Sports Injuries Presenting to the Emergency Department: Mostly a Pediatric Problem

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Abstract

Objective: The purpose of this study was to determine the incidence of all sports injuries presenting to our emergency department over a year's time (2002-3), the demographics and disposition of the sports injured group, and the association of particular injuries with particular sports.

Methods: This was a retrospective chart review of all emergency department patients that presented with documented sports injuries..

Results: 3% of all our patients had sports-related injuries [mean age = 21+15, 72% male ,71% Caucasian]. Most of the injuries were in children and males, and from basketball and biking. 5% were admitted to the hospital, mostly for head and extremity injuries.

Conclusion: Our emergency department sees a significant number of sports injuries in a young population with injuries primarily to the extremities and the head. The admitted sports injured patients were primarily involved in biking, basketball, and playground/backyard activities. Perhaps more protective gear should be recommended.

INTRODUCTION

Over the last decade the emergency department is seeing an increase in the number of sports-related injuries as more of the general population is becoming involved in recreational sports, and at an earlier age. The Centers for Disease Control estimated that in 1997-8 there were an average of 2.6 million emergency visits for sports-related injuries by persons 5 to 24 years old.[1] It has been shown that increased physical activity has many positive effects: improving overall health, reducing obesity, and decreasing the harmful effects of many diseases like osteoporosis, diabetes, coronary artery disease, and arthritis.

Unfortunately, sports injuries are a negative consequence of increased sports involvement. There is limited data on the long term consequences of an ankle sprain in a child, a dislocated shoulder in an adolescent, or a head contusion in a teenager as a result of a sports injury. Fortunately, protective gear has been instituted in football, and rules such as spearing have been changed with positive effects. [2] However, there are many sports with no protective gear, or minimal gear for girls as compared with boys playing the same sport. Studies are necessary to identify areas for potential preventive measures, and accurate information for parents regarding the relative safety of certain sports for their children, and the implications of certain injuries for the future of the individual.

The purpose of this study was to determine: 1.) The incidence of all sports injuries presenting to our ED over a year's time (2002-3), 2.)The demographics and disposition of the sports injured group, and 3.) The association of particular injuries, especially serious injuries, with particular sports. This may enable us to determine which precautions, (i.e., protective gear), might be effective in reducing sports-related injury in the future, and which groups should be targetted.

METHODS

Setting And Population: Academic emergency department in an ethnically diverse, middle class, populated suburb of New York City with approximately 60,000 visits per year.

Design: This was a retrospective chart review of all emergency department patients (children and adults) that presented to our emergency department (ED)with sports injuries from July 2002-3. We reviewed the ED charts on all registered ED patients of all ages seen over a year's time to capture all seasons of sports. Charts remained in the ED for 10 days before they went to medical records. During this time we reviewed every chart. On any chart that documented a sports related injury, we recorded the sport the patient was involved in, their demographic information (age, sex, race), the type of injury, the ED treatment, and their disposition. Any charts missed in the ED were later recalled to the medical records department for review. There were no exclusions.

Although definitions vary across research studies, for the purpose of this study, a sport or recreational activity is defined as an activity involving increased physical exertion for the purpose of competition or recreation. Injury for the purpose of this study includes any trauma to any part of the body or any medical problem (heat exhaustion, asthma exacerbation) that occurs in the act of doing the sport. In order for a patient to be included in the study group, a sport must have been documented on their ED chart. We defined serious injuries as those injuires that required admission. Children were defined as < 17 years old. This study was approved by the Institutional Review Board of the participating institution.

Protocol: Ten trained research interns (college students pursuing health careers) reviewed every ED chart from every patient who was seen and discharged or admitted from the ED to determine if the patient sustained a sports-related injury. On every ED chart there were usually three or four notes to look at, written by three or four medical personel including the physician, resident, and nurse. We recorded the type of sports related injury, the organ injured, the particular sport the individual was involved in, the demographics of the sports injuryed patient, the intervention for the injury (i.e., splint) the disposition of the patient (admitted to the floor, out-patient follow-up), and the specialty with which they were to follow up.

We used a computer generated list of all patients registered in the ED.

The list contained the patients' name and medical record only. Names were crossed out if they were reviewed and were not sports-related injuries. Names were highlighted if they were sports injuries. For those charts with a sports related injury, we generated an informational sheet where we documented the date of the ED visit, the demographics of the sports injured patient (sex, race, age), the sports related injury, the sport, the medical intervention, the disposition or referral, and any documentation of preventive equipment used. These informational sheets were given a number, but did not contain any personal identifying information so as to maintain confidentiality. Missing charts of patients were requested from medical records and reviewed at a later date.

Data Analysis: In 2003-4 we calculated frequencies on all sports, injuries, demographic variables, admissions/discharges, and follow up. We used either the Fisher's Exact test or Chi square analysis, as appropriate, when comparing children to adults, and males to females. Percentages in various group analyses do not always add up to 100% due to missing data.

RESULTS

OVERALL DATA

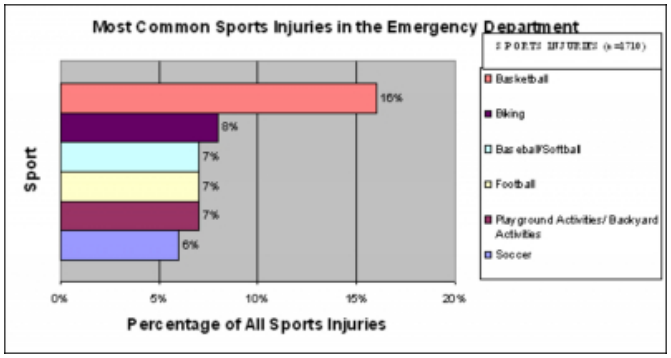
Our total census from July 13,2002-July13,2003 was 60,873. We reviewed 88% (53,477) of the charts, and identified 1710 (3%) patients with sports-related injuries/ illnesses [mean age =

21±15, 72% male, 71% Caucasian, Age Range = 0.2 - 94 years]. The racial distribution of the patients with documented sports related injuries was Caucasian 1208/1696 (71%), African American 139/1696 (8%), Hispanic 79/1696 (5%), Asian 55/1696 (3%), Arabic 6/1696 (0 .3%), and Other 209/1696 (12%). There were no significant differences between the sports or injuries in the different racial groups.

Most of the injuries were from basketball 279/1710 (16%), biking 136/1710 (8%), playground/backyard activities 120/1710 (7%), football 116/1710 (7%), baseball/ softball 112/1710 (7%), and soccer 108/1710 (6%). See Figure 1 .

Figure 1

Figure 1: Most common sports causing injury in the emergency department

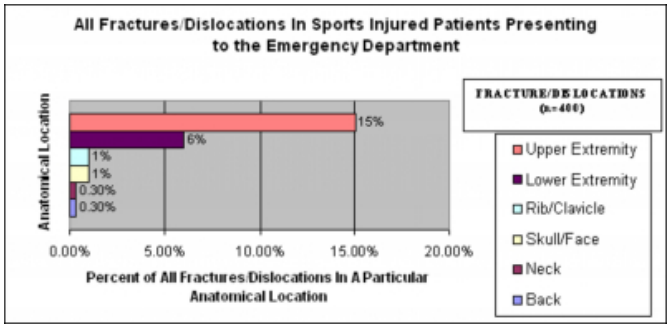


They had the following dispositions: admitted to a monitored bed 4/1710 (0.2%), to the operating room from the emergency department 5/1710 (0.3%), admitted to the floor 76/1710 (4%); and the rest were discharged to follow up with their primary care physician or emergency department 769/1710 (45%), orthopedics/hand 763/1710 (45%), plastic surgery 44/1710 (3%), dental 17/1710 (1%), ophthalmology 15/1710(1%), neurology 12/1710 (1%), and other 5/1710(0.3%).

The overall fracture/ dislocation rate in our total sample of sports injured patients was 23% (400/1710); 252/1710 (15%) with a fracture or dislocation to an upper extremity, 103/1710 (6%) with a fracture or dislocation to a lower extremity, 19/1710 (1%) fractured ribs or clavicle, 18/1710 (1%) skull/facial fractures, 5/1710 (.3%) neck fractures, and 5/1710 (.3%) fractured back. See Figure 2.

Figure 2

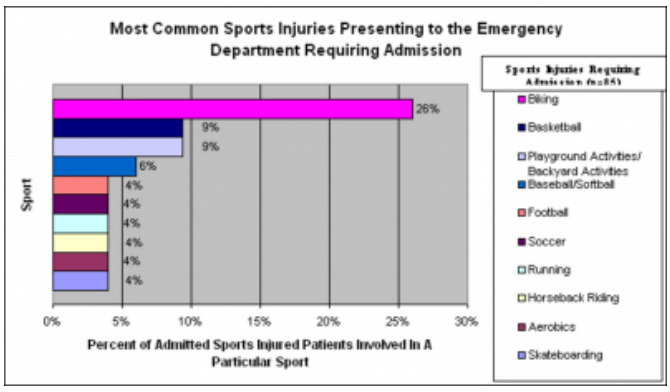
Figure 2: All fracture/ dislocations in sports injured patients by anatomical location



The most common sports resulting in admission [mean age=26±20, 65% (55/85) male, 72% (61/85) caucasian] were biking 22/85 (26%), basketball 8/85 (9%), and playground/backyard activities 8/85(9%). We define seriously injured as all admitted patients. See Figure 3.

Figure 3

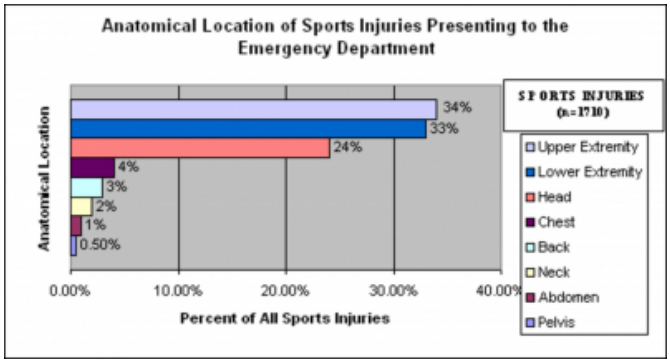
Figure 3: Admission rates of sports injuries presenting to the emergency department



The anatomical locations of the sports injuries were the following: upper extremity 579/1710 (34%), lower extremity 570/1710 (33%), head 406/1710 (24%), chest 74/1710 (4%), back 50/1710 (3%), neck 33/1710 (2%), abdomen 22/1710 (1%), and pelvis 9/1710 (<1%). See Figure 4. Of the upper extremity injuries, most were to the fingers 159/579 (27%), wrists 136/579 (23%), and shoulders 86/579 (15%). Of the lower extremity injuries, most were to the ankle 245/570 (43%) and the knee 135/570 (24%). In those patients who were admitted, the most common anatomical location involved was the lower extremity 42% (36/85).

Figure 4

Figure 4: Anatomical location of sports injuries presenting to the emergency department



SERIOUSLY INJURED (ADMITTED PATIENTS)

85/1710 (5%) sports injuries were admitted. The most common sports resulting in admission [mean age=26±21, 66% (56/85) male, 72% (61/85) caucasian] were biking 22/85 (26%), basketball 8/85 (9%), and playground activities 8/85 (9%). See Figure 3.

They were admitted with the following injuries: lower extremity 36/85 (42%), upper extremity 18/85 (21%), head injuries 14/85 (16%), chest 9/85 (11%), back 4/85 (5%),

abdominal 4/85 (5%), and neck 3/85 (4%). The overal fracture/dislocation rate in the admitted patients was 37/85 (44%) with the following fractures: lower extremity 18/37 (49%), upper extremity 14/37 (38%), ribs/ clavicle 3/37(8%), and neck 1/37 (3%). The seriously injured were not significantly older than the non-seriously injured.

Next, we will present data on the demographic groups in our study that were most effected by sports injuries: children and males. See Table 1.

Figure 5

Table 1: Comparison of sports injuries among different demographic groups.

	A Total # (%)	B Mean Age	C #1 Sport	D % Admitted	E #1 Area Injured	F Sport Most Likely Causing Admission	G Fracture Rate
OVERALL	1710 (100%)	21±15	Basketball 279/1710 (16%)	85/1710 (5%)	Upper Extremity 579/1710 (34%)	Biking 22/85 (26%)	400/1710 (23%)
FEMALES	470 (27%)	21±17	Basketball 47/470 (10%)	29/470 (6%)	Lower Extremity 170/470 (36%)	Biking 6/29 (21%)	121/470 (26%)
MALES	1235 (72%)	21±15	Basketball 232/1235 (19%)	56/1235 (5%)	Upper Extremity 420/1235 (34%)	Biking 16/56 (9%)	277/1235 (22%)
PEDIATRIC	1030 (60%)	11.5±4	Basketball 174/1030 (17%)	44/1030 (4%)	Upper Extremity 400/1030 (39%)	Playground/ Backyard Activities 8/44 (18%)	261/1030 (25%)
ADULT	675 (40%)	35±15	Basketball 105/675 (16%)	41/675 (6%)	Lower Extremity 284/675 (42%)	Biking 15/41 (37%)	139/675 (21%)
ADMITTED	85 (4%)	26±21	Biking 22/81 (27%)	85/85 (100%)	Lower Extremity 36/85 (42%)	Biking 59/85 (69%)	37/85 (44%)

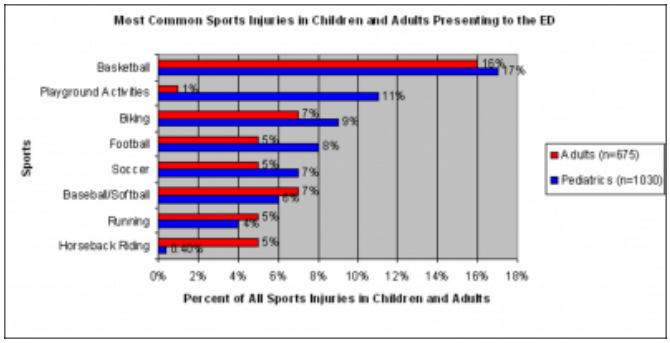
A= Total # in demographic group (% of all sports injuries)
B= Mean age in demographic group
C= The most common sport causing injury in the particular demographic group
D= The % of all sports injured patients in the demographic group that were admitted
E=The anatomical location most frequently injured in the particular demographic group
F=The sport causing the most admissions in the particular demographic group
G=The fracture rate in the demographic group

PEDIATRIC DATA

Out of our total annual ED census of 60,873 [11,941 were pediatrics] (20%). We identified 1030/1705 (60%) children in our total sample with sports-related injuries. Of all the sports injuries, pediatrics made up the majority of the injuries (60%). 9% of all our pediatric visits to our ED were for sports related injuries [mean age = 11.5 ± 4, 70% (722/1027) male, 73% (748/1024) Caucasian]. Most of the injuries were from basketball 174/1030 (17%), playground/backyard activities 113/1030 (11%), biking 88/1030 (9%), football 83/1030 (8%), soccer 76/1030 (7%), and baseball/softball 66/1030 (6%). See Figure 5 below.

Figure 6

Figure 5: Most common sports injuries in children and adults presenting to the emergency department.



They had the following dispositions: admitted 44/1030(4%), and the rest discharged to follow up with their PMD or ED 471/1030(46%), orthopedics/hand 458/1030 (44%), plastic surgery 25/1030(2%), dental 12/1030(1%), ophthalmology 10/1030 (1%), neurology 6/1030 (0.6%), and ENT 1/1030 (0.1%).

The most common sports resulting in admission were playground/backyard activities 8/44(18%), biking 7/44(16%), and basketball 4/44(9%)[mean age= 9.8 ± 4 years, 69% male (30/44), 73% Caucasian (32/44)]. The parts of the body most effected by the sports related injuries were the following: upper extremity 400/1030 (39%), lower extremity 284/1030 (28%), and head 271/1030 (26%). The children admitted for sports injuries had injuries primarily to the lower extremities 17/44 (39%), the upper extremities 15/44 (34%), and the head 7/44 (16%).

The overall fracture rate in children was 261/1030 (25%). The children sustained the following fractures: a fracture or dislocation to an upper extremity 175/1030(17%), a fracture or dislocation to a lower extremity 63/1030(6%), facial/skull fractures 15/1030 (1%), fractured ribs or clavicle 5/1030 (0.5%), neck fractures 5(0.5%), and fractured back 1(0.1%).

There were some differences between children and adults. Although 6% of adults were admitted and 4% of children, there was no significant difference in admission rates. Adults have more lower extremity injuries (284/675 (42%) vs 284/675 (28%), p= 0.0001), while children have more upper extremity injuries (400/1030 (39%) vs 177/675 (26%), p=0.0001). The overall fracture rate in children is higher than in adults (261/1030 (25%) vs 139/675 (21%), p= 0.03), p=0.003)

Children had significantly more injuries than adults due to playground activities (11% vs 1%,p<0.001), football (8% vs

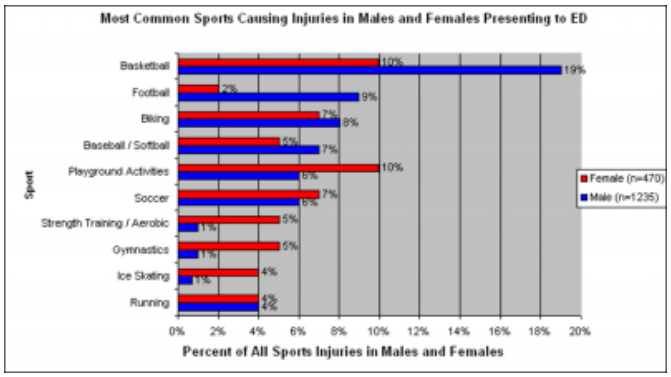
5%,p=0.008), gymnastics 3% vs 0.4%,p=0.001), skateboarding (2% vs 0.8%,p=0.02), and non-motorized scooters (2% vs 0%,p=0.0004).

MALE SPORTS INJURIES

Out of the 1710 sports-related injuries/ illnesses, males accounted for most of the sports injuries 1235 (72%) [mean age= 21 ± 15years, 70 % Caucasian]. Most of the male injuries were from basketball 232/1235 (19%), football 107/1235 (9%), biking 102/1235 (8 %), and baseball/softball 88/1235 (7%). See Figure 6. The parts of the body most effected by the sports related injuries in males were the upper extremity 420/1235 (34%), lower extremity 398/1235 (33%), and head 310/1235 (25 %). 277/1235 (22%) of all males had fractures/ or dislocations with their sports injury; upper extremity fractures 176/1235 (14%), lower extremity fractures 71/1235 (6%), skull/facial fractures 12/1235 (1%), and chest fractures 12/1235 (1%).

Figure 7

Figure 6: Most common sports causing injuries in males and females presenting to the ED.



5% (56/1235) of males were admitted. The sports resulting in the most admissions were biking 16/56 (29%) and basketball 5/56 (9%). The lower extremity was the most common location of injury in admitted, male patients 24/56 (43%) followed by the upper extremity 10/56 (18%) and the head 10/56 (18%).

When comparing male sports injuries to female sports injuries, men (310/1235) had more head injuries than women (94/470), 25% vs 20% (p=0.03). Males and females have similar fracture rates (22% vs. 26%; p=0.16) and admission rates (5% vs. 6%; p=0.17) for sports injuries.

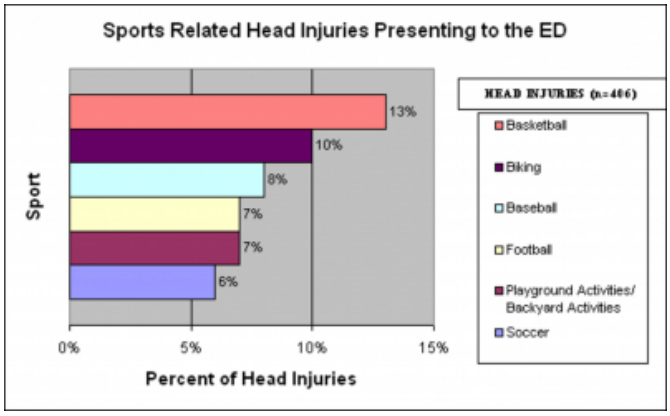
Next we will present our findings on the head injuries and extremity fractures, those areas of the body accounting for most of the seriously injured patients in our study.

HEAD INJURIES

Our ED sees a significant number of sports-related head injuries (0.7% of our total census).There were 406/1710 (24%) total head injuries in the sample [Mean age = 18 ± 14, 77% male, 71% Caucasian]. They had the following head injuries; 177 lacerations,159 head contusions, 41 head concussions, 18 facial/skull fractures, 1 intracranial bleed, and other 10. The skull/facial fracture rate was 18/406 (4%), The sports causing the most head injuries were basketball 52/406 (13%), biking 42/406 (10%), and baseball/softball 34/406 (8%). See Figure 7.

Figure 8

Figure 7: Sports-related head injuries presenting to the ED.



We admitted 14/406 (3%) of our head injured patients. The sport associated with more of the admitted, head injured, patients was biking 5/14 (36%).

Children had significantly more sports related head trauma than adults (26% vs 20%, p=0.003) . Males had significantly more sports related head injuries than females (25% vs 20%, p=0.03).

EXTREMITY FRACTURES

Most of the fractures resulting from sports injuries are to the extremities 352/400 (88%). Most of the extremity fractures are to the upper extremity 252/356 (71%). The lower extremity accounted for 103/356 (29%). The most common sport to result in an extremity fracture is basketball 53/356 (15%), followed by playground activities 48/356 (13%), and soccer 28/356 (8%).

We admitted 9% (32/352) of all extremity fractures from sports injuries. The most common sport resulting in admission for an extremity fracture is biking 8/32 (25%). Most of the extremity fractures in the admitted group were to the lower extremity 18/32 (56%).

COMPARISON BETWEEN THE MOST COMMONLY INJURED SPORTS GROUPS

We compared the most common sports causing injury in the Table 2 below.

Figure 9

Table 2: Comparison of the most common sports causing injury in the ED population.

	A	B	C	D	E	F	G	H	I
SPORT	TOTAL INJURIES # (%)	MEAN AGE	% MALE	% ADMITTED	HEAD INJURY (#,%)	UE INJURY (#,%)	LE INJURY (#,%)	FRACTURE RATE	MOST COMMON INJURY IN ADMITTED GROUP
Basketball	279 (16%)	19±10	83%	9/95 (9.4%)	52/279 (19%)	87/279 (31%)	119/279 (43%)	57/279 (20%)	Lower Ext
Biking	136 (8%)	21±18	76%	22/85 (26%)	42/136 (31%)	53/136 (39%)	36/136 (26%)	30/136 (22%)	Lower Ext
Playground Activities/ Backyard Activities	120 (7%)	9±6	62%	9/95 (9.4%)	30/120 (25%)	58/120 (48%)	24/120 (20%)	48/120 (40%)	Upper Ext
Football	116 (7%)	17±6	92%	3/85 (4%)	30/116 (26%)	46/116 (40%)	33/116 (28%)	27/116 (23%)	Lower Ext
Baseball	112 (7%)	21±13	79%	5/85 (6%)	34/112 (31%)	41/112 (37%)	29/112 (26%)	27/112 (26%)	Lower Ext
Soccer	108 (6%)	18±10	67%	3/85 (4%)	24/108 (22%)	32/108 (30%)	45/108 (42%)	30/108 (28%)	Lower Ext

A= Total # of sports injuries caused by the particular sport (% of all sports injuries caused by the sport)
B= Mean age of all patients with a sports injury from a particular sport
C= % male with injuries from the particular sport
D= % of all admitted sports injuries who were playing a particular sport
E= #,% of head injuries in a particular sport
F= #,% of upper extremity injuries in a particular sport
G= #,% of lower extremity injuries in a particular sport
H= The fracture rate in a particular sport
I= The most common injury in a particular sport resulting in admission

DISCUSSION

In our study we found that the majority of sports injuries (60%) were in children, and that 9% of all our pediatric visits were for sports related injuries. Other studies have found similar numbers. [1,3,4]

Not surprisingly, we found that 72% of all sports injuries are in males. We found that males have significantly more head injuries than females. Other studies have found the same. [1,3]

There have been many studies looking specifically at sports related head injuries and its consequences.[4,5,6,7,8,9,10,11,12] In our study head injuries accounted for 24% of all sports injuries, with basketball being the major problem for all head injuries, and biking causing the more serious head injuries. Other studies have found that football caused most of the sports related head injuries. [2] Of concern, in our study children had significantly more sports related head trauma than adults. The Centers for Disease Control reported in 1997 that there were approximately 300,000 sports-related head injuries in the US every year. [7]One study estimated in 1995-7 that 62,816 cases of mild traumatic brain injury occurred annually among high school varsity athlethes in the most popular sports, with 63% occurring in football. [10]Studies have found that both single and, especially, multiple episodes of concussion are deleterious to brain function.[5] It is possible that repeated head trauma, even without apparent concussion, may produce cumulative irreversible brain damage. [5,9] Compared with matched controls, adult soccer players in Norway who began playing soccer in youth leagues showed mild to severe deficits in attention, concentration and memory. [11]Wesson et al studied the effect of a bike helmet campaign in 1995 in Canada, and found that after the campaign the use of bicycle helmets rose, and the incidence of head injury admissions fell. [12] Perhaps helmets should be used in other sports, such as basketball, soccer, and on playgrounds to minimize head injury.

We found that extremity injuries made up the majority of sports-related injuries (67%). Similarly, the CDC study similarly found that 30% of their sports-injured patients had upper extremity injuries and 28% had lower extremity injuries.[1] Most serious sports injuries involve fractures to the extremities, as seen in our study and others. [1,4] In our study upper extremity fractures were more common than lower extremity fractures in the sports-injured patients. Studies have shown that athletic injuries to the extremities can result in future arthritis. [13]

In our study basketball accounted for the largest number of sports injured patients (17%), far more than any other sport. This was also true when considering subgroups: children (17%), adults (16%), males (19%), and females (10%). Basketball caused the most fracture/ dislocations (14%), the most extremity injuries (15%), and the most head injuries (13%). Other studies have found the same. [1,3]

Biking in our study resulted in the most admissions (27%), many of which are to the head. A study looking at the number of head injury admissions from biking found that after legislation requiring helmet use, there was a 50% reduction. [12]In the US approximately 800 people die each year in bicycle accidents and more than 500,000 are treated for injuries in EDs.[15]Other studies found similar results.[3,8,15]

There have been many studies looking at prevention of sports injuries. Rule changes in sports have reduced accidents, especially, “heads up hockey” [16], penalizing aggressive behavior[5], and eliminating “heading” the ball in soccer [5] and “spearing” in football [2]. Changing equipment to lessen impacts such as better helmets [16,17], softer baseballs [18], softer surfaces in playgrounds [19,20,21] can reduce injuries.

CONCLUSION

Our ED sees a significant number of sports related injuries (3%) in a young population (mean age 21). The majority of the sports injuries were in children (60%). Five percent of all our sports injuries were admitted to the hospital, mostly with injuries to the lower extremity (42%), upper extremity

(21%), and head (16%). Biking and basketball accounted for many of the admissions. The potential negative consequences of these head and extremity injuries, many of which are in children, should encourage us to develop more preventive strategies with regards to particular sports, such as recommending helmets and wrist/ankle guards for sports such as basketball, baseball, soccer, and on playgrounds. We should also study the long term implications of these injuries for these patients.

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