Lawn mower injuries presenting to the emergency department: 2005 to 2015

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ABSTRACT

Objective: The objective of this study was to describe recent trends in the epidemiology of lawn mower injuries presenting to the Emergency Department in the United States using nationally representative data for all ages.
Methods: Data for this retrospective analysis were obtained from the U.S. Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS), for the years 2005–2015. We queried the system using all product codes under "lawn mowers" in the NEISS Coding Manual. We examined body part injured, types of injuries, gender and age distribution, and disposition.
Results: There were an estimated 934,394 lawn mower injuries treated in U.S. ED's from 2005 to 2015, with an average of 84,944 injuries annually. The most commonly injured body parts were the hand/finger (22.3%), followed by the lower extremity (16.2%). The most common type of injury was laceration (23.1%), followed by sprain/strain (18.8%). The mean age of individuals injured was 46.5 years, and men were more than three times as likely to be injured as women. Patients presenting to the ED were far more likely to be discharged home after treatment (90.5%) than to be admitted (8.5%).
Conclusion: Lawn mowers continue to account for a large number of injuries every year in the United States. The incidence of lawn mower injuries showed no decrease during the period of 2005–2015. Preventative measures should take into account the epidemiology of these injuries.

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1. Introduction

1.1. Background

Mowing the lawn is a part of daily life in the United States. The U.S. Bureau of Labor Statistics found that in the year 2015, 9.8% of Americans engaged in "lawn and garden care", with 12.1% of men and 7.7% of women performing these tasks [1]. Lawn mowers pose a particular risk due to their relatively powerful engines and fast moving blades. However, the commonplace nature of these products may lead people to underestimate the threat posed by lawn mowers. This threat is not limited to the lawn mower users, but also includes bystanders that may be injured by flying debris [2-12].

It has been estimated that approximately 74,000 people with lawn mower injuries (LMIs) present to Emergency Departments (ED) annually [3]. Although amputations and burns may be considered the prototypical lawn mower injuries, they represent the minority of lawn mower injuries in both pediatric and adult studies [2-5,13]. Previous studies have shown that other types of injuries, including lacerations and strains/sprains, are far more common injuries [2-5]. These injuries affect all age groups and special attention is often given to preventing pediatric injuries [4,6-7,9-12,14-18]. However, those between the ages of 40–70 years old appear to be at the highest risk of being injured while using lawn mowers [3,5,13].

1.2. Importance

There are a significant number of ED visits related to lawn mower injuries every year, and previous work has shown a slight increase in incidence of these injuries over previous decades [3]. This may indicate that lawn mowers represent a line of products that have not made significant progress in the area of consumer safety. Several previous studies have utilized the National Electronic Injury Surveillance System (NEISS) to examine lawn mower injuries. The most recent study presented data from 1990 to 2014 but included only pediatric patients (>18 years of age) [12]. The most recent studies presenting nationally representative data on adults examined the years from 1996 to 2004 and 2004–2007 [3,5]. There has been no published examination of national data regarding lawn mower injuries in patients older than 20 years of age since 2007.

1.3. Goals of this investigation

The objective of this study was to examine recent trends in lawn mower injuries presenting to EDs in the United States for both children

and adults, using data from NEISS for 2005–2015. Using this data, we aim to better tailor prevention measures that could reduce annual incidence of LMI.

2. Methods

2.1. Source

Data were obtained from the NEISS database of the United States Consumer Product Safety Commission. The NEISS compiles data collected by a national probability sample of exactly 100 emergency departments throughout the U.S. and its territories. Cases are then weighted according to sample design, in order to produce national estimates for the number of ED visits represented by each case [19-20].

2.2. Inclusion criteria

Criteria for data selection included all LMI occurring between 2005 and 2015 in patients of all ages. The specific NEISS lawn mower product codes queried included: 1401 - Powered lawn mowers, 1402 - Manual push lawn mowers, 1405 - "Garden tractors", 1422 - "Riding power lawn mower", 1439 - "Lawn mowers, not specified", and 1448 - "Rotary power lawn mowers (walk-behind)".

2.3. Variables

Lawn mower types were categorized into "walk-behind," "ride-on," and "other" (unspecified) groups, containing codes 1402 and 1448, 1405 and 1422, and 1401 and 1439, respectively. Date of visit, age, sex, race, diagnosis, body part affected, and ED disposition were among the many variables collected per case. Diagnosis and body part were re-coded into specific subgroups in order to view trends during analysis.

Body parts were grouped according to body region. "Head and neck" included the scalp, parietal and occipital regions, neck, and the ears, while "face and eyeball" collectively included face, eyeball, and mouth. "Lower trunk" included the lumbar vertebrae and pubic region. "Upper extremity" includes shoulder, upper arm, elbow, lower arm, and wrist. "Lower extremity" includes upper leg, knee, lower leg, and ankle. "Hand/finger" and "foot/toe" were grouped separately. The remaining body part codes were labeled as "other," and included cases where percentages of the entire body were affected or the body part was not specified in the record.

Certain diagnoses were grouped according to the type of injury. Common diagnoses were not combined with other codes. These common diagnoses included "fracture," "amputation," "sprain/strain," and "projectile (foreign body)" injury. "Burns" included electrical, scalding, chemical, and thermal burns. "Soft tissue injuries" included contusions, abrasions, crushing injuries, and hematoma. Injuries to the skin were collectively labeled "laceration," and contained lacerations, punctures, and avulsion.

2.4. Analysis

The NEISS data were compiled and analyzed utilizing IBM SPSS Statistics software (version 24). Univariate analyses were computed using descriptive statistics procedures, while cross-tabulations were used for bivariate analyses.

3. Results

There were an estimated 934,394 LMIs presenting to U.S. emergency departments from 2005 to 2015 (Table 1). During this 11-year period, there were approximately 85,000 injuries each year, on average. Fig. 1 shows the estimated year incidence of LMIs presenting the ED. The estimated incidence varied up to 7.38% between consecutive years (2010

Table 1

Incidence and demographic characteristics of LMIs based on national estimates from NEISS over an 11-year period from 2005 to 2015.

Total incidence from 2005 to 2015	**934,394**
Annual incidence	84,945
Population-based annual incidence[a]	27.5
Median age (Q1, Q3)	47 (33,60)
Gender [%] (male)	77.1
Race [%] (white/black/other/unknown)	65.5/6.2/3.3/25.2
LM type [%]	
Walk-behind	8.9
Ride-on	18.8
Not specified	72.3
ED disposition [%]	
Discharged	90.5
Admitted/transferred	8.5
Fatalities	0.3
LWBS/unknown	0.7

[a] Number of injuries per 100,000 people, based on the 2010 U.S. Census. The overall population in 2010 was 308,745,538. LWBS - Left without being seen.

and 2011) during the study period. The highest number of injuries occurred in 2010 (91,332 LMIs) and the lowest was in 2007 (80,917 LMIs). However, there was no overall trend towards increasing or decreasing rates of injury during the study period. Most of these injuries occurred in the summer months, with May having the highest number and February having the least number of injuries (Fig. 2).

The incidence of LMIs peaked in middle age. Fig. 3 shows the distribution of LMIs by age of the injured person. The age ranges of 45–48 and 49–52 years had the highest rates of LMIs, with a mean age of 46.5 years. Younger children (0–4 years old) were more likely to be injured than older children. After age 12, the number of injuries increases with age until a peak in the late 40s. Men accounted for a majority of the cases, 77.1%, while women only accounted for 22.9%. With respect to race, Whites were the group most affected (65.3%), followed by Blacks (6.2%) and Asians (0.2%). (Table 1).

Laceration was the most common injury (23.1%), followed by sprain/strain (18.8%) and soft tissue injury (14.8%). Table 2 lists the most common injury diagnoses and body parts affected by LMIs. Burns (3.2%) and amputations (2.9%) were among the least common. Insect bites while operating the mower accounted for an estimated 17,859 cases (1.9%) and concussions accounted for an estimated 3360 cases (0.4%). The hand/finger was the most commonly injured body part (22.3%), followed by the lower extremity (which excludes the feet and toes) (16.2%), and the lower trunk (13.8%). The head/neck was the least commonly injured (5.4%), yet this body region still accounted for an estimated 50,838 cases in this 11-year span. Among patient with hand injuries lacerations, fractures, and amputations were the most common injuries (Table 3).

The large majority of patients with LMIs (90.5%) were discharged from the ED after being examined and/or treated (Table 4) There were, however, 79,786 cases (8.5%) in which the patient was admitted
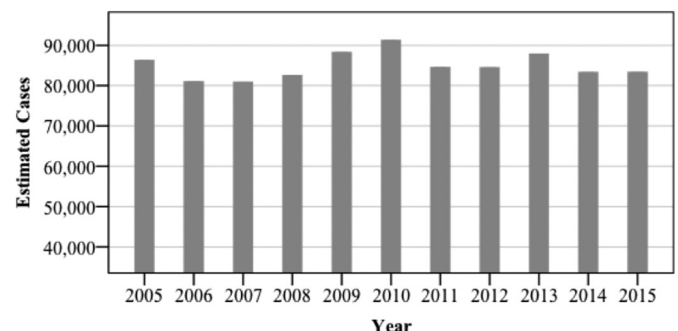

Fig. 1. Annual incidence of LMIs in the U.S. from 2005 to 2015.