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A Statewide Assessment of Youth Sports- and Recreation-Related Injuries Using Emergency Department Administrative Records



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ABSTRACT

Purpose: Adequate levels of physical activity are essential for health, but participation in sports and recreational physical activities is associated with an increased risk of injury. The present study quantifies the impact of sports- and recreation-related injuries (SRIs) for middle and high school-aged Kentucky children.

Methods: The study describes unintentional injuries in 2010–2012 Kentucky emergency department (ED) administrative records for patients age 10–18 years. SRIs were identified based on external codes of injuries, according to the *International Classification of Diseases, Ninth Revision, Clinical Modification*.

Results: A total of 163,252 ED visits by 10- to 18-year olds occurred during the study period, of which 31,898 (20%) were related to participation in physical activity. Males accounted for 70% of the SRIs. The primary mechanisms for SRIs were strikings (55%), falls (26%), and overexertion (13%). Superficial contusions (25%), sprains/strains (33%), and fractures (18%) were the primary diagnoses. The total charges billed for SRIs exceeded \$40 million, or 19% of the total charges billed for all unintentional injury-related ED visits in this age group.

Conclusions: The present study revealed one fifth of all Kentucky ED visits, and ED charges billed for unintentional injury among youth aged 10–18 years were related to sport and recreation. In the absence of a dedicated SRI surveillance system, ED administrative records provide meaningful utility for conducting statewide assessments of adolescent SRIs.

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IMPLICATIONS AND CONTRIBUTION

The methodology used in the present study illustrates a low-cost means to assess statewide data necessary to establish the burden of sport- and recreation-related injuries (SRIs). This is particularly useful in regions like Kentucky that lack an active surveillance system for youth-associated SRIs.

The public health community supports increased physical activity as an effective means to prevent obesity and associated adverse health conditions [1,2]. However, physical activity carries with it an inherent risk of potential injury [3]. About 3.8 million sports-related injuries are treated in emergency departments

(EDs) annually, of which 2.6 million are among those 5–24 years old [4]. Sports- and recreation-related injuries (SRIs), particularly concussions, have risen to the level of broad national discussion in recent years, as demonstrated by the 2013 Institute of Medicine/National Research Council report [5].

Globally and at the national level, youth SRIs have been recognized as an understudied public health problem [6,7]. There is a need to understand the greater health and health care implications of youth SRIs, particularly in terms of prevalence and resource utilization. In 2009, Kentucky's governor signed House

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Bill 383, calling for a safety assessment of the state's middle- and high-school interscholastic athletic programs [8]. This legislation was timely given the growing number of student athletes in Kentucky [9] and the need for a better understanding of the impact of sport-related injuries on the health of individuals and communities, as well as the state's health care system [10–13]. However, the assessment was not conducted due to a lack of appropriate data, and concerns regarding the cost of a statewide school-based injury surveillance system [14].

The public health approach to sports injury prevention begins with establishing the problem (i.e., incidence and severity), as well as the etiology and mechanisms of injury [15]. To execute these steps, timely and accurate data are required. Kentucky lacks an active sports injury surveillance system; thus, an alternative data source was necessary. In the absence of a formal injury surveillance system, the State and Territorial Injury Prevention Directors Association recommends hospital and ED discharge data to assess community health status [16]. Discharge data from these sources are considered reliable, representative, and inclusive in terms of the range of health information captured (i.e., risk factors and injury distribution) [4]. Using the best available source, ED administrative records, the present study sought to quantify the burden of unintentional SRIs among middle and high school-aged children in Kentucky. Specifically, this study assessed the prevalence of injuries, associated risk factors, and charges billed per injury, to establish an evidence base for future policies and interventions to reduce SRI among Kentucky's adolescent population.

Methods

Data source

ED administrative records contain discharge data coded according to the *International Classification of Diseases, Ninth Revision, Clinical Modification*. This classification system describes an injury using diagnosis and external cause of injury codes (E-codes). The diagnosis code describes the nature of the injury (e.g., fracture, open wound, dislocation, etc.) and the body region. Kentucky's ED data system allows for the collection of up to 25 diagnostic code fields per case. The principal diagnosis for a patient is the primary physiological reason for the patient's visit to the ED. Supplementary or secondary diagnoses are coded in the remaining 24 diagnosis fields. In addition to diagnostic codes, E-codes provide information about the external cause of injury, place of occurrence, and activity. The E-code describes the mechanism of injury (e.g., fall, motor-vehicle collision, firearm, etc.) and the intent (e.g., unintentional, assault, self-inflicted, or undetermined). Only those injuries coded as unintentional were analyzed. E-code E849 designates the place of occurrence and for the purpose of this study, code E849.4, "place for recreation and sport," was utilized, in conjunction with E-codes that indicate a particular activity. Activity codes indicate the type of activity the patient was involved with when the injury occurred (e.g., walking, running, resistance exercise, etc.). The ED records also contain demographic information regarding age, gender, site of care, and total medical charges billed for services rendered. To protect patient privacy, the agency maintaining ED data removed personal identifiers.

Sample population

This study explored SRIs among middle and high school-aged Kentucky children. Thus, data analyses were limited to individuals

aged 10–18 years. The data source represented ED visits by KY residents to Kentucky facilities.

Analytical procedures

This is a cross-sectional study for the years 2010–2012. Demographic information and diagnostic codes were used to determine the primary reason for the ED visit, and when related to injury, to determine the external cause of injury. Descriptive statistics, including frequencies and rates, were used to create a profile of events as they occurred by gender, age, injury diagnosis, and injury mechanism. Data pertaining to charges billed were used to create a profile of the total medical charges billed for treatment. Information regarding charges billed is not the same as reimbursement or actual cost for medical services.

Operational definitions

Given the context of this study, injuries were defined as visits to the ED for unintentional events with an injury diagnosis based on the Barell matrix definition of injury [17], regardless of external cause of injury. Only unintentional injuries, as defined by the recommended framework for E-code grouping and injury morbidity data reporting, were selected for this study. SRIs were defined as ED visits with any of the following E-codes listed: E849.4, E885.0, E885.1, E885.2, E885.3, E885.4, E886.0, E910.0, E910.1, E910.2, E917.0, E917.5, or E001.0–E010.

Data analysis

SAS v.9.3 statistical software (SAS Institute Inc., Cary, NC) was used for analysis. Functions consisted of counts, frequencies, and percentages, providing a descriptive analysis of injury distribution and mechanisms of injury.

Results

Prevalence of unintentional injuries

Among Kentucky children aged 10–18 years, a total of 163,252 ED visits for unintentional injuries were reported during the years 2010–2012. Over this period, SRIs accounted for 31,898 (20%) events, a rate of 2,113 SRIs per 100,000 Kentucky adolescents (Table 1). The percentage of SRIs among this population of Kentucky residents remained consistent throughout the 2010–2012 period.

Variations in the distribution of sports and recreational injuries

Gender and age. More injuries occurred among Kentucky males than females in both sport and recreation and nonsport and recreation categories (Table 2). Males accounted for 58% ($n = 94,147$) of all injuries among those aged 10–18 years and 70% ($n = 22,215$) of all SRIs. The rate of SRIs among males was more than twice that of females. SRIs peaked between the ages 13–15 years, representing 40% ($n = 12,918$) of all SRIs.

Injury mechanism and type of injury. The most common mechanism of SRIs was being struck by or against something, such as another person or an object. This mechanism was responsible for 55% ($n = 17,482$) of all SRIs (Table 3). Although falls accounted for 26% ($n = 8,136$) and overexertion another 13% ($n = 4,057$) of SRIs,

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