Injuries Associated With Strollers and Carriers Among Children in the United States, 1990 to 2010

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ABSTRACT

OBJECTIVE: To describe the incidence, rate, and characteristics of injuries associated with strollers and carriers among young children in the United States.

METHODS: A retrospective analysis was conducted using data from the National Electronic Injury Surveillance System for children 5 years of age and younger treated in emergency departments (1990–2010), who sustained an injury associated with a stroller or carrier.

RESULTS: An estimated 360,937 (95% confidence interval: 294,279–427,594) children aged 5 years or younger were treated in emergency departments for stroller- or carrier-related injuries, an average of 17,187 annually. Overall, the rate of stroller- and carrier-related injuries decreased significantly during the study period. Regarding stroller-related injuries, patients were most commonly male (52.4%) and younger than 1 year of age (42.0%); the head (43.0%) and face (31.0%) were most commonly injured. The most common diagnoses were soft tissue injuries (39.4%) and traumatic brain injuries/concussions (24.6%). Similarly, for carrier-related injuries, patients were most commonly male (52.5%) and younger than 1 year of age (89.0%); the head (61.5%) and face (24.7%) were most commonly injured. The most common diagnoses were soft tissue injuries (48.1%) and traumatic brain injuries/concussions (34.9%). Carrier-related injuries resulted in more hospitalizations (6.5%) than stroller-related injuries (2.4%).

CONCLUSIONS: Stroller- and carrier-related injuries, specifically those resulting from falls from the product or tip-overs, are important sources of injury for children 5 years of age and younger. Although injuries over the 21-year study period decreased overall, the considerable number of injuries annually shows the need to further reduce the potential for injury associated with these ubiquitous products.

KEYWORDS: carriers; falls; injury; National Electronic Injury Surveillance System; strollers; traumatic brain injury

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WHAT'S NEW

Despite industry safety monitoring of strollers and carriers, including product recalls, updates to manufacturing standards, and product testing, patterns of injury associated with strollers and carriers are similar to those identified more than a decade ago.

STROLLERS AND CARRIERS are ubiquitous and intended to provide a safe and secure means to transport children and are regularly used by caregivers in the United States. Despite updates to voluntary manufacturer standards, recalls issued by the US Consumer Product Safety Commission (CPSC), and improvements in product design, strollers and carriers are frequently associated with injuries in children. From 1990 through 2010, the US CPSC issued 43 stroller-related recalls and 13 infant carrier-related recalls for injury risks that included falls, entrapment, strangulation or choking hazards, amputations, and lacerations,[1] clear evidence that strollers and carriers pose a significant risk for injury. In 2010, stroller- and carrier-related injuries were 2 of the 3 most common "nursery" product-related injuries in children younger than 5 years of age treated in US emergency departments (EDs), with infant carriers/car seat carriers as the most common followed by cribs/mattresses and strollers/carriages.[2]

Stroller- and carrier-related injuries occur most commonly among children 1 year of age or younger[2] because both are products widely used by caregivers to transport and/or secure young children while traveling during outings, errands, and everyday activities. Carriers might include devices worn on the adult, handheld carriers, and carriers that are part of a detachable carrier-stroller unit.[3–6] Previously published studies have shown that falls represent a major mechanism for stroller- and carrier-related injuries.[3–7] Most injuries are caused by

falls, many of which result in traumatic brain injury (TBI) or less severe head injuries.[2]

To our knowledge, this is the first study to report national estimates and population-based rates for stroller- and carrier-related injuries treated in US EDs among children 5 years of age or younger over a 21-year period and to describe patterns of these injuries. The goal of this research is to provide accurate information that can be used as the basis for evidence-based decisions and policies to reduce stroller- and carrier-related injuries.

METHODS

DATA SOURCE

The National Electronic Injury Surveillance System (NEISS), established in 1972 by the US CPSC,[8,9] provides data on consumer product and sports-related injuries treated in US EDs. Data are collected from a network of approximately 100 hospitals representing a stratified probability sample of 6100 hospitals (including urban, suburban, rural, and children's hospitals) with 6 or more beds and a 24-hour ED and are weighted to yield national injury estimates. At sampled hospitals, ED medical charts are reviewed by professional NEISS coders, and information including the patients' age and sex, injury diagnosis, body part injured, locale where the injury occurred, product(s) involved, and disposition from the ED, as well as a narrative describing the incident, are captured. Data from the US Census Bureau[10,11] were used to calculate injury rates per 10,000 children 5 years of age and younger.

CASE SELECTION CRITERIA

All injuries among patients 5 years of age and younger associated with strollers (NEISS product codes 1505 and 1522) and carriers (NEISS product codes 1524, 1527, 1531, 1548, and 1549) from January 1, 1990 through December 31, 2010 were reviewed. A total of 12,811 cases were reviewed. Inclusion and exclusion criteria and additional categories beyond those recorded by the NEISS were developed after a review of a subset of narratives. Case narratives were individually reviewed to ensure they involved a product of interest. Ambiguous narratives and a subset of narratives were reviewed by 1 or more authors, and consensus was reached. A total of 701 cases were excluded because the narratives revealed that the injury was not directly related to a stroller or carrier (eg, "patient stung by bee on torso while in stroller"), the final diagnosis did not include an injury (eg, "no injury noted when fell from infant carrier"), or the case was a duplicate. Five fatalities were excluded from analysis in this study including 3 fatalities in which the child was hit by a car while strapped in the stroller, 1 fatality coded as trauma with unclear circumstances, and 1 cardiac arrest with unclear circumstances. A total of 12,105 actual cases remained in the data set and were included in these analyses.

VARIABLES

Existing NEISS variables were regrouped in the following categories. Patients were categorized according to age (younger than 1 year, 1 year, and 2–5 years of age). Body part injured was grouped according to region into categories of head, face (including face, eyeball, ear, and neck), mouth, upper extremities (including shoulder, upper arm, elbow, lower arm, and wrist), hand/digits (including hand and finger), trunk (including upper trunk, lower trunk, and pelvic region), lower extremities (including upper leg, knee, lower leg, ankle, foot, and toe), and other (including "25%–50% of the body" and "all parts of the body"). Injury diagnoses were grouped into the categories of TBIs and/or concussions (including fractures and internal injuries to the head, and concussions),[12] fractures and/or dislocations, soft tissue injuries (including contusions, abrasions, hematomas, crushing injuries, and hemorrhages), lacerations and/or avulsions (including lacerations, punctures, and avulsions), and other (including amputations, anoxia, aspirated foreign objects, dental injuries, foreign bodies, ingested foreign objects, internal organ injuries other than to the head, nerve damage, poisonings, strains and sprains, submersions, and other). The location where the injury occurred was categorized as home (including home/apartment/condo, farm/ranch, and mobile/manufactured home), street and/or highway, or other (including industrial place, place of recreation or sports, school, or other public property). Disposition was categorized as not hospitalized (including treated and released or left against medical advice) and hospitalized (including treated and transferred to another hospital, treated and admitted for hospitalization, and held for observation $<$24 hours). The variable sex was used as reported. Case narratives were used to generate 3 new variables: general mechanism of injury (contact with the ground, contact with the stroller or carrier, contact with an object other than the stroller or carrier, and other), specific mechanism of injury (product tipped over, patient fell from product, product malfunctioned or collapsed, patient tripped over product, extremity entrapment, and collision while in the product), and sibling or other child involvement (yes or no). General mechanism of injury was able to be coded for 97.8% of cases and specific mechanism for 97.5% of cases.

STATISTICAL ANALYSES

Data were analyzed using IBM SPSS Statistics Complex Samples Module version 22 (IBM Corp, Armonk, NY). A sample weight was assigned to each case by the CPSC on the basis of the inverse probability of selection, and weights were used to generate national estimates. All statistical analyses accounted for the complex sampling frame of the NEISS. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated using contingency tables to assess the strength of association between demographic and injury characteristics of interest. Chi-square tests were used to compare proportions of injury according to diagnosis and mechanism of injury. Statistical significance was assessed by using $\alpha = .05$. Intercensal population estimates used to calculate injury rates were derived from the US Census Bureau.[10,11] Trend significance of the number of stroller- and carrier-related injuries over time was analyzed using Poisson regression. National estimates were on the basis of weighted data for 12,105 patients 5