total	**329**	**100.0**	**558**	**100.0**	**449**	**100.0**	**191**	**100.0**	**1,527**	**100.0**	

*p-value for linear trend in proportions
**diagnostic subgroup of Neurotrauma

TABLE 4
Anatomical site of rugby injuries in Kingston, Canada, by age (1993–2003)

	Age groups (years)										
	14-16		17-19		20-24		≥ 25		Total		
	N	%	N	%	N	%	N	%	N	%	Trend*
Head/Neck	**96**	**29.2**	**203**	**36.4**	**193**	**43.0**	**67**	**35.1**	**559**	**36.6**	**0.01**
Face	39	11.9	99	17.7	115	25.6	41	21.5	294	19.3	0.00
Head	45	13.7	74	13.3	56	12.5	20	10.5	195	12.8	0.29
Neck	12	3.6	30	5.4	22	4.9	6	3.1	70	4.6	0.83
Upper extremity	**114**	**34.7**	**153**	**27.4**	**116**	**25.8**	**70**	**36.6**	**453**	**29.7**	**0.68**
Arm	50	15.2	55	9.9	31	6.9	25	13.1	161	10.5	0.05
Shoulder	27	8.2	54	9.7	37	8.2	21	11.0	139	9.1	0.56
Finger/Thumb	20	6.1	34	6.1	41	9.1	21	11.0	116	7.6	0.01
Clavicle	17	5.2	10	1.8	7	1.6	3	1.6	37	2.4	0.01
Lower extremity	**96**	**29.2**	**149**	**26.7**	**97**	**21.6**	**37**	**19.4**	**379**	**24.8**	**0.002**
Ankle	46	14.0	53	9.5	38	8.5	12	6.3	149	9.8	0.003
Knee	23	7.0	58	10.4	29	6.5	15	7.9	125	8.2	0.62
Leg	27	8.2	38	6.8	30	6.7	10	5.2	105	6.9	0.22
Abdomen/Thorax	**21**	**6.4**	**38**	**6.8**	**35**	**7.8**	**14**	**7.3**	**108**	**7.1**	**0.45**
Core	20	6.1	37	6.6	35	7.8	14	7.3	105	6.9	0.39
Spine	1	0.3	1	0.2	0		0		2	0.1	
Other	**2**	**0.6**	**15**	**2.7**	**8**	**1.4**	**3**	**1.6**	**28**	**1.8**	
Total	**329**	**100.0**	**558**	**100.0**	**449**	**100.0**	**191**	**100.0**	**1,527**	**100.0**	

* *p*-value for linear trend in proportions

Our analysis led to the identification of five "target" types of injury that warrant attention as prevention priorities (Table 5). These patterns were identified as priorities, based on objective criteria, and involved consideration of a cross-tabulation of nature of injury and body part, as well as disposition from the emergency department. The identification process admittedly involved some judgment on our part, although we used standard cut-offs pertaining to frequency (> 5% of the case series) and severity (> 10% with "serious" consequences). In the end, we hoped to identify a parsimonious list of target injury patterns that had importance for primary prevention as well as clinical intervention.

Our list includes some common injury types that, although requiring immediate medical procedures and associated follow-up care (e.g., stitching, casting), are likely to have a favourable long-term prognosis. Examples of these are facial wounds (target pattern 1) and upper extremity fractures (target pattern 2). The list also includes some less common injury patterns (e.g., shoulder dislocations/separations—target pattern 3; neurotrauma—target pattern 5) that have the potential to lead to long-term medical sequelae. Both general categories of target injury events are of importance and this surveillance initiative provides objective data in support of these events as prevention priorities.

Target pattern 1

Facial wounds were a common form of injury. These types of wounds may not limit on-going participation in rugby activity but often require treatment by stitches. Facial wounds are more commonly observed in the older age groups and among males. This may potentially be attributed to a higher paced and aggressive style of play. As players become more proficient in rugby skills, they begin to perform them quickly and aggressively, leading to high-speed collisions.

Target pattern 2

Upper extremity fractures were observed predominantly in younger players, a finding consistent with previous reports.[6] This type of injury ranges from a fracture of the clavicle to fractures of digits of the hand. These injuries can be debilitating on a long-term basis, depending upon their severity. The leading mechanism of this injury was the tackling phase (62/142; 43.7%), and this pattern was observed amongst both genders.

Target pattern 3

Shoulder dislocations/separations are potentially debilitating injuries that can lead to time off from play. The tackling phase resulted in nearly half of all shoulder dislocations/separations (35/76; 46.1%). Generally, this injury occurs when tackled and then landing on the point of the shoulder. Shoulder dislocations/separations were also more common among the senior age groups, likely as a result of high-impact tackles.

TABLE 5
Target injury events identified for rugby injury in Kingston, Canada (1993–2003)

Target injury pattern	Frequency		Serious injury*		Example
	N	%	N	%**	
1. Facial wound	232	15.2	195	84.1	A senior male forward is going into a ruck***, hoping to maintain possession of the ball. He then finds himself on the opposition's side of the ruck as they drive over. His face is stepped on during the process. He heads to the emergency room for stitches.
2. Upper extremity fracture	142	9.3	115	81.0	A smaller back is attempting to pass the ball from a ruck, when a large opposing forward tackles him to the ground. The back's arms are pinned to his side by the opposing forward and he falls forward, fracturing his clavicle as he is pressed to the ground. He is taken to hospital for treatment of a clavicle fracture.
3. Shoulder dislocation/separation	76	5.0	29	38.2	A high school male back is running with the ball when he is tackled by a larger player from the side. He falls sideways and lands on the ground with the point of the shoulder. He is unable to move the shoulder and his collar bone can be seen "standing up". He is taken to hospital for treatment of a third degree shoulder separation.
4. Lower extremity sprain/strain	187	12.2	49	26.2	A high school female back is running with the ball in open field and has only the opposing fullback to beat. She attempts to quickly cut to the outside, but her cleat has sunk into the ground and her foot remains planted. She twists her knee, resulting in a sprain and goes to the hospital for further observation.
5. Neurotrauma	149	9.8	23	15.1	A high-school-level back 1 receives a poor pass from back 2, which bounces along the ground. The back 2 is bent over, running forward in an attempt to pick up the ball, when an opposing flanker hits back 2 in the head with his shoulder. The player is immobilized and taken to hospital. Upon arrival, the player is administered the Glasgow Coma Score, the results of which suggest the need for further investigation for a possible concussion.
Concussion/spinal injury	73	4.8	11	15.1	
Minor head injury	76	5.0	12	15.8	

* Injuries requiring hospital admission or treatment with follow-up required
** Proportion of target injury
*** A play whereby the two sets of forwards mass together around the ball, struggling to gain possession of it

Target pattern 4

Sprains/strains of the lower extremity is the only target injury pattern that is more common among females (67/443; 15.1%) than males (120/1,084; 11.1%) and among the youngest age group (46/329; 14.0). Sprains and strains often occur when tendons and ligaments are stretched beyond normal limits. The forces involved may be major or minor, depending upon the level of impact involved in the injury event.[15] The types of rugby played within the above demographic groups are usually a "low impact" version of the game, and this injury pattern is consistent with what might be expected from that style of play.[3,9] The tackling phase accounted for 36% of these injuries (68/187) with running or making maneuvers on the field leading to another third of these injuries (57/187; 30.5%). Sprains/strains of the ankle and knee represented 12% of all the rugby injuries (187/1,527)

Target pattern 5

Neurotrauma (operationally defined as all cases of spinal cord injury, concussion or closed head injury) is the final target form. Head and spinal injury have received considerable media attention in recent past.[16] These injuries can be very debilitating and on rare occasions result in paralysis or death.[17,18] According to the International Rugby Board, players reported to have suffered a concussion are put on a mandatory three-week stand down from any rugby activity. Younger players and males experienced the highest proportions of these injuries. The majority of neurotrauma resulted from the tackling phase (59/149; 39.6%) and collisions on the field (58/149; 38.9%). In total, neurotrauma accounted for 9.8% of all rugby injury. Spinal cord injuries (N = 2) were rare.

Other notable injury patterns

As in other studies, the tackling phase was the leading cause of injury among rugby players.[1,3,8-11] Sprains/strains were also the most common nature of injury in this population.[1-3,7,12] We also found that the face/head was the most frequently injured anatomical location.[5,19] Foul play accounted for only 2.3% of represented injuries, a level below existing reports.[3,5] However, our estimate should be viewed as conservative as this designation was based on a text description of this injury event, collected in a medical setting.

Prevention

Unlike other community-based sport programs in Canada (e.g., ice hockey, soccer, basketball), rugby is generally introduced at the high school level, when participants are about 14 years of age. This can, speculatively, lead to an increased risk for injury (all target patterns) due to undeveloped levels of skill. Players should practice fundamental skills to some point of proficiency so that they are not a risk to other players or themselves. Many of the injuries observed (e.g., patterns 2, 3, 5) were a result of collisions on the field. The elements of play need to be closely monitored. Concussion and spinal injuries (pattern 5) are specific injuries that have been shown to be reduced through rule enforcement, attention to technique and team skills.[20] There is an inherent role for education and rule enforcement at player, coaching and game official levels in order to minimize playing risks.

A second approach to prevention is the use of protective equipment. In the context of rugby, most existing protective equipment has demonstrated limited efficacy in the prevention of common forms of injury, with some exceptions (e.g., scrum caps—foam helmets no thicker than 1 cm—support sleeves and mouth guards.[11,12]) Though scrum caps have not been shown to reduce concussion (pattern 5), they have led to reductions in lacerations to the head (pattern 1).[11,12] There is the possibility of further optimization of these caps in the prevention of neurotrauma, such as providing more padding near the temporal area, where most concussive blows occur.[21] Support sleeves have been shown to reduce injury, specifically sprain/strain injury (pattern 4).[11] Our identification of sprain/strain injury as a target priority would support programs to test the adoption of support sleeves. Mouth guards are a common piece of equipment that have been shown to prevent orofacial injuries.[9,11,23,24] They are generally worn because of the idea that they help prevent concussion (pattern 5); a perception that remains under debate.[11,22,23]

In terms of tertiary prevention, it is important that rugby injuries be assessed clinically and properly rehabilitated before the player returns to the sport.[22,25] Players who return to the game with a lingering injury from a prior event are significantly more likely to be re-injured (e.g., patterns 2-5).[22,25] Neurotraumas are an important area of clinical concern due to their relatively high frequency. A player who suffers a concussion is required to take a three-week stand down period from any rugby activity, including practices, irrespective of the severity of the concussion.[3,6,26] However, in reality this rule may be disregarded and the player's return dependent upon the coach's or player's own perceptions. This practice requires further discussion as an obvious prevention priority.

Limitations

Limitations of our analysis warrant recognition. First, this analysis only considers rugby injuries that present to the emergency department for care. As such, these visits represent only a portion of the injuries that require and/or receive medical attention. It was not possible to determine the number of injuries treated in physicians' offices and outpatient clinics, or identify players who did not seek medical care. Second, because exposure data were not available, we were unable to calculate meaningful rates of injury. Third, descriptions of injury circumstances were based upon self-reports collected as part of an established surveillance program. The CHIRPP system was not developed exclusively for the study of rugby injuries, which limits detail at the record level. For example, descriptions of injury mechanisms are based upon close-ended coding items and the exact natures of the playing circumstances or physical descriptions of injury-producing events are rarely available. This lead to some judgments during the coding of specific mechanisms of injury, and the possibility of random coding errors due to missing or sparse information on the CHIRPP record. For a portion of the injuries, the mechanism could not be specified from the CHIRPP records (Table 1). Available CHIRPP descriptions also do not provide an indication of player position or relative time with respect to the match. Fourth, up to 15% of patients that present to emergency are unable or unwilling to complete the CHIRPP surveillance form and injury descriptions are provided by a proxy respondent or abstracted from the medical record. This process may also lead to misclassified or non-specific data reports. Finally, while standard approaches to the triage and initial management of these injuries are in place, emergency physicians vary in their approach to patient management. This may lead to varying and non-specific diagnoses being recorded on the medical chart and hence the CHIRPP surveillance record.

Conclusion

This novel analysis profiled the scope and nature of injuries experienced during the sport of rugby. This study is unique in that it encompasses participants at all levels of the sport in a defined population and because of its relative size, compared with existing reports. Our hope is that the identified target injury patterns are helpful in indicating priorities for injury prevention at the grassroots level.

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