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Hospitalizations for Injury and Poisoning in the United States, 1991

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Introduction

In 1991, approximately 2.8 million Americans were hospitalized due to injury or poisoning diagnoses (1), and close to 150,000 persons died from injuries (2). Apart from women giving birth, injury was the leading cause of hospital admissions for people younger than 45 years of age (1) and the leading cause of death in this same age group (2). It has been estimated that one in four Americans are injured annually, and that injuries cost the United States more than $100 billion per year due to lost productivity and medical care (3).

Information on fatal injuries is generally recorded on death certificates. However, a nationwide system for reporting information on nonfatal injuries does not exist. Hospital discharge data are valuable sources of information on the injuries that require hospitalization. Although these injuries comprise only a small portion of injuries as a whole, they are important to track because they are the most costly in terms of human suffering as well as health care resource consumption.

A serious problem with hospital data is the lack of complete information on the causes of injury. Accurate and reliable information regarding the external causes of injury (E–codes) is critical for planning, implementing, and evaluating injury-control programs (4). Such information also is required to assess our country's progress toward achievement of the national health objectives for the year 2000 that relate to the reduction of injury morbidity and injury control interventions (5,6).

Using information from the National Hospital Discharge Survey (NHDS), this paper describes the characteristics of patients hospitalized due to an injury or poisoning and reports on the completeness of the E–code information in the NHDS. Persons treated in hospital emergency rooms, outpatient departments, or ambulatory care clinics who were not admitted as inpatients are not included in this paper.

The NHDS is a continuous voluntary survey conducted by the National Center for Health Statistics since 1965. This survey is one of the principal sources of information on patients discharged from non-Federal, short-stay hospitals in the United States. In 1991, data for the survey were abstracted from medical records of approximately 274,000 sampled patients discharged from a sample of 484 hospitals.

A three-stage, stratified sample design has been used in the NHDS since 1988. A brief description of this design, data collection procedures, and the estimation process are in the Technical notes of this report.

Up to seven diagnoses and four procedures were coded for each discharge in the survey. Coding of diagnoses and procedures was performed according to the *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD–9–CM) (7).

For this paper injury and poisoning diagnoses include all of the codes in Chapter 17 of the ICD–9–CM, namely codes 800–994, which have been termed "true injuries" including trauma and poisoning, and codes 995–999, which have been termed "medical injuries"

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including adverse effects and complications of medical care (8). This paper will focus primarily on "true injuries" although data for all categories will be included in the tables. Discharges with a first-listed injury or poisoning diagnosis are the focus of this report.

To interpret data and compare them with available data from other sources on short-stay hospital use, one must become familiar with the definitions used in NHDS. Definitions of the terms in this report are in the Technical notes.

NHDS data indicate that, in 1991, 2.8 million patients were hospitalized due to an injury or poisoning diagnosis. These patients comprised 9 percent of all hospital discharges in 1991 and were in the hospital for a total of 19.1 million days, which was 10 percent of all patient days (table 1). These patients had an average of 1.6 injury and poisoning diagnoses. Sixty-seven percent had only one injury and poisoning diagnosis, 19 percent had two, and 14 percent had three or more such diagnoses (figure 1). On average, patients with a first-listed diagnosis of injury and poisoning spent 6.9 days in the hospital; the average length of stay for patients with other diagnoses was 6.4 days.

In addition to the 2.8 million persons hospitalized primarily due to their injury or poisoning, there were an additional 1.5 million patients who had at least one injury or poisoning diagnosis, but were hospitalized primarily for other conditions. Over one-half of these patients had first-listed diagnoses of diseases of the circulatory, digestive, or musculoskeletal systems, or neoplasms. These patients will not be covered in this report since their injuries were not the primary reason for their hospitalization. According to Smith, Langlois, and Buechner (8), who studied hospital discharge data in Rhode Island, these other injuries are usually minor, are often associated with another condition (for example, cancer), or even may have occurred while the person was in the hospital (for example, a fall resulting in a hip fracture).

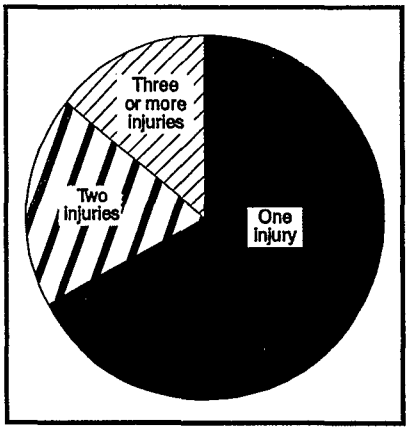

Figure 1. Discharges with first-listed injury and poisoning diagnoses

Table 1. Selected measures of hospital utilization for patients discharged from short-stay hospitals: United States, 1991

[Discharges from non-Federal hospitals. Excludes newborn infants]

Measure of hospital utilization	All patients	Injury and poisoning patients	Patients with other diagnoses
Number of discharges in thousands	31,098	2,768	28,330
Number of days of care in thousands	199,099	19,138	179,961
Average length of stay in days	6.4	6.9	6.4

Highlights

- The overall hospitalization rate for injury and poisoning diagnoses was 110.5 per 10,000 population, but it ranged from 51.9 per 10,000 for children under 15 to 279.6 per 10,000 for persons 65 years of age or older.
- The most common injury and poisoning diagnosis was fractures (37 percent).
- More than one-half of the group 65 years of age and over with injury and poisoning diagnoses had fractures—with most of these being hip fractures.
- Males had higher hospital discharge rates than females for intracranial injuries, lacerations and open wounds, dislocations, burns, and internal injuries. Females had higher rates in the poisoning and toxic effects category.
- White and black persons had similar overall hospital discharge rates for injury and poisoning. But white persons had higher rates of fractures than black persons, and black persons had higher rates of lacerations and open wounds, burns, poisonings, and internal injuries than white persons.
- Of the 15–44-year-olds, 18 percent were in the self-pay category.
- Only 56 percent of the elderly were discharged home. For the younger age groups 86–93 percent went home.
- Recording of the external causes of injuries (E–codes) continues to be incomplete. Only 44 percent of the persons hospitalized for injury or poisoning had one or more E–codes.
- Average lengths of stay for injury and poisoning patients ranged from 3.2 days for poisoning patients to 12.3 days for burn patients.

Sex and race

Of the patients with first-listed injury and poisoning diagnosis, 52 percent were male and 48 percent female. Females used 53 percent of the days of care in this category compared with 47 percent for the males. The average length of stay for males was 6.3 and for females it was 7.6 days. These results are not surprising in view of the fact that 44 percent of the female discharges were over 65 compared with 21 percent of the male discharges.

The overall rate of injury and poisoning for males and females did not differ significantly (table 2). The rate of fractures, the largest of the specific categories of injury analyzed in this study, also did not differ. There were significant differences in some of the smaller specific categories of injuries. The rate for intracranial injuries was significantly higher for males than for females. For most age groups the rates of intracranial injuries for males and females were not significantly different, but for 15–24-year-old males the rate was significantly higher. The overall rate for males was also significantly higher than for females in the laceration and

Table 2. Number, rate, and percent distribution of patients discharged from short-stay hospitals, by category of first-listed injury and poisoning diagnoses, sex, and race: United States, 1991

[Discharges from non-Federal hospitals. Excludes newborn infants. Diagnostic groupings and code number inclusions are based on the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)]

Category of first-listed diagnosis and ICD-9-CM code	Total	Sex		Race[1]			
		Male	Female	White	Black	All other	Not stated
	Number of patients discharged in thousands						
All injury and poisoning .800–999	2,768	1,437	1,331	1,834	324	85	525
Fractures .800–829	1,034	481	553	726	86	28	195
Dislocation .830–839	64	41	23	44	*7	*	11
Sprains and strains .840–848	171	91	80	119	14	*5	32
Intracranial injuries (excluding those with skull fracture) .850–854	180	106	74	108	17	*6	49
Internal injury of chest, abdomen, and pelvis .860–869	83	64	19	45	18	*	15
Lacerations, open wounds, injuries to blood vessels .870–904	193	137	56	102	48	*6	37
Late effects of injuries and poisoning .905–909	*8	*	*	*7	*	*	*
Superficial injuries and contusions .910–924	88	40	47	63	*8	*	15
Burns .940–949	52	36	16	29	11	*	9
Other injury .855–859,926–939,950–959	72	46	25	45	12	*	12
Poisoning and toxic effects .960–989	205	82	122	128	32	*8	36
Other effects of environmental causes .990–994	18	14	*	11	*	*	*
Certain adverse effects not elsewhere specified .995	33	13	21	19	*	*	9
Miscellaneous complications of surgical and medical care .996–999	567	281	286	388	62	16	102
	Rate of patients discharged per 10,000 population						
All injury and poisoning .800–999	110.5	118.2	103.2	87.5	105.0	84.2	...
Fractures .800–829	41.3	39.6	42.9	34.6	28.0	27.5	...
Dislocation .830–839	2.6	3.4	1.8	2.1	*2.1	*	...
Sprains and strains .840–848	6.8	7.5	6.2	5.7	4.5	*5.3	...
Intracranial injuries (excluding those with skull fracture) .850–854	7.2	8.7	5.7	5.1	5.5	*5.9	...
Internal injury of chest, abdomen, and pelvis .860–869	3.3	5.3	1.5	2.2	5.8	*	...
Lacerations, open wounds, injuries to blood vessels .870–904	7.7	11.3	4.4	4.9	15.6	*6.2	...
Late effects of injury and poisoning .905–909	*0.3	*	*	*0.3	*	*	...
Superficial injuries and contusions .910–924	3.5	3.3	3.6	3.0	*2.6	*	...
Burns .940–949	2.1	3.0	1.2	1.4	3.5	*	...
Other injury .855–859,926–939,950–959	2.9	3.8	2.0	2.2	3.8	*	...
Poisoning and toxic effects .960–989	8.2	6.7	9.5	6.1	10.5	*7.8	...
Other effects of environmental causes .990–994	0.7	1.1	*	0.5	*	*	...
Certain adverse effects not elsewhere specified .995	1.3	1.0	1.6	0.9	*	*	...
Miscellaneous complications of surgical and medical care .996–999	22.6	23.1	22.2	18.5	20.0	15.6	...
	Percent distribution						
All injury and poisoning .800–999	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Fractures .800–829	37.4	33.5	41.6	39.6	26.7	32.7	37.1
Dislocation .830–839	2.3	2.9	1.7	2.4	*2.0	*	2.1
Sprains and strains .840–848	6.2	6.4	6.0	6.5	4.3	*6.3	6.2
Intracranial injuries (excluding those with skull fracture) .850–854	6.5	7.4	5.5	5.9	5.2	*7.0	9.3
Internal injury of chest, abdomen, and pelvis .860–869	3.0	4.4	1.4	2.5	5.6	*	2.8
Lacerations, open wounds, injuries to blood vessels .870–904	7.0	9.5	4.2	5.6	14.8	*7.4	7.1
Late effects of injury and poisoning .905–909	*0.3	*	*	*0.4	*	*	*
Superficial injuries and contusions .910–924	3.2	2.8	3.5	3.4	*2.4	*	2.8
Burns .940–949	1.9	2.5	1.2	1.6	3.3	*	1.8
Other injury .855–859,926–939,950–959	2.6	3.2	1.9	2.5	3.6	*	2.3
Poisoning and toxic effects .960–989	7.4	5.7	9.2	7.0	10.0	*9.2	6.9
Other effects of environmental causes .990–994	0.7	1.0	*	0.6	*	*	*
Certain adverse effects not elsewhere specified .995	1.2	0.9	1.6	1.0	*	*	1.7
Miscellaneous complications of surgical and medical care .996–999	20.5	19.5	21.5	21.1	19.0	18.5	19.4

[1]NOTE: Rates for race categories may be underestimated because race was not reported for all discharged patients

open wound category. In three age groups the differences were significant by sex—the 15–24, 25–34, and the 35–44 age groups. Males also had significantly higher rates than females for dislocations, burns, internal injuries, and other injury.

These results are consistent with data that show the leading causes of death for males in the young adult age groups. Accidents, including motor vehicle accidents, are a major cause of death in these age groups, particularly for males (2). In addition, Fingerhut (9) reports high male rates of firearm deaths for the 15–34-year-olds for each of the years she studied (1985–90). Runyan and Gerken (10) discuss several possible reasons for these higher male rates, including more driving by males, more participation in high-risk sports (such as football), and a greater tendency by males to acquire weapons.

The only category in which females had a significantly higher rate than males was the poisoning and toxic effects category. Females had higher

rates in this category in the 15–24, the 35–44, and the 45–64 age groups. The poisoning and toxic effects category includes overdoses and "wrong substances given or taken in error" (7). It does not include drug dependence or nondependent abuse of drugs. Most of the poisonings for males and females were caused by analgesics, antipyretics, and antirheumatics (including aspirin and acetaminophen)—ICD–9–CM code 965—and psychotropic drugs (primarily antidepressants and tranquilizers)—ICD–9–CM code 969.

The overall rates of first-listed injury and poisoning diagnoses were similar for white and black hospital discharges. But there were some differences between the two groups' rates for various types of injuries and poisoning. White persons had a higher rate of fractures than black persons. This is not surprising since previous research (11–13) has found that bone density is greater in black than in white subjects, and, consequently, the prevalence of osteoporosis and the incidence of fractures is lower in black persons than in white persons. Black persons had higher rates of lacerations and open wounds, burns, poisonings, internal injuries, and other trauma. These findings are consistent with cause of death statistics which show that, in 1991, the homicide and legal intervention rate among black persons was 41.9 per 100,000 deaths compared with 6.2 per 100,000 deaths for white persons (2).

Age and diagnoses

Of the 2.8 million patients hospitalized for injury and poisoning diagnoses, the largest proportion had fractures—over 37 percent (table 3). Fractures were the most common diagnoses for patients in each of the six age groups examined in this report, but the percentage of fractures ranged from 28 percent of the injury and poisoning discharges in the 35–44-year-age group to 51 percent of the 65 and over age group. Over one-half of the fractures in the age group under 15 were of the bones of the skull (17 percent) and the arm (45 percent). For the 15–44-year-olds these two categories totaled 38 percent and ankle fractures accounted for another 17 percent. For the 45–64-year-olds most of the fractures were of the arm (22 percent), ankle (18 percent), and hip (17 percent). Over 57 percent of the elderly's fractures were hip fractures and only 9 percent were of an upper limb.

In the younger age groups, other frequent injury and poisoning diagnoses included lacerations and open wounds, intracranial injuries, poisoning and toxic effects, and (with the exception of the 15–24-year-olds) miscellaneous complications of surgical and medical care. In the elderly, fractures and miscellaneous complications of surgical and medical care made up over 75 percent of those hospitalized for an injury or poisoning diagnosis.

Miscellaneous complications of surgical and medical care represented 21 percent of the injury and poisoning diagnoses. The percent of cases hospitalized due to these conditions ranged from 5 percent of the 15–24-year-olds to 27 percent of the elderly. About one-half of the diagnoses in this category involved complications of an internal prosthetic device, implant, or graft. Also included in this category were postoperative infections and postoperative shock. It is important to note that these diagnoses cannot be used as an indicator of substandard medical care. Many of these conditions would be expected considering the complexity of the procedures undertaken, the often fragile condition of the patient at the time of surgery (particularly of the elderly), and the variability of patient response to invasive procedures.

Injury and poisoning rates

The overall rate of hospitalization for injury and poisoning diagnoses was 110.5 per 10,000 population, but it ranged from 51.9 for children under 15 years of age, to 279.6 for the elderly 65 or over. The elderly's rate was more than twice the rate for the 15–24, the 25–34, and the 45–64-year-old age groups, more than three times the rate for the 35–44-year-old age group, and more than five times the rate for children under 15.

The fracture rate was also lowest for the under 15 age group (18.9 per 10,000) and highest for the elderly (142.4 per 10,000). The elderly's fracture rate was more than four times the rate for the second highest age group (45–64-year-olds) and was more than seven times the rate for children. Other research has noted that advanced age substantially increases the risk of hospitalization for minor fractures (14).

The 15–24 and the 25–34-year-old age groups had the highest rates of lacerations and open wounds and of internal injuries. As noted previously, this is consistent with high young adult (particularly male) death rates from firearms and motor vehicle accidents (1,9).

The 15–24-year-old age group also had the highest poisoning rate, but one of the lowest rates of sprains and strains. Beginning with the 25–34-year-old age group, the rate for miscellaneous complications of surgical and medical care increased significantly for each successive age group.

Source of payment

As shown in table 4, private health insurance was the expected source of payment for over one-half of the patients hospitalized due to injury and poisoning diagnoses in the under 15 years of age group and the 45–64-year-old age group, and for close to one-half (47 percent) of the patients in the 15–44-year-old age group. The vast majority (87 percent) of the 65 and over age group hospitalized due to injury or poisoning diagnoses expected their hospital care to be paid for by Medicare. Only 5 percent of the elderly cited private insurance as their expected principal source of payment, and only 2 percent of this age group were in the self-pay category.

Medicaid was expected to pay for the care of 23 percent of the discharges under 15 years old. Another 10 percent of the patients in this age group were in the self-pay category—an indication of no or inadequate health insurance.

Of the 15–44-year-olds, 18 percent were in the self-pay category. In this age group, over one-quarter of the patients with diagnoses of lacerations and open

Table 3. Number, rate, and percent distribution of patients discharged from short-stay hospitals, by category of first-listed injury and poisoning diagnoses and age: United States, 1991

[Discharges from non-Federal hospitals. Excludes newborn infants. Diagnostic groupings and code number inclusions are based on the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)]

Category of first-listed diagnosis and ICD-9-CM code	All ages	Under 15 years	15–24 years	25–34 years	35–44 years	45–64 years	65 years and over
				Number of patients discharged in thousands			
All injury and poisoning. 800–999	2,768	286	367	400	336	492	888
Fractures 800–829	1,034	104	110	115	95	158	452
Dislocation 830–839	64	*	18	15	9	10	9
Sprains and strains 840–848	171	*	19	32	35	48	34
Intracranial injuries (excluding those with skull fracture) 850–854	180	30	37	34	24	20	34
Internal injury of chest, abdomen, and pelvis 860–869	83	*7	21	23	13	12	*7
Lacerations, open wounds, injuries to blood vessels 870–904	193	25	53	50	25	24	16
Late effects of injuries and poisoning 905–909	*8	*	*	*	*	*	*
Superficial injuries and contusions 910–924	88	*8	13	11	14	13	30
Burns. 940–949	52	16	*7	*6	*6	*9	*7
Other injury 855–859,926–939,950–959	72	14	12	17	*6	11	11
Poisoning and toxic effects 960–989	205	32	52	43	31	23	23
Other effects of environmental causes 990–994	18	*	*	*	*	*	*
Certain adverse effects not elsewhere classified 995	33	*	*	*	*	10	13
Miscellaneous complications of surgical and medical care 996–999	567	36	19	48	72	148	243
				Rate of patients discharged per 10,000 population			
All injury and poisoning. 800–999	110.5	51.9	102.7	94.8	86.0	105.3	279.5
Fractures 800–829	41.3	18.9	30.8	27.2	24.5	33.8	142.4
Dislocation 830–839	2.6	*	5.1	3.5	2.4	2.2	2.9
Sprains and strains 840–848	6.8	*	5.3	7.6	8.9	10.3	10.8
Intracranial injuries (excluding those with skull fracture) 850–854	7.2	5.5	10.3	8.1	6.3	4.3	10.8
Internal injury of chest, abdomen, and pelvis 860–869	3.3	*1.2	5.8	5.5	3.2	2.6	*2.3
Lacerations, open wounds, injuries to blood vessels 870–904	7.7	4.5	14.8	11.9	6.5	5.2	5.0
Late effects of injuries and poisoning 905–909	*0.3	*	*	*	*	*	*
Superficial injuries and contusions 910–924	3.5	*1.5	3.5	2.5	3.6	2.8	9.4
Burns. 940–949	2.1	2.9	*2.0	*1.5	*1.6	*1.9	*2.3
Other injury 855–859,926–939,950–959	2.9	2.6	3.5	4.1	*1.5	2.3	3.5
Poisoning and toxic effects 960–989	8.2	5.8	14.7	10.3	8.0	4.9	7.1
Other effects of environmental causes 990–994	0.7	*	*	*	*	*	*
Certain adverse effects not elsewhere classified 995	1.3	*	*	*	*	2.1	4.2
Miscellaneous complications of surgical and medical care 996–999	22.6	6.6	5.3	11.4	18.4	31.7	76.6
				Percent distribution			
All injury and poisoning. 800–999	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Fractures 800–829	37.4	36.4	30.1	28.7	28.4	32.1	50.9
Dislocation 830–839	2.3	*	5.0	3.7	2.8	2.1	1.0
Sprains and strains 840–848	6.2	*	5.2	8.0	10.3	9.8	3.9
Intracranial injuries (excluding those with skull fracture) 850–854	6.5	10.5	10.1	8.5	7.3	4.0	3.8
Internal injury of chest, abdomen, and pelvis 860–869	3.0	*2.3	5.6	5.8	3.8	2.4	*0.8
Lacerations, open wounds, injuries to blood vessels 870–904	7.0	8.7	14.4	12.6	7.6	4.9	1.8
Late effects of injuries and poisoning 905–909	*0.3	*	*	*	*	*	*
Superficial injuries and contusions 910–924	3.2	*2.6	3.4	2.7	4.2	2.6	3.4
Burns. 940–949	1.9	5.5	*2.0	*1.6	*1.8	*1.8	*0.8
Other injury. 855–859,926–939,950–959	2.6	5.0	3.4	4.3	*1.7	2.2	1.3
Poisoning and toxic effects 960–989	7.4	11.2	14.3	10.8	9.3	4.7	2.6
Other effects of environmental causes 990–994	0.7	*	*	*	*	*	*
Certain adverse effects not elsewhere classified 995	1.2	*	*	*	*	2.0	1.5
Miscellaneous complications of surgical and medical care 996–999	20.5	12.6	5.2	12.0	21.4	30.1	27.4

wounds and internal injuries of the chest, abdomen, and pelvis; over one-fifth of the patients with intracranial injuries and poisonings and toxic effects; and 19 percent of the patients with fractures were in the self-pay category. It is probable that many of these patients required emergency care that hospitals provided regardless of their lack of insurance.

Overall, 4 percent of persons hospitalized in 1991 due to injury and poisoning diagnoses expected workers' compensation to cover the cost of their hospital care. Of the 119,000 discharges expecting this source of payment, 69 percent were in the 15–44-year-old age group. In this age group 31 percent of the burns, 15 percent of the dislocations, and 16 percent of the sprains and strains were expected to be paid for by workers' compensation. Another 25 percent of the discharges expecting their hospitalization to be paid for by workers' compensation were in the 45–64-year-old age group. In this age group 16 percent of the sprains and strains and 15 percent of the burns had workers' compensation indicated as the anticipated payment source.

Disposition

The dispositions of injury and poisoning patients are shown in table 5. Over three-quarters of the patients hospitalized due to an injury or poisoning diagnosis were discharged home, but the percentage ranged from

Table 4. Number and percent distribution of patients with injury and poisoning diagnoses discharged from short-stay hospitals, by age and expected principal source of payment: United States, 1991

[Discharges from non-Federal hospitals. Excludes newborn infants]

Source of payment	All ages	Under 15 years	15–44 years	45–64 years	65 years and over
	Number of discharges in thousands				
All sources	2,768	286	1,102	492	888
Private insurance	983	150	520	265	48
Medicare	893	*	45	69	775
Medicaid	213	67	101	34	11
Workers' compensation	119	*	82	30	*8
Other Government payments	71	*9	50	10	*
Self-pay	275	28	193	40	13
Other sources	99	17	53	22	*7
Not stated	115	11	58	22	24
	Percent distribution				
All sources	100.0	100.0	100.0	100.0	100.0
Private insurance	35.5	52.3	47.2	53.9	5.4
Medicare	32.3	*	4.1	14.1	87.3
Medicaid	7.7	23.3	9.2	6.9	1.2
Workers' compensation	4.3	*	7.4	6.1	*1.0
Other Government payments	2.6	3.0	4.6	2.0	*
Self-pay	9.9	9.9	17.5	8.2	1.5
Other sources	3.6	6.0	4.8	4.4	*1.0
Not stated	4.2	4.0	5.3	4.4	2.7

Table 5. Number and percent distribution of patients with first-listed injury and poisoning diagnoses discharged from short-stay hospitals, by age and disposition: United States, 1991

[Discharges from non-Federal hospitals. Excludes newborn infants]

Disposition	All ages	Under 15 years	15–44 years	45–64 years	65 years and over
	Number of discharges in thousands				
All dispositions	2,768	286	1,102	492	888
Routine discharge	2,147	267	963	425	492
Transfer to another short-term hospital	137	*7	47	16	67
Transfer to long-term care institution	246	*	23	14	206
Other live discharges	156	*	47	23	81
Dead	41	*	*9	*	27
Not stated	40	*	13	10	15
	Percent distribution				
All dispositions	100.0	100.0	100.0	100.0	100.0
Routine discharge	77.6	93.4	87.3	86.4	55.5
Transfer to another short-term hospital	5.0	*2.4	4.3	3.2	7.6
Transfer to long-term care institution	8.9	*	2.1	2.9	23.2
Other live discharges	5.6	*	4.3	4.7	9.1
Dead	1.5	*	*1.0	*	3.0
Not stated	1.5	*	1.2	2.0	1.7

68 percent of fractures to 95 percent of dislocations. Fourteen percent discharged to other facilities–5 percent to short-term hospitals and 9 percent to long-term care institutions. Of hospital discharges with first-listed diagnoses other than injury and poisoning, 83 percent were discharged home.

As is shown in table 5, of all discharges with first-listed injury and poisoning diagnoses, the elderly were the least likely to be discharged home (56 percent) and the most likely to be discharged to other facilities (31 percent). For elderly patients with diagnoses other than injury and poisoning, 69 percent were discharged home and 17 percent were discharged to other facilities. Of the 273,000 elderly with injury and poisoning diagnoses discharged to other facilities, three-fourths went to long-term care institutions and the remainder went to other short-term hospitals. One-half of these elderly discharged to long-term care institutions had hip fractures and another 21 percent had other fractures.

Two percent (41,000) of the discharges hospitalized for injury and poisoning were discharged dead. Of the patients with injury or poisoning diagnoses who died in the hospital, 66 percent were 65 years of age and older. Twenty-two percent of those who died in the hospital had a diagnosis of hip fracture. Patients hospitalized due to an injury or poisoning diagnosis made up 9 percent of hospital patients; they represented 5 percent of all of the deaths in the hospital in 1991.

E–codes

In instances where patients are hospitalized because of an injury or poisoning, information concerning the cause of the injury should be recorded in the medical record. This information allows the use of E-codes (codes E800–E999), which describe "environmental events, circumstances, and conditions as the cause of injury, poisoning, and other adverse effects" (7). These codes provide additional information about other diagnoses and hence should be recorded only as a supplementary diagnosis category.

Hospital discharge data systems are seen by some experts as an appropriate vehicle for gathering E–code information for the more serious injuries. According to Sniezek, Finklea, and Graitcer (15) "E–coded hospital discharge data systems are potentially one of the most effective and feasible means available to collect data needed to prevent and control injuries." There is not a national requirement for hospitals to record E–codes, except in those cases where drugs or medicinal and biological substances caused an adverse effect in therapeutic use (16). Consequently, data on external cause of injury from discharge data systems are incomplete.

E–codes were coded in the NHDS when the necessary information was present on the face sheet or discharge summary of the medical record or was included in the automated data provided by abstract services or State systems. Table 6 shows the percentage of patients with first-listed injury and poisoning diagnoses by sex, age, race, region,

specific diagnoses, number of diagnoses, hospital ownership and bedsize with one or more E–codes.

In 1991 1.2 million patients, or 44 percent of patients hospitalized due to an injury or poisoning diagnosis, had at least one E–code diagnosis recorded.

Table 6. Percent of patients by selected patient and hospital characteristics with first-listed injury and poisoning diagnoses discharged from short-stay hospitals with one or more external cause of injury and poisoning codes: United States, 1991

[Discharges from non-Federal hospitals. Excludes newborn infants. Data are for discharges with first-listed diagnoses of 800–999 from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM), with one or more external cause of injury codes]

Characteristic	*Percent with E-code*[1]
All injury and poisoning discharges	44.3
Sex	
Male	46.2
Female	42.2
Age	
Under 5 years	56.8
5–14 years	45.4
15–24 years	49.1
25–34 years	49.0
35–44 years	47.2
45–64 years	44.2
65–74 years	42.6
75 years and over	34.1
Race	
White	43.9
Black	57.5
All other	34.5
Not stated	39.1
Region	
Northeast	44.2
Midwest	42.9
South	42.8
West	49.1
First-listed diagnosis and ICD-9-CM codes	
Fractures .800–829	34.2
Dislocation .830–839	25.9
Sprains and strains .840–848	20.0
Intracranial injuries (excluding those with skull fracture) .850–854	43.9
Internal injury of chest, abdomen, and pelvis .860–869	46.2
Lacerations, open wounds, injuries to blood vessels .870–904	50.2
Late effects of injury and poisoning .905–909	23.0
Superficial injuries and contusions .910–924	34.1
Burns .940–949	44.4
Other injury .855–859,926-939,950–959	38.8
Poisoning and toxic effects .960–989	78.7
Other effects of environmental causes .990–994	60.1
Certain adverse effects not elsewhere classified .995	63.6
Miscellaneous complications of surgical and medical care .996–999	58.4
Number of diagnoses	
Seven diagnoses	45.7
Six diagnoses	60.0
Five diagnoses	51.3
Four diagnoses	56.0
Three diagnoses	54.2
Two diagnoses	46.4
Hospital ownership	
Church/nonprofit	42.0
Proprietary	44.2
Government	55.9
Hospital bedsize	
6–99	40.4
100–299	42.7
300–499	42.4
500 or more	55.8

[1] E-code is external cause of injury and poisoning code.

More males (46 percent) had an E–code reported than females (42 percent). Children under 5 had the highest (57 percent) E–code completion; discharges 75 years of age and over had the lowest (34 percent) proportion completed. For black persons, the percent with E–codes was significantly higher (58 percent) than the percent for white persons (44 percent). The percentage of E–codes recorded in the West was significantly higher than for every other region (49 percent)—probably reflecting the fact that both California and Washington required E-coding. There was considerable variation among the diagnostic groups in completion of E–codes. Only 20 percent of sprains and strains had an E–code compared with 79 percent of those with poisoning and toxic effects. The latter category would be expected to be more complete than others because it includes those diagnoses in which E–codes are mandatory. Two other categories with over 50 percent E–code completion were miscellaneous complications of surgical and medical care and lacerations and open wounds.

A study of E–codes in Maryland conducted by Marganitt et al. (17) found that there was systematic underreporting of E–codes in the elderly, the severely injured, and patients with long lengths of stay. This was primarily due to the fact that these groups were more likely to have multiple chronic conditions prior to the injury and/or more complications during the hospital stay. In these situations, the data fields available for recording diagnoses are likely to be filled, thereby leaving no room for the E–code. E–codes may be considered of lesser importance to hospitals since they do not influence reimbursement. Hence, in cases where all of the applicable codes would not fit on the abstract forms, E–codes would be the least likely to be coded.

The percentage of first-listed injury and poisoning diagnoses with at least one E–code in 1988 was 40; in 1990 and 1991, 44 percent of these records had E–codes. In 1991, five States (California, New York, Washington, Rhode Island, and Vermont) had mandated E-coding of hospital records.

Since that time, an additional nine States have instituted such a requirement. As the number of States mandating the use of E–codes rises, the percentage recording them on NHDS abstract forms is expected to increase.

Data on E-codes collected in the National Hospital Discharge Survey are not included in this report because the evidence cited above indicates that these data would likely be biased and unrepresentative of all E-codes. Since all of the other data on injuries included in this report, as well as information generally reported from this survey, are nationally representative, it was felt that it would be misleading to report the incomplete E-code information.

Days of care

Information about days of care is included in table 7. The average length of stay for the different diagnostic categories ranged from 3.2 days for patients with poisoning and toxic effects to 12.3 for burns. In addition to burns, long lengths of stay occurred for patients with fractures, internal injuries, late effects of injury and poisoning, and miscellaneous complications of surgical and medical care. Dislocations, sprains and strains, and poisoning and toxic effects had short lengths of stay.

Of the days of care for injury and poisoning patients, 46 percent were for fracture patients. This is compared with the 37 percent of the discharges having fractures as their first-listed diagnosis. Of the days of care, 80 percent were for patients with fractures, miscellaneous complications of surgical and medical care, intracranial injuries, and lacerations and open wounds. Patients in these four categories made up 71 percent of the discharges in the injury and poisoning category.

Summary

In 1991, 2.8 million patients were hospitalized because of an injury or poisoning; and 1 in every 10 hospital days were devoted to caring for these patients. The average length of stay for these patients was 6.9, but this ranged from 3.2 days for patients with poisonings to 12.3 days for burn patients.

The overall hospitalization rate for injury and poisoning for males and females did not differ significantly, but there were significant differences in some of the specific categories of injuries. Males had higher rates than females for intracranial injuries, lacerations and open wounds, dislocations, burns, and internal injuries. Females had a higher rate than males in the poisoning and toxic effects category. White persons had higher rates than black persons for fractures, but black persons had higher rates of lacerations and open wounds, burns, poisoning and toxic effects, and internal injuries.

The elderly's rate of hospitalization for injury or poisoning was more than twice the rate for the 15–34 and the 45–64-year-old age groups, more than three times the rate for the 35–44-year-olds, and more than five times the rate for children. The 15–34-year-olds had the highest rates of lacerations and open wounds and internal injuries.

Fractures were the most common injury and poisoning diagnoses for all of the age groups, but the rate ranged from 18.9 per 10,000 for children under 15, to 142.4 per 10,000 for the elderly. Most of the elderly's fractures were hip fractures, while the most frequent fractures for children under 15 were bones of the skull and arm.

The percentage of self-pay patients with injury and poisoning diagnoses was high, particularly in the 15–44-year-old age group. Most of the injury and poisoning patients were discharged home, but a smaller portion of the elderly were discharged home relative to the other age groups. Of the elderly, 31 percent were discharged to other institutions. Over three-quarters of these went to long-term care institutions and most of these had hip fractures.

Only 44 percent of the first-listed injury and poisoning patients had one or more external cause of injury codes (E–codes). As the number of States mandating E–codes increases, this percentage can be expected to increase.

Table 7. Number and percent distribution of patients discharged from short-stay hospitals and average length of stay, by first-listed injury and poisoning diagnoses: United States, 1991

[Discharges from non-Federal hospitals. Excludes newborn infants. Diagnostic groupings and code numbers are based on the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)]

First-listed diagnosis and ICD-9-CM codes		Days of care		Average length of stay in days
		Number in thousands	Percent distribution	
All injury and poisoning	800–999	19,138	100.0	6.9
Fractures	800–829	8,733	45.6	8.4
Dislocation	830–839	219	1.1	3.4
Sprains and strains	840–848	629	3.3	3.7
Intracranial injuries (excluding those with skull fracture)	850–854	1,041	5.5	5.8
Internal injury of chest, abdomen, and pelvis	860–869	712	3.7	8.6
Lacerations, open wounds, injuries to blood vessels	870–904	940	4.9	4.9
Late effects of injury and poisoning	905–909	*76	*0.4	*9.1
Superficial injuries and contusions	910–924	395	2.1	4.5
Burns	940–949	639	3.3	12.3
Other injury	855–859,926–939,950–959	342	1.8	4.8
Poisoning and toxic effects	960–989	644	3.4	3.2
Other effects of environmental causes	990–994	103	0.5	5.6
Certain adverse effects not elsewhere classified	.995	144	0.8	4.3
Miscellaneous complications of surgical and medical care	996–999	4,521	23.6	8.0

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Symbols

- - -	Data not available
. . .	Category not applicable
–	Quantity zero
0.0	Quantity more than zero but less than 0.05
Z	Quantity more than zero but less than 500 where numbers are rounded to thousands
*	Figure does not meet standard of reliability or precision

Technical notes

Survey methodology

Source of data

The National Hospital Discharge Survey (NHDS) covers discharges from noninstitutional hospitals, except Federal, military, and Veterans Administration hospitals, that are located in the 50 States and the District of Columbia. Only short-stay hospitals (hospitals with an average length of stay for all patients of less than 30 days) or those whose specialty is general (medical or surgical) or children's general are included in the survey. These hospitals must also have six beds or more staffed for patient use.

For 1991, the sample consisted of 528 hospitals. Of these hospitals, seven were found to be out of scope (ineligible) because they went out of business or otherwise failed to meet the criteria for the NHDS universe. Of the 521 in-scope (eligible) hospitals, 484 responded to the survey.

Sample design and data collection

The National Center for Health Statistics (NCHS) has conducted the NHDS continuously since 1965. A report on the development of the original NHDS was published (18).

Beginning in 1988, the NHDS sample includes with certainty all hospitals with 1,000 beds or more or 40,000 discharges or more annually. The remaining sample of hospitals is based on a stratified three-stage design. The first stage consists of a selection of 112 primary sampling units (PSU's) that comprise a probability subsample of PSU's to be used in the 1985–94 National Health Interview Survey. The second stage consists of a selection of noncertainty hospitals from the sample PSU's. At the third stage, a sample of discharges was selected by a systematic random-sampling technique. A detailed description of the old and new survey designs has been published (19).

Two data collection procedures were used for the survey. One was a manual system of sample selection and data abstraction. The second, an automated method used for

approximately 33 percent of the respondent hospitals in 1991, involved the purchase of data tapes from abstracting services, State data systems, or hospitals.

In the manual system, the sample selection and transcription of information from hospital records to abstract forms were performed at the hospitals. The completed forms, along with the sample selection control sheets, were forwarded to NCHS for coding, editing, and weighting. A few of the hospitals have submitted their data via computer printout or tape in recent years. In about two-thirds of the hospitals using this manual system in 1991, the work was performed by their own medical records staff. In the remaining hospitals using the manual system, the U.S. Bureau of the Census personnel did the work on behalf of NCHS.

For the automated system, NCHS purchased tapes containing machine-readable medical record data that were systematically sampled by NCHS.

The data collected for the survey included items relating to the patient's personal characteristics, including birth date, sex, race, and marital status (but not the patient's name and address); administrative information, including admission and discharge dates, discharge status, and medical record number; and medical information, including diagnoses and surgical and nonsurgical operations or procedures. Beginning in 1977, data pertaining to patient ZIP Code, expected source of payment, and dates of surgery were also collected. (The medical record number and patient ZIP Code are confidential information and are not available to the public.)

Presentation of estimates

The relative standard error (RSE) of the estimate and the number of sample records that the estimate was based on are used to identify estimates with relatively low reliability. Because of the complex sample design of the NHDS, estimates of less than 5,000 are not presented; only an asterisk (*) appears in the tables. Generally, these estimates have an RSE of more than 30 percent or are based on a sample of less than 30 cases. Estimates of 5,000 to 9,000 are preceded by an asterisk (*) to indicate they should not be assumed reliable. These estimates are usually based on fewer than 60 cases.

Sampling errors and rounding of numbers

The standard error is primarily a measure of sampling variability that occurs by chance because only a sample rather than the entire universe is surveyed. The RSE of the estimate is obtained by dividing the standard error by the estimate itself. The resulting value is multiplied by 100, so the RSE is expressed as a percent of the estimate.

Estimates of sampling variability for 1991 data were calculated with SESUDAAN software, which computes standard errors by using a first-order Taylor approximation of the deviation of estimates from their expected values. A description of the software and the approach it uses has been published (20). The constants for RSE curves for the 1991 NHDS estimates are presented in table I. The RSE of an estimate (X) can be estimated from the formula:

$$\mathrm{RSE}(X) = 100\sqrt{a + b/X}$$

where X, a, and b are as defined in table I.

Estimates have been rounded to the nearest thousand. For this reason, figures within tables do not always add to the totals.

Tests of significance

In this report, the determination of statistical inference is based on the two-sided t-test with a critical value of 1.96 (0.05 level of significance). Terms such as "higher" and "less" indicate that differences are statistically significant. Terms such as "similar" and "no difference" mean that no statistically significant difference exists between the estimates being compared. A lack of comment on the difference between any two estimates does not mean that the difference was tested and found insignificant.

Definition of terms

Age—Patient's age at birthday prior to admission to the hospital.

Average length of stay—The number of days of care accumulated by patients discharged during the year divided by the number of patients.

Days of care—The number of patient days accumulated by a patient at time of discharge. A stay of less than 1 day (patient admission and discharge on the same day) is counted as 1 day in the summation of total days of care. For patients admitted and discharged on different days, the number of days of care is computed by counting all days from (and including) the date of admission to (but not including) the date of discharge. The terms days of care, patient days, and hospital days are synonymous.

Diagnosis—A disease or injury (or other factor that influences health status and contact with health services) listed on the medical record of a patient.

- *Principal diagnosis*—The condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care.
- *First-listed diagnosis*—The coded diagnosis identified as the principal diagnosis or listed first on the face sheet or discharge summary of the medical record if the principal diagnosis cannot be identified. The number of first-listed diagnoses is equal to the number of discharges.

Discharge—The formal release of a patient by a hospital, that is, the termination of a period of hospitalization by death or disposition to place of residence, nursing home, another hospital, or other location. The terms discharge, patient, and inpatient are synonymous.

Discharge rate—The ratio of the number of hospital discharges during a year to the number of persons in the civilian population on July 1 of that year.

Disposition—The disposition of a patient on termination of hospitalization is classified in one of six categories in this report:

- *Routine discharge*—Patients who returned to their previous place of residence after discharge.

Table I. Estimated parameters for relative standard error equations for National Hospital Discharge Survey statistics, by selected characteristics: United States, 1991

Characteristic	Number of discharges or first-listed diagnoses		Number of days of care	
	a	b	a	b
Total	0.00101	546.321	0.00173	2,343.213
Sex				
Male	0.00447	213.042	0.00518	5,120.963
Female	0.00099	442.186	0.00194	1,634.957
Age				
Under 15 years	0.01786	65.842	0.07618	737.582
15–44 years	0.00956	111.147	0.02384	475.352
45–64 years	0.01292	44.094	0.02949	92.219
65 years and over	0.01149	25.788	0.01849	25.558
Region				
Northeast	0.00293	243.156	0.00451	1,967.234
Midwest	0.00603	331.780	0.01037	608.558
South	0.00247	547.686	0.00400	1,435.185
West	0.00513	403.340	0.00891	871.769
Source of payment				
Workers' compensation	0.00250	588.807	0.00393	12,444.000
Medicare	0.00548	883.428	0.00456	6,548.842
Medicaid	0.00348	1,979.378	0.00136	18,545.000
Other Government	0.08079	177.390	0.04261	988.154
Private	0.00148	780.110	0.00169	12,606.000
Self	0.00244	662.998	0.00399	5,923.664
No charge or other	0.02235	407.608	0.02240	2,779.271
Not stated	0.04490	639.387	0.05367	3,639.382
Race				
White	0.00234	927.094	0.00360	2,087.655
Black	0.00569	273.368	0.00926	1,034.092
All other	0.02889	280.075	0.04980	253.439
Not stated	0.01666	427.619	0.02339	966.802

NOTE: The relative standard error (RSE) for an estimate (X), expressed as a percent of X, can be determined from the equation $RSE(X) = 100\sqrt{a + b/X}$

- *Transfer to another short-term hospital*—Patients who were transferred to another short-term hospital at discharge.
- *Transfer to long-term care institution*—Patients who entered a nursing home or other long-term care institution upon discharge from the hospital.
- *Other live discharges*—Patients who left the hospital against medical advice, patients discharged alive with dispositions other than routine discharge or transfer, and patients discharged alive whose dispositions were not stated.
- *Dead*—Patients who died during an inpatient stay.
- *Not stated*—Patients whose discharge status, that is, alive or dead, was not reported at discharge.

External cause of injury codes (E–codes)—This refers to the *International Classification of Diseases, 9th Revision, Clinical Modification* section entitled "Supplementary Classification of External Causes of Injury or Poisoning" and includes codes E800–E999. These codes describe environmental events, circumstances, and conditions as the cause of injury, poisoning, and other adverse effects.

Expected principal source of payment—The expected principal source of payment is reported by the patient or the patient's representative at the time of admission and may differ somewhat from the actual source of payment as determined after discharge. In this report, payment sources are grouped as follows:

- *Private insurance*—Insurance provided by nongovernmental sources, including Blue Cross and other insurance companies, private industry, and philanthropic organizations.
- *Medicare*—A nationwide program providing health insurance protection to people 65 years of age and over, people eligible for Social Security disability payments for more than 2 years, and people with end-stage renal disease.
- *Medicaid*—A joint Federal-State program that provides benefits for people who meet their State's definition of "low income."
- *Workers' compensation*—A program in all States under which employees injured on the job receive financial compensation without regard to fault.
- *Other Government payments*—Government payments other than those through the Medicare or Medicaid programs, such as payments made under the Title V Program, and the Civilian Health and Medical Program for the Uniformed Services (CHAMPUS), which provides coverage for civilian medical care for family members of active-duty uniformed service personnel and for retired uniformed service personnel and their families.
- *Self-pay*—Patients who expect the costs of hospitalization to be paid for primarily by themselves, spouses, parents, or next of kin.
- *Other sources*—Includes other nonprofit sources of payment, such as church welfare; hospitalizations for which there was no charge; and sources that could not be assigned to any other category.
- *Not stated*—Patients for whom no source of payment was indicated.

Geographic region—Hospitals are classified by location in one of the four geographic regions of the United States that correspond to those used by the U.S. Bureau of the Census.

Region	*States included*
Northeast	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania

Midwest	Michigan, Ohio, Illinois, Indiana, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
South	Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
West	Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Hawaii, and Alaska

Hospital—Hospitals with an average length of stay of less than 30 days for all patients as well as hospitals whose specialty was general (medical or surgical) or children's general, even if the average length of stay of all patients was 30 days or more. Federal hospitals, hospital units of institutions, and hospitals with less than six beds staffed for patients' use were not included.

Injury and poisoning—In this report, injury and poisoning diagnoses includes codes 800–999 of the *International Classification of Diseases, 9th Revision, Clinical Modification.*

Newborn—A patient admitted by birth to a hospital.

Patient—A person formally admitted to the inpatient service of a short-stay hospital for observation, care, diagnosis, or treatment. Newborn infants, defined as those admitted by birth to the hospital, are excluded from this report. The terms patient, inpatient, and discharge are synonymous.

Population—The U.S. resident population, excluding members of the Armed Forces.

Procedure—Surgical or nonsurgical operations, diagnostic procedures, or special treatments reported on the medical record of a patient. In the NHDS, a maximum of four procedures are coded.

Race—Patients are classified into three groups, "white," "black," and "all other," with all other including all categories other than white or black. In addition, 21.6 percent of the patients had no race stated on the face sheet of the medical record.

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