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Results on sports-related injuries in children from NHS emergency care dataset Oxfordshire pilot: an ecological study

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Summary

Objectives: To analyse and report on sports-related injuries using enhanced injury data collected by the testbed for the NHS emergency care injury data set and admissions data collected from inpatients.
Design: Ecological study design.
Setting: Two Oxfordshire NHS England hospitals.
Participants: Emergency department attendees and inpatients aged 0–19 years with sports injuries.
Main outcome measures: Data were analysed from 1 January 2012 to 30 March 2014 by age, gender sport, injury location, injury mechanism and diagnosis including concussion/post-concussion, bone fractures and ligament damage. Admissions data were analysed from 1 January 2012 to 24 January 2015.
Results: Children and adolescents aged 0–19 years accounted for almost half (47.4%) of sports injury-related emergency department attendances and almost one-quarter (23.5%) of sports injury-related admissions for all ages. The highest rates of attendance occurred at 14 years for boys (68.22 per 1000 person-years) and 12 years for girls (33.72 per 1000 person-years). For male 0–19-year-olds the three main sports were (in order) football (soccer), rugby union and rugby league and for females, trampoline, netball and horse-riding. The largest gender differences were in netball where injuries were predominantly in females and in wheeled motorsports where injuries were predominantly in males. Almost one-quarter of emergency department sports-related injuries recorded were fractures, the highest percentage to the upper limbs.
Conclusions: Public health departments in local authorities and schools should consider target sports injury prevention at children in the first four years of secondary school. For younger age groups, trampolines in the home warrant improved safety. Rugby and horse-riding should also be a focus for interventions.

Keywords

Orthopaedics and sports medicine, injury, epidemiology, emergency medicine

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Introduction

Encouraging children to take part in sports is a key part of the UK government's childhood obesity strategy.[1] To maximise the benefits, however, attention to sports injury prevention is required.[2] NHS England Hospital Episode Statistics for emergency departments record 367,093 attendances related to sports in 2014–2015, 1.9% of all emergency department attendances and 7.7% of injury-related attendances.[3] UK data on the European Injury Data Base estimates an incidence of four sports injury-related emergency department attendances for every 10,000 inhabitants in 2012; for 10–14-year-olds the rate was 20 per 10,000 inhabitants for 2012.[4] These figures may, however, be an underestimate; a study of injury data at two Oxfordshire NHS emergency departments found receptionists recorded twice as many sports injury-related attendances than were returned to Hospital Episode Statistics.[5] Sports injuries can be severe; in Europe an estimated 7000 fatalities occur annually during sports and recreational activities.[6] In the US, 32% of all life-threatening injuries in children at emergency departments are sports-related.[7]

Children are particularly affected by sports injuries; a six-month study in an Irish emergency department found that 40% of sports injury-related attendances were in children aged 4–16 years, despite this age group comprising only 18% of the general population.[8] US data records sports as the number one cause of paediatric injury-related emergency department attendances.[9] Children with sports-related injuries are more likely to present with fractures than adults.[8] In the US, head and neck sports injury emergency department attendances in 5–18-year-olds are estimated to have risen 18.5% from 270,000 in 2001 to 320,000 in 2013, while other sports injuries to the upper and lower extremities have fallen or stayed the same.[10] The numbers of sports concussion emergency department attendances

are also estimated to have risen across the US by over 200% from a national estimate of 96,015 in 2001–2004 (2.0% of all sports injury emergency department attendances) to 291,762 in 2009–2013 (4.6%).[10]

Discontinuation of the UK wide Home & Leisure Accident Surveillance System in 2002 has deduced the data collected from emergency department patients on injury and sports are a neglected area, particularly in children.[11,12] In January 2012, a pilot project for the NHS National Emergency Care Data Set injury section was initiated at two Oxfordshire hospitals which included data on sports-related injury. The emergency care data set will be a valuable source of UK data on sports injury covering the full range of sports played in society across age groups.[13]

The main aim of this paper is to analyse and report the results from the Oxfordshire injury pilot of the emergency care data set for sports-related injury attendances in 0–19-year-olds. Additionally, for comparison, data collected separately from hospital inpatients with more severe injuries via the routine Trauma and Audit Research Network system were analysed for 0–19-year-olds sports-related admissions.

Methods

This is an ecological study using data from two sources, the main analysis uses emergency department data and the secondary, comparative analysis uses routinely collected inpatients data. Details of the two data sources are given below.

Emergency department data

Enhanced injury data, over and above that required by Hospital Episode Statistics, have been collected at the two emergency departments, John Radcliffe Hospital in Oxford and Horton General Hospital in Banbury, Cherwell, of the Oxford University Hospitals NHS Foundation Trust since January 2012. The Oxford University Hospitals NHS Foundation Trust has two 24-hour emergency departments, one sited at the John Radcliffe Hospital, a designated Major Trauma Centre for adult and paediatric major trauma, and the other at the Horton General Hospital, providing acute and emergency care but not trauma care. Full details of the development of this pilot injury data collection exercise and of the data sets are available in an earlier paper.[5]

Data were analysed from 1 January 2012 to 30 March 2014. All injury attendances were included regardless of intent as intentional injuries in sports are likely to be foul play rather than intentional assaults. Sports-related injury attendances were identified as those with a specific sport or 'Other specified sport' recorded. Excluded from analysis were those also coded as road traffic collisions.

Data were analysed for 0–19-year-olds by age, gender, sport, location of injury, mechanism of injury and diagnosis including concussion/post-concussion, bone fractures and ligament damage. Injury incidence was calculated using data from patients resident in the districts of Oxford and Cherwell, the districts containing the two emergency departments. In 2013, the population of Oxfordshire was estimated to be 652,323 with the two largest districts Oxford and Cherwell containing 154,773 and 143,659 people, respectively. Patient residence was identified by lower super output area, see earlier paper for method,[5] and Office for National Statistics mid-year population estimates for 2012, 2013 and one-quarter of 2014 by age, sex and lower super output area were used to calculate exposure as person-years.

Diagnoses in the form of SNOMED Description ID codes were converted into International Classification of Diseases (ICD)-10 Chapter Blocks.[5] These were supplemented with information from unmatched SNOMED codes to form a body site classification for each diagnosis.

Trauma and Audit Research Network data

Data on severe injury leading to hospital admission under Trauma and Audit Research Network criteria to the Oxford University Hospitals NHS Foundation Trust hospitals from 1 January 2012 to 24 Jan 2015 were obtained from the Oxford University Hospitals Trauma and Audit Research Network database. The Trauma and Audit Research Network contains data on patients admitted to hospital for at least three days or admitted to a critical care area regardless of length of stay for particularly serious injuries including fractures of the skull and upper and lower limbs.[14] Trauma data were collected separately from hospital inpatients under the Trauma and Audit Research Network criteria as part of the routine trauma data collection processes.

There will be some patients included in the trauma data set who also appear in the enhanced emergency department data-set; this will depend on whether they were admitted via emergency department reception. There was no linkage available between the emergency department data and trauma data so the exact details of this subgroup of patients are unknown.

The Trauma and Audit Research Network data were analysed for 0–19-year-olds by age, gender and

sport. Patients injured during sports or recreational activities were identified by interrogating the free text field 'Incident Description'.

Results

Emergency Department attendances

There were 63,877 emergency department injury attendances recorded between 1 January 2012 and 30 March 2014 for all ages with 11,676 (18.3%) recorded as sports-related of which 1.9% were in 0–4-year-olds, 6.3% in 5–9-year-olds, 20.4% in 10–14-year-olds and 18.8% in 15–19-year-olds. For 0–19-year-olds there were 20,883 attendances with 5533 (26.5%) sports-related of which 3763 (68.0%) were in males and 1770 (32.0%) in females. There were 227 (4.8%) sports-related attendances out of 4733 all-cause attendances in 0–4-year-olds, 733 (18.9%) of 3884 in 5–9 year-olds, 2380 (42.6%) of 5592 in 10–14-year-olds and 2193 (32.9%) of 6674 in 15–19-year-olds. There were 66 sports injury attendances in 0–19-year-olds also coded as road traffic collisions and excluded: cycling (n = 28); other specified sport (n = 27); motorsports – wheeled (n = 9); cricket (n = 1); and football (n = 1). Attendances varied by month peaking in March for both see online (see online Figures 1 and 2).

Football (soccer) was the sport associated with the largest number of injuries in 0–19-year-old males, 1420 (37.7% of total male sports injury attendances), followed by rugby union, rugby league, trampoline and basketball with 584 (15.5%), 190 (5.0%), 159 (4.2%) and 120 (3.2%) attendances, respectively (see online Table A1 and A2). The largest number of injuries for each sport in 0–19-year-old males occurred at: 15 years for football; 14 years for rugby union and rugby league; nine years for trampoline; and 13 and 14 years for basketball (see online Table 2 and Figure 1).

In 0–19-year-old females, trampoline was the sport associated with the largest number of injuries, 213 (12.0% of total female sports injury attendances), followed by netball, horse-riding, football and ice-skating with 154 (8.7%), 142 (8.0%), 142 (8.0%) and 120 (6.8%) attendances, respectively (see online Table 1). The largest number of injuries for each sport in 0–19-year-old females occurred at: eight years for trampoline; 14 years for netball; 13 years for horse-riding; 13, 14 and 17 years for football; and 12 years for ice-skating (see online Table 2 and Figure 2).

Netball had the largest gender difference with 98% of injuries in females (Figure 3). Horse-riding injuries were 92% female while wheeled motorsport, rugby

Figure 1. Sports-related unintentional injuries in males aged 0–19 years in Oxfordshire. Number of injury-related emergency department attendances by age for the five main sports.
Source: Oxford University Hospitals NHS Foundation Trust Emergency Departments, 1 January 2012 to 30 March 2014.

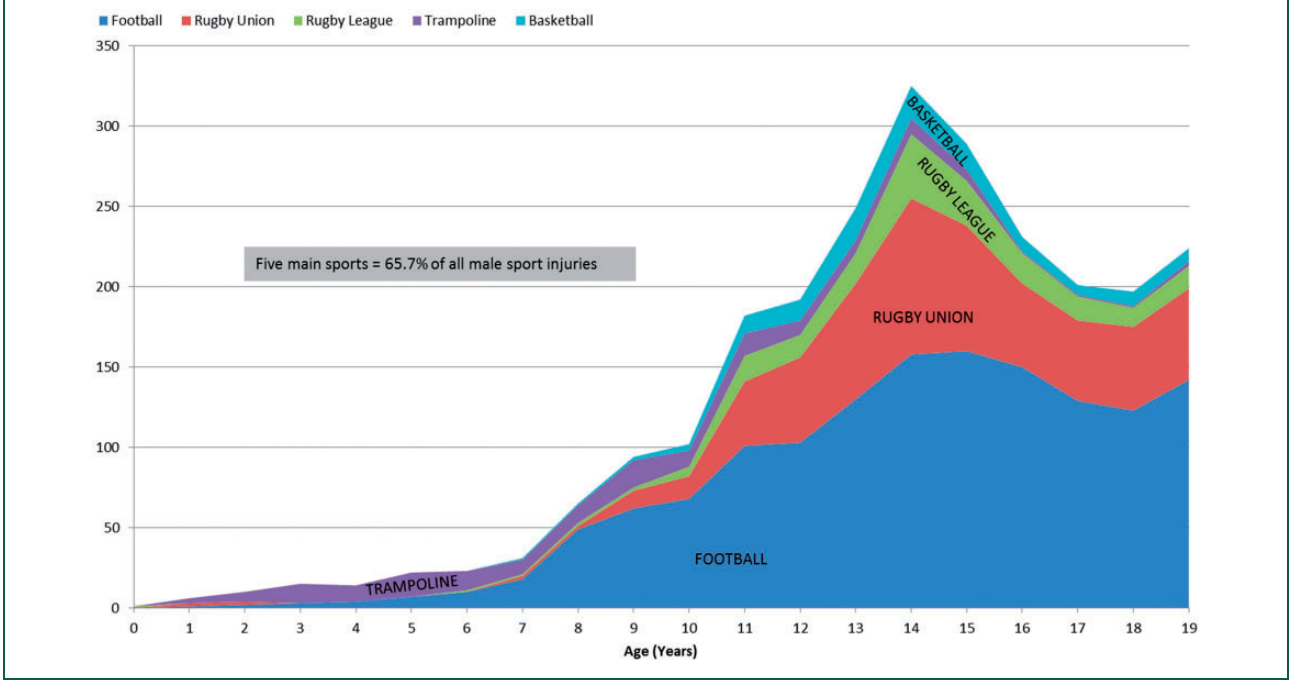
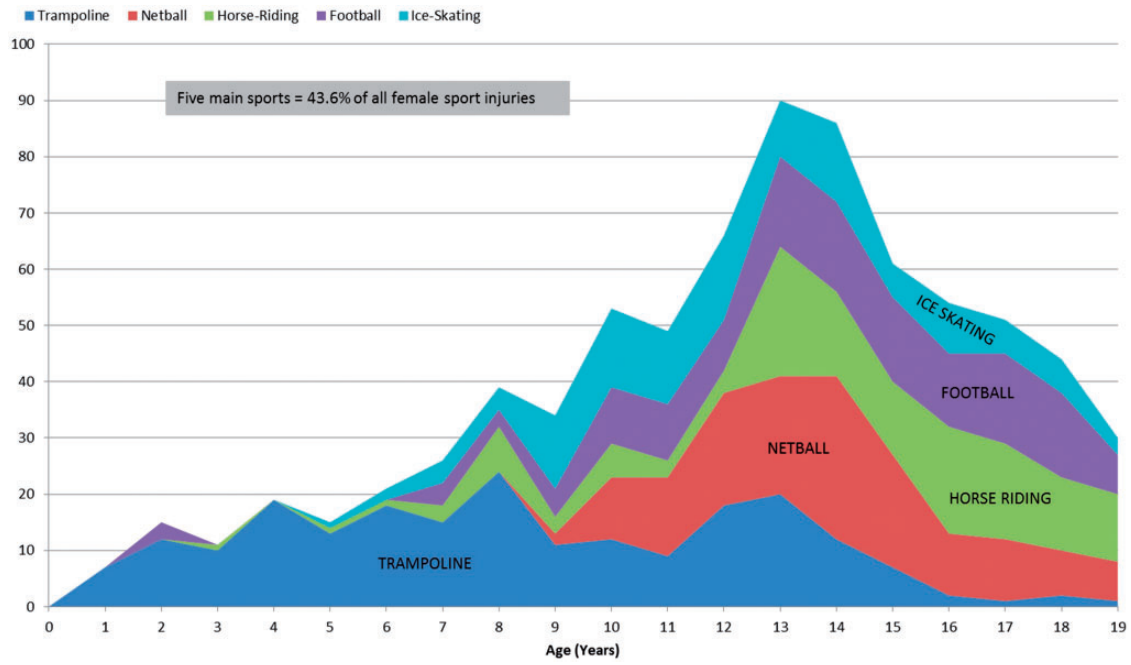


Figure 2. Sports-related unintentional injuries in females aged 0–19 years in Oxfordshire. Number of injury-related emergency department attendances by age for the five main sports.
Source: Oxford University Hospitals NHS Foundation Trust Emergency Departments, 1 January 2012 to 30 March 2014.



union and rugby league injuries were 96%, 95% and 95% male, respectively.

Peak incidence for attendance for patients resident in Oxford and Cherwell districts occurred at 14 years for boys and 12 years for girls, 68.22 and 33.72 injury attendances per 1000 person-years, respectively. The location with the highest incidence was home for children up to six years, leisure for 7–10 years, education for 11–13 years and leisure for 14–19 years (see online Table D and Figure C).

The most frequent location in males was 'Athletics and Sports Area' followed by 'School, Educational Area' accounting for 42.4% and 28.2% of attendances, respectively, and for females, 'School, Educational Area' followed by 'Athletics and Sports Area' accounting for 29.0% and 28.6% of attendances, respectively (see online Table E).

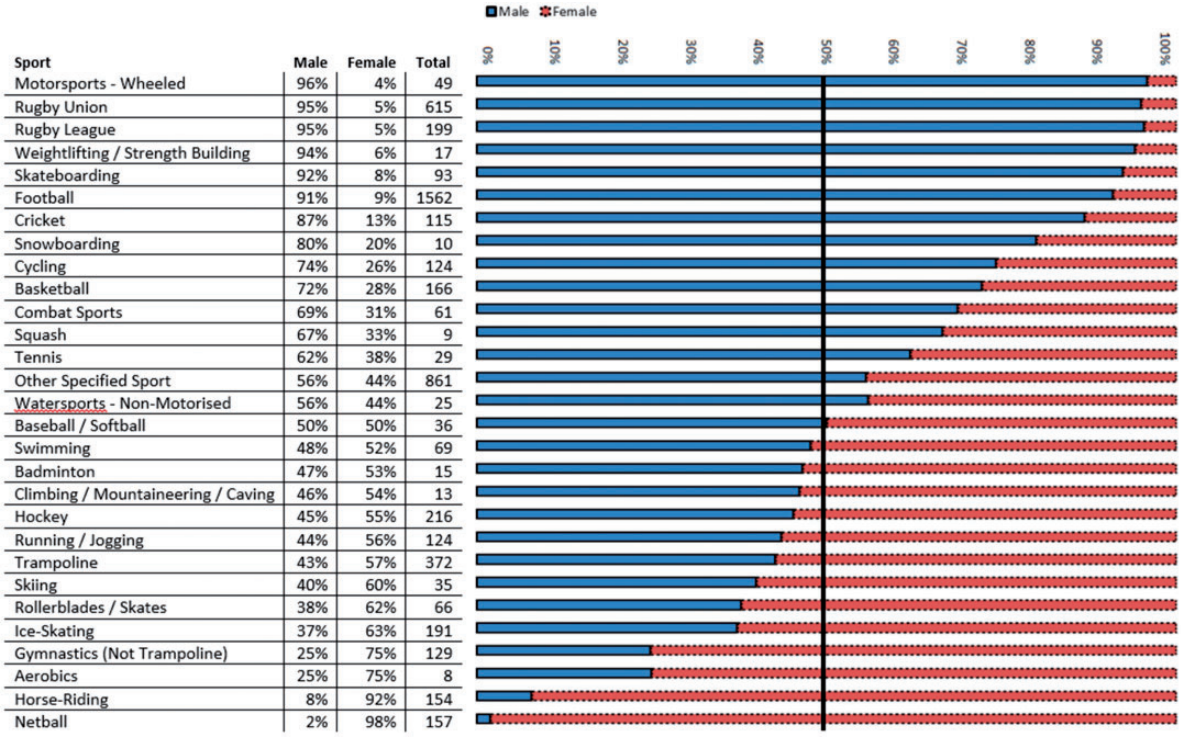
Nature of injury

A large number of attendances were diagnosed as injury with body site unspecified, 1245 (33.1%) in males and 618 (34.9%) in females with a further 215 (5.7%) and 103 (5.8%) coded as undiagnosed in males and females, respectively (Table 1). The main body sites injured were upper limb, 765 (20.3%) in males and 396 (22.4%) in females, and lower limb, 604 (16.1%) in males and 277 (15.6%) in females.

There were 1253 fractures recorded, 22.6% of attendances, 873 (69.7%) in males and 380 in females (30.3%) (Table 1). The highest proportion were to upper limbs, 549 (43.8%) with 187 (14.9%) to the lower limbs (see online Table F). Girls had proportionally more fractures in younger age groups than boys (0–4 years 6.8% versus 2.4%, respectively) and 5–9 years (25.3% versus 12.7%, respectively), $p<0.0001$ for both. In 0–4 year-old girls this was due to a higher percentage of fractures in 'Other Specified Sport' whereas in 5–9-year-old girls there was a high percentage of fractures from horse-riding (11 out of 16 injuries, 68.8%).

Excluding sports with relatively small numbers of injuries (less than 80 and 30 attendances in boys and girls, respectively), fractures made up the largest proportion of injuries in cycling (30.4%), skateboarding (33.7%) and gymnastics (not trampoline) (34.4%) in males and rollerblades/skates (46.3%) and cycling (31.3%) in females (see online Tables A1 and B1). Peak fracture incidence in Oxford and Cherwell districts occurred at 13 years for boys and 12 years for girls, 18.33 and 7.78 injury attendances per 1000 person-years, respectively. For children aged 10–19 years, fracture incidence was 10.74 and 3.74 per 1000 person-years for males and females, respectively.

Figure 3. Emergency department attendances from sports-related injury 0–19 years, January 2012 to March 2014 Oxfordshire England.
Percentage of injuries by gender.[a]
[a]Not including hiking (males 100%, females 0%, total = 2); golf (75%, 25%, 4); air sports – not motorised (50%, 50%, 2); water sports – motorised (25%, 75%, 4); SCUBA diving (recreational) (0%, 100%, 1).



Sport	Male	Female	Total
Motorsports - Wheeled	96%	4%	49
Rugby Union	95%	5%	615
Rugby League	95%	5%	199
Weightlifting / Strength Building	94%	6%	17
Skateboarding	92%	8%	93
Football	91%	9%	1562
Cricket	87%	13%	115
Snowboarding	80%	20%	10
Cycling	74%	26%	124
Basketball	72%	28%	166
Combat Sports	69%	31%	61
Squash	67%	33%	9
Tennis	62%	38%	29
Other Specified Sport	56%	44%	861
Watersports - Non-Motorised	56%	44%	25
Baseball / Softball	50%	50%	36
Swimming	48%	52%	69
Badminton	47%	53%	15
Climbing / Mountaineering / Caving	46%	54%	13
Hockey	45%	55%	216
Running / Jogging	44%	56%	124
Trampoline	43%	57%	372
Skiing	40%	60%	35
Rollerblades / Skates	38%	62%	66
Ice-Skating	37%	63%	191
Gymnastics (Not Trampoline)	25%	75%	129
Aerobics	25%	75%	8
Horse-Riding	8%	92%	154
Netball	2%	98%	157

There were a total of 65 and 23 diagnoses related to ligament damage in males and females, respectively (Table 1). In males there were 29 diagnoses of ligament damage in football and 14 in rugby union. Netball and football recorded four ligament damage diagnoses each in females.

Head injury

Rugby union was the sport most associated with head and neck injuries in boys with 102 (17.5% of all rugby union injuries) and 17 (2.9%) injuries, respectively (Table 1). In girls, the sport most associated with a head injury was horse-riding with 17 injuries (12.0%); four girls (1.9%) injured their neck while trampolining. There were 10 concussions or post-concussions recorded in rugby union in boys out of 19 such diagnoses for all sports. In girls, hockey had the most concussions or post-concussions, 3 out of 16 for all sports. There was a higher percentage of rugby head and neck injuries in 15–19-year-old boys (61 out of 289 injuries, 21.1%) than in 10–14-year-old boys (46/276, 16.7%).

Hospital admissions

Trauma data recorded 324 sports-or recreational activity-related admissions in patients aged 0–19 years. Of the 91 (28.1%) which were injury-related (Table 2), cycling was cited in 22 (24.2%) with a majority in males (81.8%) and horse-riding in 16 (17.6%) with a majority in females (87.5%). Other main sports were trampoline (seven injuries, 7.7% of total), rugby (six injuries, 6.6%) and motocross (six injuries, 6.6%). Six cycling injuries were also road traffic collisions involving other traffic.

There were 23.5% of all ages sports-and recreation-related admissions in 0–19-year-olds and 16.2% in 0–14-year-olds; excluding cycling, the figures were 29.4% and 20.4%, respectively.

Discussion

This study has confirmed the high burden of sport injury in children and adolescents with almost a half of sport injury related emergency department attendances and almost a quarter of sport injury

Table 1. Emergency department attendances from sports-related injury in those aged 0–19 years, January 2012 to March 2014 Oxfordshire England. Top five sports and all sports by gender and main diagnosis body site with percentages of all injuries, including fractures, concussion/post-concussion and ligament damage diagnosis.

Gender	Sport	Diagnosis body site									Fractures (percentage of all sport fractures)	Ligament damage[a]	Concussion/ post-concussion[b]
		Head	Neck	Upper limb	Abdomen, spine, thorax, pelvis	Lower limb	Injuries, site unspecified	Other diagnosis	No diagnosis	Total			
Males	Football	98 (6.9%)	4 (0.3%)	281 (19.8%)	8 (0.6%)	337 (23.7%)	482 (33.9%)	158 (11.1%)	52 (3.7%)	1420 (100%)	345 (39.5%)	29	6
	Rugby union	102 (17.5%)	17 (2.9%)	130 (22.3%)	2 (0.3%)	55 (9.4%)	145 (24.8%)	86 (14.7%)	47 (8%)	584 (100%)	115 (13.2%)	14	10
	Rugby league	18 (9.5%)	3 (1.6%)	35 (18.4%)	6 (3.2%)	27 (14.2%)	78 (41.1%)	14 (7.4%)	9 (4.7%)	190 (100%)	41 (4.7%)	4	0
	Trampoline	23 (14.5%)	4 (2.5%)	38 (23.9%)	1 (0.6%)	26 (16.4%)	36 (22.6%)	18 (11.3%)	13 (8.2%)	159 (100%)	42 (4.8%)	1	0
	Basketball	3 (2.5%)	0 (0%)	33 (27.5%)	0 (0%)	19 (15.8%)	57 (47.5%)	2 (1.7%)	2 (1.7%)	120 (100%)	26 (3.0%)	4	0
	All sports	419 (11.1%)	32 (0.9%)	765 (20.3%)	30 (0.8%)	604 (16.1%)	1245 (33.1%)	453 (12%)	215 (5.7%)	3763 (100%)	873 (100%)	65	19
Females	Trampoline	11 (5.2%)	4 (1.9%)	37 (17.4%)	1 (0.5%)	44 (20.7%)	70 (32.9%)	24 (11.3%)	22 (10.3%)	213 (100%)	55 (14.5%)	3	1
	Netball	4 (2.6%)	0 (0%)	44 (28.6%)	0 (0%)	35 (22.7%)	56 (36.4%)	10 (6.5%)	5 (3.2%)	154 (100%)	30 (7.9%)	4	1
	Football	9 (6.3%)	0 (0%)	30 (21.1%)	1 (0.7%)	27 (19%)	46 (32.4%)	24 (16.9%)	5 (3.5%)	142 (100%)	28 (7.4%)	4	2
	Horse-riding	17 (12%)	0 (0%)	28 (19.7%)	6 (4.2%)	8 (5.6%)	59 (41.5%)	15 (10.6%)	9 (6.3%)	142 (100%)	37 (9.7%)	1	1
	Ice-skating	6 (5%)	0 (0%)	40 (33.3%)	0 (0%)	17 (14.2%)	40 (33.3%)	12 (10%)	5 (4.2%)	120 (100%)	31 (8.2%)	1	0
	All sports	127 (7.2%)	19 (1.1%)	396 (22.4%)	14 (0.8%)	277 (15.6%)	618 (34.9%)	216 (12.2%)	103 (5.8%)	1770 (100%)	380 (100%)	23	16

Source: Oxford University Hospitals NHS Foundation Trust Emergency Departments, 1 January 2012 to 30 March 2014.

[a]Also in males, cricket (n = 1), hockey (n = 2), ice-skating (n = 1), motorsports – wheeled (n = 1), other specified sport (n = 4), running/jogging (n = 1), skiing (n = 1), swimming (n = 1), water sports – non-motorised (n = 1); and in females, gymnastics (not trampoline) (n = 1), hockey (n = 2), other specified sport (n = 3), rugby union (n = 1), skiing (n = 3).

[b]Also in males, cycling (n = 1), hockey (n = 1) and snowboarding (n = 1); and in females, cycling (n = 1), hockey (n = 3), rugby union (n = 2), skiing (n = 2), swimming (n = 2) and water sports – non-motorised (n = 1).

Table 2. Admissions to hospital for severe injury from sports and recreational activities in those aged 0–19 years, January 2012 to March 2015 Oxfordshire England.

Sport	Both genders				Male (0–19 years)	Female (0–19 years)	Both genders (0–19 years)
	0–4 years	5–9 years	10–14 years	15–19 years			
Cycling	1	5	9	7	18	4	22
Cycling (non-road traffic collision and play)	*0*	*5*	*4*	*2*	*8*	*3*	*11*
Cycling (road traffic collision)	*0*	*0*	*4*	*2*	*5*	*1*	*6*
BMX	*0*	*0*	*1*	*3*	*4*	*0*	*4*
Mountain bike	*1*	*0*	*0*	*0*	*1*	*0*	*1*
Horse-riding	0	4	7	5	2	14	16
Trampoline	1	3	2	1	3	4	7
Rugby[a]	0	0	2	4	6	0	6
Motocross	0	1	3	2	6	0	6
Football	2	1	1	1	5	0	5
Scooter	0	1	0	0	2	2	4
Climbing frame	2	1	0	0	2	1	3
Tree climbing	0	0	3	0	3	0	3
Speedway	0	0	0	2	2	0	2
Skateboard	0	0	1	1	2	0	2
Jogging/running	0	1	0	1	1	1	2
Diving	0	0	0	2	2	0	2
Go-Kart	1	0	1	0	2	0	2
Helter skelter	0	1	0	0	1	0	1
Swimming	0	0	1	0	1	0	1
Kabaddi	0	0	0	1	1	0	1
Toy car	1	0	0	0	1	0	1
Motorsport	0	0	0	1	1	0	1
Rollerblades	0	1	0	0	0	1	1
Basketball	0	1	0	0	1	0	1
Wrestling	0	0	1	0	1	0	1
Netball	0	0	1	0	0	1	1
Total	11	20	32	28	63	28	91

Source: Trauma Audit and Research Network Oxford University Hospitals NHS Foundation Trust Emergency Departments, 1 January 2012 to 24 March 2015.

[a]Does not specify whether rugby union or rugby league.

related inpatient admissions for all ages, in 0-19 year-olds. Almost a quarter of emergency department sport-related injuries were fractures most commonly to the upper limbs.

Some countries use surveys and surveillance systems to monitor injuries with hospital data from outpatients, ED attendances and admissions, for example the National Hospital Ambulatory Medical Care Survey and the National Electronic Injury Surveillance System in the US;[15–17] and the Victorian Injury Surveillance & Applied Research System in Australia.[18] Figures from these are reassuringly comparable to those from Oxfordshire with an estimated 23% of emergency department injury attendances in 0–18-year-olds in the US sports-related[19] and an estimated 33% of all emergency department sport and active recreation injury attendances in Australia in 0–14-year-olds.[20] Peak incidence of emergency department sports injury attendances in the US is at 13–18 years at 51 per 1000 person-years.[19] In the US, 24% of emergency department sports injury attendances in 0–18-year-olds are estimated to be fractures and dislocations.[19] Finally, in Australia, 21% of admissions for sports and active recreation injury are estimated to be in 0–14-year-olds.[20]

No such systematic monitoring exists in the UK, with only a small number of *ad hoc* surveys available on sports injury in children in hospitals, mainly in North East England[21,22] and Edinburgh and South East Scotland.[23] Again comparable figures to those from Oxfordshire are evident. A study from Gateshead between September 1997 and August 1998 found 20.3% of sports-related injury emergency department attendances in 5–15-year-olds were fractures.[21] A study from Edinburgh in Scotland in year 2000 found the highest incidence of emergency department sport fracture attendances of 9.28 and 1.86 attendances per 1000 person-years in 10–19-year-old males and females, respectively.[23]

There is evidence, however, of possible poor recording of upper limb fractures in Oxfordshire. Upper limb fractures made up 90% of all fractures in 5–15-year-olds in Gateshead[21] and 84% in 10–19-year-olds in Edinburgh.[23] In Oxfordshire, only 43.8% of fractures in 0–19-year-olds were recorded as upper limb fractures with a large percentage (38.5%) site unspecified. Early results from the introduction of the emergency care data set show a dramatic increase in diagnostic accuracy over that previously provided to Hospital Episode Statistics.[13]

Higher rates of concussion diagnoses are evident in the US compared to Oxfordshire. In the US, concussion diagnoses rose from 2.0% to 4.6% of all emergency department sports injury attendances in 5–18-year-olds between 2001–2004 and 2009–2013.[10] These figures are higher than the 0.6% figure of concussion diagnoses in 5–18-year-olds in Oxfordshire emergency department sport injuries. Additionally, sport concussions which make it to an emergency department are likely to be the tip of the iceberg.

What stands out from the US, Australian and Oxfordshire data is the preponderance of collision sports. A survey from Australia across all ages which included measures of sports participation found rugby league (2.0 injuries per 1000 player-hours), rugby union (1.9) and Australian rules football (1.9) had the highest sports injury incidence.[24] Unfortunately, due to the lack of sports participation data on children in Oxfordshire and the UK more generally, it has not been possible for this study to calculate comparable sports injury emergency department attendance rates per person-years for individual sports. In the US, American football is the most frequently recorded sport in National Electronic Injury Surveillance System data attributed to 28.3% of emergency department sports injury attendances in 5–18-year-olds[10] whereas in Australia, Australian Rules Football is the number one sport, cited in 31% of emergency department sports injuries in 0–14-year-olds.[24] Additionally, an Edinburgh study of emergency department attendances found rugby accounted for the second highest number of sports-related fractures in 10–19-year-olds, 15.7% behind football on 36.0%.[23] In Oxfordshire, rugby union and rugby league were the second and third most cited sport for emergency department injury attendances in males, respectively, despite rugby being only the 18th and 14th most played sport for 5–10-year-olds and 11–15-year-olds in 2016/17, respectively.[25]

Unfortunately, these data on child sports participation for England are limited and hampered by a lack of the gender differentiation evident in the data from Oxfordshire. Such gender differences have also been found in the US albeit for different sports where in 1–18-year-olds, the highest proportion of male injuries are in American football (95%), combat sports (89%) and skateboards (89%) with softball (88%), gymnastics and cheerleading (86%) and horseback riding (75%) injuries predominantly female.[26]

Collision sports also dominate concussion diagnoses. In a US study of nine sports selected for their potential for contact and risk of concussion in 4–13-year-olds, American football (41% of all sport concussion emergency department attendances) was the main sport followed by basketball (20%) and soccer (17%).[27] In Oxfordshire, rugby union was the main

sport in 0–19-year-olds responsible for more than half of all diagnosed concussions in males. It is not difficult to understand why collision sports have high risks of concussion, a US study found player-to-player contact (40% of sport concussion emergency department attendances) and player-to-ground contact (18%) were the most frequently occurring mechanisms in sports concussion in 4–13-year-olds followed by ball-to-head contact (15%) and player-to-other-object contact (5%).[27] Since 2008, the number of concussions due to player-to-player contact has increased more rapidly than those by any other mechanism.[27]

Summary

This study has demonstrated the high burden on NHS hospitals from sports injury attendance in children and adolescents and the need for serious injury prevention work in this field. Data on sports injury are poor across the UK but should improve with the new NHS emergency care data set[13] with detailed coding of injuries by individual sport within the NHS for the first time in England. Serious consideration needs to be given to how data generated can be used to inform schools, clubs, coaches, parents and children and to inform injury prevention strategies and reduce the burden of injuries and morbidity in children.

One of the biggest problems experienced by this study when attempting to compare results across studies from different countries was the lack of standard age groupings. There is a need for standardisation of this basic demographic; this study chose the age grouping used by Information Services Division NHS Scotland to present data on unintentional injury admissions.[28] There is also a need for the Taking Part survey organised by the Department for Digital, Culture, Media & Sport to include gender differentiation into its lists of most participated sports; differentiating between rugby union and rugby league would also be helpful.

If public health departments in local authorities and schools were to adopt a high-risk strategy to prevention they should target those in the first four years of secondary school. For younger age groups, trampolines in the home warrant improved safety. Rugby and horse-riding should also be a focus for interventions.

Declarations

Competing Interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare they have no conflicts of interest.

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