National Trends in Injury Hospitalizations 1979-2001

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

Injury data

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Highlights

In 2001

• In 2001 injuries accounted for 1.8 million hospital discharges or 64.2 discharges per 10,000 population, and injuries accounted for 9 million days of inpatient care. (figures 1, 2, and 24)

• In 2001, 68 percent of injury discharges had an external cause code; of these, unintentional injuries were the majority. Falls, poisonings, and motor vehicle traffic-related injuries were the leading external causes of injuries regardless of intent. (figures 20–22)

From 1979 to 2001

• In 2001 injury discharges accounted for 6 percent of all short-stay hospital discharges, down from 9 percent in 1979. (figure 1)

• From 1979 to 2001 the discharge rate for injuries decreased on average 4.3 percent per year, and the total number of days of inpatient care for injuries decreased on average 5.2 percent per year. (figures 2 and 24)

• Injury hospital discharge rates were generally higher for males than for females under 65 years of age; however, females 65 years of age and over had higher injury discharge rates than males. From the early 1980s to 2001, females 65 years of age and over had the highest rate of injury discharges of any age/sex group although the overall rates for women 65 years and over decreased on average 0.6 percent per year. (figures 5 and 6)

• Fractures were the leading cause of injury hospitalizations, accounting for 36 percent of all injury hospital discharges in 1979 and 55 percent in 2001. The highest discharge rate was among females 65 years of age and over. (figures 9 and 11)

• Poisoning and toxic effects accounted for 6 percent of all injury hospital discharges in 1979 and 11 percent in 2001. (figures 12 and 13)

• Extremity injury discharge rates were higher than the rates for the other body regions and declined, on average, 3.4 percent per year. The highest discharge rates were consistently among females 65 years of age and over. (figures 14 and 16)

• Discharge rates for head and neck injuries for males and females under 65 years of age decreased on average 4.0 to 7.6 percent per year. From 1979 to 2001 traumatic brain injuries accounted for about 50–70 percent of all head and neck injuries. (figures 17 and 18)

• Hip fractures were most common among females 65 years of age and over. Females 85 years and over had the highest discharge rate for hip fracture, and the discharge rate for this group increased on average 0.7 percent per year. (figure 19)

Highlights

• The average length of stay for injury hospitalizations among those 65 years of age and over decreased on average 4.4 percent per year, while the average decrease for those under 65 years of age was 1.9 percent per year. (figure 25)

• From 1981 to 2001 the percent of injury hospitalizations discharged home among those 65 years of age and over decreased on average 4 percent each year compared with those under 65 years of age for whom the percent decreased on average 0.5 percent each year. The percent discharged to a long-term care institution and to a short-term facility increased for both age groups. (figures 28–30)

• In 2001 private insurance was the principal expected source of payment for about one-half of injury patients under 65 years of age. However, from 1979 to 2001, the proportion of injury discharges covered by Medicare, Medicaid, and the uninsured increased while the proportion paid by private health insurance decreased. (figure 31)

Introduction

Medical expenditures for injury remained relatively constant from 1985 to 2000 and were estimated in 2000 at $117 billion (1–3)[§] accounting for 10.3 percent of total medical expenditures. Expenditures per injured person were approximately $2,600 and nearly $430 per capita (1). In 1995 the total cost of injury was estimated at $1.7 trillion, including work loss, direct costs, and costs for pain and suffering (2).

In 2001 injuries accounted for 157,000 deaths (4), 1.8 million hospitalizations, 9 million days of inpatient care (5), and 33.8 million emergency department visits (6). This report describes trends in injury hospitalizations. National data on injury deaths, emergency department visits and episodes of injuries are available from other National Center for Health Statistics (NCHS) sources (7–9) as well as from other Federal and non-Federal sources (10).

Data on fatal and nonfatal injuries are used by public health officials and researchers to monitor trends, measure risk factors, evaluate the effectiveness of existing policies and programs, and assess the need for new policies and programs. In addition, data on injuries are used in monitoring progress toward achieving the Healthy People 2010 Injury-Related Objectives for the Nation (11).

Until recently there has not been a uniform method for analyzing and reporting injury hospital discharge data; thus, comparisons of hospital discharge rates for injuries within and across States and other jurisdictions were problematic. To help standardize injury hospital discharge data, the State and Territorial Injury Prevention Directors Association (STIPDA), in collaboration with other State and Federal agencies, released a report, *Consensus Recommendations for Using Hospital Discharge Data for Injury Surveillance* (12). The report recommended standard *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) categories and methods for analyzing and reporting injury hospital discharge data. This chartbook is the first application of the STIPDA recommendations to national level data. In addition to providing broad measures for the United States, national level data are valuable as a benchmark for States and localities.

Methods

Data from 23 years, 1979 through 2001, of the National Hospital Discharge Survey (NHDS) are analyzed for this report. The NHDS is a nationally representative survey of discharges from non-Federal short-stay hospitals in the United States. "Appendix A" includes a detailed description of the NHDS. Since 1979, ICD-9-CM has been used for coding diagnoses and procedures in the NHDS (13). There were a small number of ICD-9-CM coding changes over the study period, but they only minimally affected the total number of injury discharges ("Appendix A," ICD-9-CM addenda affecting injuries). Chapter 17 of the ICD-9-CM includes the diagnosis codes for injury. Codes for external causes of injury are in the Supplementary Classification of External Causes of Injury and Poisoning section of ICD-9-CM. Codes used in this report are listed in tables 1 and 2.

[§] The 1985 estimate used for comparison is inflation-adjusted to year 2000 dollars. The 1985 actual estimate was $45 billion. The 1995 inflation-adjusted estimate based on 2000 dollars was $109 billion ($91 billion actual dollars) (2–3 and T. Miller, personal communication, January 2004).

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Table 1. Diagnosis labels and ICD-9-CM codes

Category	Principal diagnosis (first-listed diagnosis) ICD-9-CM diagnosis codes included
All discharges	001-999, V01-V82
Injury[1] (as defined by STIPDA)	800-909.2, 909.4, 909.9, 910-994.9, 995.5-995.59, 995.80-995.85
Noninjury	
Complications of care and adverse effects (and their late effects)	909.3, 909.5. 995.0-995.4, 995.6-995.7, 995.86, 995.89, 996-999
All other	001-799, V01-V82

[1]Unless otherwise specified "injury" diagnoses include poisoning.

NOTE: See "Appendix B" for ICD-9-CM codes and labels.

Table 2. External cause code definition

All injury and poisoning external cause codes (as defined by ICD-9-CM)	E800-E999 (ICD-9-CM Supplementary Classification of External Causes of Injury and Poisoning)
Injury and poisoning external cause codes as defined by the External cause of injury matrix and used for figures 20-22	E800-E848, E850-E868, E869.0-E869.3, E869.8-E869.9, E880-E929, E950-E966, E968-E999

NOTE: See "Appendix A," External cause of injury code, and "Appendix C," ICD-9-CM External Cause of Injury Matrix.

The STIPDA recommended case definition for injury hospitalizations was used to define injuries for this chartbook and is based on the first-listed diagnosis. The injury codes include ICD-9-CM 800-909.2, 909.4, 909.9, 910-994.9, 995.5-995.59, 995.80-995.85 (12). Excluded from the recommended definition are the codes for complications of care and adverse effects as well as their late effects (12) (see table 1). Deaths in the hospital are included in this definition.

The STIPDA defined injuries were further categorized using the two-dimensional Barell Injury Diagnosis Matrix (14). One dimension is the body region of the injury, and the other dimension is the nature of the injury. A category of the matrix referred to as "system wide" injuries does not fit the two dimensional aspect of the matrix, but refers to conditions that are systemic, such as poisoning. The cells of the Barell Matrix contain ICD-9-CM codes from chapter 17 corresponding to the intersection of the dimensions of the matrix, and the codes are provided in "Appendix B." A more thorough explanation of the matrix is in the Barell Matrix section of the chartbook and in "Appendix A," Barell Matrix.

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External causes of injury are defined and categorized using the two-dimensional ICD-9-CM External Cause Matrix (15,16). One dimension is the mechanism or external cause of the injury (e.g., fall, motor vehicle, etc.), and the other dimension is the manner or intent of the injury (e.g., self-inflicted, assault, unintentional, undetermined; see "Appendix A," External Cause of Injury codes). The following external cause codes are included in the matrix: E800-E869 (excluding E849, E869.4), E880-E929, E950-E999 (excluding E967) (see table 2). "Appendix C" includes the codes used to define each cell of the matrix. Exclusions include misadventures to patients during surgical and medical care and drugs, medicinal, and biological substances causing adverse effects in therapeutic use. Other exclusions are for invalid first-listed external cause codes (e.g., codes for place of occurrence or perpetrator of child or adult abuse) that should not be used without other external cause codes. If more than one ICD-9-CM external cause code was listed for a given record, only the first external cause code listed in the diagnostic code fields was used in this report. Coding guidelines recommend that the external cause code be related to the principal diagnosis as opposed to the initiating or underlying cause of the injury diagnosis (17).

External cause of injury coding provides information on the circumstances and causes of injuries. For discharges with a first-listed injury diagnosis, external cause coding increased from 14 percent in 1979 to 68 percent in 2001 (appendix table 20a); however, there has been no significant increase since 1997. Much of the increase in external cause code recording on medical record abstracts is attributed to the increased number of States that mandate external cause codes (18). External cause of injury data in figures 20–22 are shown only for 2001 because the percent of injury discharges that were assigned an external cause code is relatively high, 68 percent, for this year. However, the percent without an external cause code is still substantial and as a result, analysis and interpretation of the data is somewhat limited. The data are still informative particularly in the absence of other more complete nationally representative data.

Two measures are used in this report to present and discuss trends and changes in injury discharges in the United States from 1979 to 2001. The average annual percent change is calculated using weighted least squares regression. The average or total percent change from 1979 to 2001 is the average annual percent change multiplied by 22. Trends and differences were tested for statistical significance (see "Appendix A," Average percent change over time, test of trend, and test of significance between two statistics).

Estimates in all tables are rounded to the nearest thousand. Totals may include data for categories that are not shown individually in the tables. For these reasons, estimates within tables do not always add to the totals. Rates, percents, and average lengths of stay are calculated from unrounded figures and may not precisely agree with measures calculated from rounded data. Population denominators are for the civilian resident population.

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Organization of the Chartbook

Trends are graphically displayed by age and sex along with brief text highlights. Time trends are shown on a logarithmic scale to emphasize the rate of change and to enable measures with large differences in magnitude to be shown on the same figure ("Appendix A," Logarithmic scale). Figures in this chartbook have been grouped into three sections:

1. General statistics by demographic information (figures 1–6)
2. Injury diagnoses and external causes of injuries (figures 7–22)
3. Utilization and payment (figures 23–31)

Following the figures in the chartbook are data tables for each figure that show the data points graphed and related appendix tables. Standard errors for the data points are also provided. Data points in the figures are either age-adjusted or age-specific rates, percents, or means ("Appendix A," Age adjustment).

When selecting figures for this chartbook, consideration was given to measures that illustrate the trends and demographic patterns for the leading injury diagnoses among inpatients in U.S. short-stay hospitals as well as patterns in utilization.

Trends in injury hospitalization should be considered within the context of overall hospitalization. For this reason this chartbook includes data on discharge rates, average numbers of diagnoses, days of care, and average lengths of stay for patients hospitalized for both injury and noninjury diagnoses.

Discussion

In general, injury hospital discharge rates decreased from 1979 to 2001. It is important to understand that the decline reflects not only trends in the incidence of injury, but also changes in health care utilization and resources and the impact of new medical technologies (19). Partitioning the effects of each of these variables on injury hospitalization over time is beyond the scope of this chartbook. However, work is ongoing at the international level to develop measures of injury severity that will foster more valid and reliable surveillance of injury incidence (20).

A number of important changes in the health care delivery system led to decreases in hospitalization as a whole during the period from 1979 to 2001 including stricter utilization review that limited entry into the hospital, the growth of managed care that emphasized the avoidance of expensive hospitalization whenever possible, and the movement of a large proportion of diagnostic and surgical procedures from the inpatient to the outpatient setting (21–25).

It was hypothesized that, in addition to these factors, hospitalization for injury would also be affected by numerous public and private sector efforts designed to decrease the occurrence and/or severity

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of unintentional and violence-related injuries. Included among these efforts were the widespread promotion and adoption of injury prevention activities such as the use of seat belts, safer automobiles (e.g., with air bags), improvements in road safety, requirements for helmet use for bicycles, motorcycles and in sports activities, efforts to improve home and workplace safety including access to poison control centers, and initiatives aimed at reducing assaults and self-directed harm and their resulting injuries (10). Most recently, attention is being directed to how hospitals can and should respond to mass trauma events with the aim of reducing the severity of the injuries (26).

Injury hospitalization data are important to track because such injuries, though rarely an immediate threat to life (only 2 percent of hospitalized injury patients die during their hospital stay), are generally serious enough to warrant acute inpatient care. The importance and expense of inpatient treatment has led most States to gather comprehensive data on injury hospitalization in their data systems. States will be able to compare the data they gather to the national data included in this chartbook. The data in this publication, along with data on the occurrence of, and health care treatment for, injuries in settings other than the hospital, can help States improve existing and design new injury prevention programs.

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