

STATISTICAL BRIEF #29

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Adverse Drug Events in U.S. Hospitals, 2004

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Introduction

Pharmaceutical treatment is a critical component of the U.S. health care system, helping to cure and control disease for millions. However, adverse drug events (ADEs), either due to inherent side effects or from inappropriate use, are serious patient safety concerns. It has been a challenge to evaluate the prevalence of ADEs.¹ One source of information on ADEs is hospital administrative data—information that is collected as a routine part of providing care in hospitals. It is not possible to distinguish ADEs that occur in the hospital from those that originate outside the hospital, nor is it certain that all ADEs are captured in administrative data. Nonetheless, these data can provide some insight into the frequency and types of ADEs seen in U.S. hospitals.

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on ADEs in 2004. This publication provides national estimates on the types of patients seen with ADEs in U.S. hospitals, and details on the types of ADEs that are reported. ADEs are split into two broad categories—*adverse effects* of drugs properly administered and *drug poisoning* (accidental overdose, wrong drugs given or taken in error, or drugs taken inadvertently). ADEs are further broken down into general drug categories as well as more specific categories. Care was taken to exclude hospital stays associated with illicit drug use or with evidence of intentional harm, self-inflicted or otherwise. All differences noted in the text are significant at the 0.05 level or better.

Findings

In 2004, ADEs were noted in 1,211,100 hospital stays, or about 3.1 percent of all stays. ADEs can be split into several broad categories, as shown in figure 1. The vast majority of ADEs (90.3 percent, or 1,093,600 stays) represented *adverse effects* of drugs. These are drugs properly administered in therapeutic and prophylactic dosages but which cause adverse reactions, including allergic or hypersensitivity reactions. Most remaining ADEs were *drug*

¹Kohn, L.T., Corrigan, J.M., Donaldson, M.S., eds. *To Err is Human: Building a Safer Health System*, National Academy Press, Washington DC, 2000; Aspden, P., Wolcott, J., Bootman, J.L., Cronenwett, L.R., eds. *Preventing Medication Errors*, National Academy Press, Washington, DC, 2006.

Highlights

- In 2004, adverse drug events (ADEs) were noted in over 1.2 million hospital stays in the U.S., about 3.1 percent of all stays.
- Most ADEs (90.3 percent, or 1.1 million stays) were listed as adverse effects of drugs properly administered. About 8.6 percent of ADEs (104,000 stays) were drug poisoning—accidental overdose, wrong drugs given or taken in error, or drugs taken inadvertently.
- Hospitalized patients with ADEs were on average about 62 years of age, compared with 47 years for all inpatients. About 59 percent of all patients with ADEs were female—a similar distribution to all hospital stays. Patients with adverse effects tended to be older (63 years of age average) while patients with poisoning were more likely to be younger (47 years).
- Drugs most commonly associated with ADEs overall were: corticosteroids, 141,000 hospital stays (10.3 percent of all ADEs); anticoagulants (blood thinners), 117,700 hospital stays (8.6 percent); antineoplastic (anticancer) and immunosuppressant agents (used to prevent rejection of organ transplants), 116,400 hospital stays (8.5 percent); opiates (such as codeine and morphine for pain control), 79,900 stays (5.9 percent); and analgesics and antipyretics not elsewhere classified (such as pentazocine), 60,200 stays (4.4 percent).
- While the top five causes of *adverse effects* were the same as the most common ADEs overall, the most common causes of *drug poisoning* were benzodiazepine tranquilizers, opiates, aromatic analgesics (such as acetaminophen), antidepressants, and anticonvulsants.

poisoning, which involve accidental drug overdose, wrong drugs taken or given in error, or drugs taken inadvertently. Drug poisoning accounted for 8.6 percent of all coded ADEs (104,200 stays). The remaining 1.1 percent of coded ADEs include neuropathy or dermatitis due to drugs—no further information is provided for these cases on how the event took place or what drug was responsible.

Characteristics of hospital stays with ADEs

Hospital inpatients with ADEs were on average 62 years of age (table 1). Among those with adverse effects, the mean age was 63.3 years, significantly older than patients with drug poisoning—47.4 years. Figure 2 shows the distribution of ADEs across age categories. Compared with all inpatients, those with adverse effects were predominantly in the 65+ age group, while patients with poisoning tended to be younger, primarily in the 18–64 age groups.

Table 1 also shows that among all patients with ADEs, 59.1 percent were female—similar to the percentage for all hospital stays. A slightly smaller percentage of patients with poisoning were female (54.9 percent). Among cases with poisoning, 80 percent were admitted through the emergency department, compared with 62.9 percent of cases with adverse effects.

Consistent with the findings on age, figure 3 shows that most patients with adverse effects were covered by Medicare (58.5 percent). Medicare patients also comprised 35.4 percent of poisonings. Compared with patients experiencing adverse effects, patients with poisoning were more likely to be covered by Medicaid (21.9 percent compared with 9.3 percent) or to be uninsured (12.2 percent compared with 2.8 percent).

Resource use related to ADEs

The length of hospital stays tended to be shorter among cases with poisoning (3.6 days) while those with adverse effects stayed in the hospital 6.4 days on average. Hospital costs were similarly lower for those with poisoning (\$6,000 per stay versus \$10,500 for cases with adverse effects). The percent of patients who died was lower among those with poisoning (1.6 percent) than among those with adverse effects (2.8 percent).

General and specific causes of ADEs

Figure 4 summarizes information on the top 10 specific causes of all ADEs, which comprised over half (53.5 percent) of all ADEs. Corticosteroids were the most common specific cause of ADEs, accounting for 141,000 hospital stays, or 10.3 percent of all ADEs. Anticoagulants (blood thinners) ranked second, accounting for 117,700 hospitalizations, or 8.6 percent of all ADEs. Antineoplastic (anticancer) and immunosuppressant agents (used to prevent rejection of organ transplants) accounted for 116,400 hospital stays, or 8.5 percent of all ADEs. Opiates (such as codeine and morphine for pain control) were the fourth most common cause of ADEs, accounting for 79,900 stays, or 5.9 percent of all ADEs. Other specified analgesics and antipyretics (such as pentazocine) ranked fifth with 60,200 stays (4.4 percent of all ADEs). The remaining top 10 specific causes of ADEs were antihypertensive agents (3.4 percent), diuretics other than saluretics (3.2 percent), other antibiotics (3.2 percent), cardiotonics, such as digitalis (3.2 percent), and sedatives and hypnotics (2.7 percent).

Table 2 provides information on general causes of ADEs, as well as details on specific causes for ADEs that account for at least 10,000 cases in U.S. hospitals. Information is provided separately for adverse effects and poisoning. Analgesics, antipyretics, and antirheumatics were the most common general cause of ADEs, accounting for a total of 192,200 stays across the adverse effects and poisoning subgroups. This category includes drugs used to treat pain, fever, inflammation, and arthritis. These drugs caused 13.3 percent of all adverse effects and 20.2 percent of all poisonings. The most common specific cause of ADEs within this group is opiates.

Hormones and synthetic substitutes ranked second, accounting for a total of 183,200 hospital stays. This category includes such drugs as insulin for diabetes; and corticosteroids (such as prednisone) used to treat arthritis, asthma, allergic reactions, hepatitis, ulcerative colitis, and other inflammatory conditions. This category of drugs caused 14.1 percent of all adverse effects and 8.1 percent of all poisonings.

Cardiovascular drugs ranked third, accounting for a total of 153,400 hospital stays. This category includes high blood pressure medications (antihypertensives), cardiotoxic drugs such as digitalis, and other drugs specifically for the heart. About 11.5 percent of all adverse effects and 9.5 percent of all poisonings were caused by cardiovascular drugs.

Agents that affect blood constituents ranked fourth and accounted for a total of 132,400 hospital stays with ADEs—10.3 percent of all adverse effects and 5.2 percent of all poisonings. The most common specific ADE in this category was caused by anticoagulants.

The fifth most common cause of ADEs were systemic agents (which include antiallergic and antiemetic drugs, enzymes, and vitamins, among others), accounting for a total of 127,400 ADE-related hospital stays. Antineoplastic and immunosuppressive drugs were the most common specific cause in this category.

Figure 5 illustrates the top five specific causes of ADEs for the adverse effects and poisoning subgroups. In only one case was an ADE in the top five for both adverse effects and poisonings—opiates were responsible for 7.3 percent of all poisonings and 5.7 percent of all adverse effects. The other most common specific causes of *adverse effects* were corticosteroids (11.6 percent of all adverse-effects hospitalizations), antineoplastic (anticancer) and immunosuppressant agents (used to prevent rejection of organ transplants, 9.6 percent of adverse-effects stays), anticoagulants (blood thinners, 9.4 percent), and unspecified analgesics (4.6 percent). The other most common specific causes of *poisonings* were benzodiazepine tranquilizers (9.7 percent of all poisonings), aromatic analgesics (such as acetaminophen, 5.1 percent), antidepressants (4.9 percent), and unspecified anticonvulsants (antiepilepsy drugs) other than oxazolidine, hydantoin, and succinimides (3.7 percent).

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2004 Nationwide Inpatient Sample (NIS).

Definitions

Types of hospitals included in HCUP

HCUP is based on data from community hospitals, defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include OB-GYN, ENT, orthopedic, cancer, pediatric, public, and academic medical hospitals. They exclude long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals, but these types of discharges are included if they are from community hospitals.

Unit of analysis

The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in one year will be counted each time as a separate “discharge” from the hospital.

Costs and charges

Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare and Medicaid Services (CMS).² Costs will tend to reflect the actual costs of production, while charges represent what the hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used because detailed charges are not available across all HCUP states. Hospital charges reflect the amount the hospital charged for the entire hospital stay and does not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundreds.

Payer

Up to two payers can be coded for a hospital stay in HCUP data. When this occurs, the following hierarchy is used:

- If either payer is listed as Medicaid, the payer is “Medicaid.”
- For non-Medicaid stays, if either payer is listed as Medicare, the payer is “Medicare.”
- For stays that are neither Medicaid nor Medicare, if either payer is listed as private insurance, the payer is “private insurance.”

²HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2003. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp.

- For stays that are not Medicaid, Medicare, or private insurance, if either payer is some other third-party payer, the payer is “other,” which consists of Worker’s Compensation, TRICARE/CHAMPUS, CHAMPVA, Title V, and other government programs.
- For stays that have no third-party payer and the payer is listed as “self-pay” or “no charge,” the payer is “uninsured.”

Diagnoses and ICD-9-CM Codes

The principal diagnosis is that condition established after study to be chiefly responsible for the patient’s admission to the hospital. Secondary diagnoses are concomitant conditions that coexist at the time of admission or that develop during the stay. All-listed diagnoses include the principal diagnosis plus these additional secondary conditions. All-listed diagnoses were used for this analysis.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 12,000 ICD-9-CM diagnosis codes.

To define ADEs in this analysis, we used the following ICD-9-CM codes or external cause of injury codes (E codes) in any diagnosis or E code field:

357.6, Neuropathy due to drugs
 692.3, Contact dermatitis due to drugs and medicines in contact with skin
 693.0, Dermatitis due to drugs or medicines taken internally
 960.0–964.9, 965.02–969.5, 969.8–979.9, Poisoning by drugs, medicinal and biological substances (includes overdose of these substances and wrong substances given or taken in error)
 E850.1–E858.9, Accidental poisoning by drugs, medicinal substances, and biologicals (includes accidental overdose, wrong dose given or taken in error, and drug taken inadvertently)
 E 930.0–E934.9, E935.1–E949.9, Drugs, medicinal substances, and biologicals causing adverse effects in therapeutic use (includes correct drug properly administered in therapeutic or prophylactic dosage as the cause of any adverse reaction including allergic or hypersensitivity reactions)

Note that the following codes were excluded (a total of 28,700 cases):

965.00, Opium poisoning
 965.01, Heroin poisoning
 969.6, Psychodysleptic poisoning
 969.7, Poisoning by psychostimulants (caffeine, cocaine)
 E850.0, Accidental poisoning by heroin
 E854.1, Accidental poisoning by hallucinogens
 E854.2, Accidental poisoning by psychostimulants
 E935.0, Accidental poisoning by heroin
 E939.6, Adverse effects of hallucinogens
 E939.7, Adverse effects of psychostimulants

We also excluded any case with evidence of self-inflicted poisoning or assault, or poisoning that was undetermined whether accidentally or purposely inflicted (a total of 190,900 cases):

E950.0–E950.9, Suicide and self-inflicted poisoning (159,600 cases)
 E962.0–E962.9, Assault by poisoning (300 cases)
 E980.0–E980.9, Poisoning undetermined whether accidentally or purposely inflicted (31,100 cases)

Duplicative coding was noted for about 80,900 cases, that is, both an ICD-9-CM diagnosis code and an E code for the same drug event was coded (e.g., diagnosis code 960.0, Penicillin poisoning; and external cause of injury code E930.00, Adverse effect of penicillin, were coded on the same case). For purposes of analysis, such a case was counted only once. To calculate percents, the denominator was the number of discharges, rather than the number of events.

Because the NIS is based on a sampling frame of statewide data-collection organizations, we examined the coding of ADEs by state and found considerable variability across states in the percentage of all records that have an ADE code. Three states had fewer than one percent of cases with ADEs. The remaining states ranged from 1.4 percent to 5.6 percent cases with ADEs. Thus, it is likely that ADE cases are under-identified in these data.

About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, non-rehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame that contains hospitals comprising 88 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

About HCUP

HCUP is a family of powerful health care databases, software tools, and products for advancing research. Sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP includes the largest all-payer encounter-level collection of longitudinal health care data (inpatient, ambulatory surgery, and emergency department) in the United States, beginning in 1988. HCUP is a Federal-State-Industry Partnership that brings together the data collection efforts of many organizations—such as State data organizations, hospital associations, private data organizations, and the Federal government—to create a national information resource.

For more information about HCUP, visit <http://www.hcup-us.ahrq.gov>.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

Arizona Department of Health Services
Arkansas Department of Health & Human Services
California Office of Statewide Health Planning & Development
Colorado Health & Hospital Association
Connecticut Integrated Health Information (Chime, Inc.)
Florida Agency for Health Care Administration
Georgia GHA: An Association of Hospitals & Health Systems
Hawaii Health Information Corporation
Illinois Health Care Cost Containment Council and Department of Public Health
Indiana Hospital & Health Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Maryland Health Services Cost Review Commission
Massachusetts Division of Health Care Finance and Policy
Michigan Health & Hospital Association
Minnesota Hospital Association
Missouri Hospital Industry Data Institute
Nebraska Hospital Association
Nevada Division of Health Care Financing and Policy, Department of Human Resources
New Hampshire Department of Health & Human Services
New Jersey Department of Health & Senior Services
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oregon Office for Oregon Health Policy and Research and Oregon Association of Hospitals and Health Systems
Rhode Island Department of Health
South Carolina State Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health

For additional HCUP statistics, visit HCUPnet, our interactive query system at www.hcup.ahrq.gov.

For More Information

For a detailed description of HCUP and more information on the design of the NIS and methods to calculate estimates, please refer to the following publications:

Steiner, C., Elixhauser, A., Schnaier, J. The Healthcare Cost and Utilization Project: An Overview. *Effective Clinical Practice* 5(3):143–51, 2002.

Design of the HCUP Nationwide Inpatient Sample, 2004. Online. August 8, 2006. U.S. Agency for Healthcare Research and Quality.
http://www.hcup-us.ahrq.gov/db/nation/nis/reports/NIS_2004_Design_Report.pdf

Houchens, R., Elixhauser, A. *Final Report on Calculating Nationwide Inpatient Sample (NIS) Variances, 2001*. HCUP Methods Series Report #2003-2. Online. June 2005 (revised June 6, 2005). U.S. Agency for Healthcare Research and Quality.
<http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf>

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at hcp@ahrq.gov or send a letter to the address below:

Irene Fraser, Ph.D., Director
Center for Delivery, Organization, and Markets
Agency for Healthcare Research and Quality
540 Gaither Road
Rockville, MD 20850

Table 1. Characteristics of hospital stays during which adverse drug events (ADEs) were noted, 2004

	All cases with any ADE*	Cases with adverse effects of drugs properly administered in therapeutic or prophylactic dosage	Cases with poisoning (accidental overdose, wrong drugs given or taken in error, drugs taken inadvertently)	All hospital stays
Number of discharges (% of stays with ADEs)	1,211,100 (100%)	1,093,600 (90.3%)	104,200 (8.6%)	38,661,800 (3.1%)
Age, mean	62.0	63.3	47.4	47.1
Female, percent	59.1%	59.6%	54.9%	58.9%
Admitted through the emergency department, percent	64.4%	62.9%	80.0%	43.1%
Length of stay, mean days	6.2	6.4	3.6	4.6
Total hospital costs, mean	\$10,100	\$10,500	\$6,000	\$7,600
Died in the hospital, percent	2.7%	2.8%	1.6%	2.1%

* Based on all-listed diagnoses. For 13,300 cases with neuropathy or dermatitis ADE codes, the ICD-9-CM codes do not identify whether the origin of the ADE was poisoning or adverse effects due to drugs properly administered.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2004.

Table 2. Causes of adverse drug events (ADEs)* in U.S. hospitals, by adverse effects and poisoning, 2004

General causes of ADEs and rank overall Specific cause of ADE	Adverse effect		Poisoning	
	Number of events [†]	Percentage of all ADEs with adverse effects	Number of events [†]	Percentage of all ADEs with poisoning
1. Analgesics, antipyretics, and antirheumatics	161,000	13.3%	31,200	20.2%
Opiates (such as codeine and morphine for pain control)	68,700	5.7%	11,300	7.3%
Salicylates	15,900	1.3%	2,600	1.7%
Antirheumatics	14,000	1.2%	700	0.4%
Aromatic analgesics	3,300	0.3%	7,900	5.1%
Other specified analgesics and antipyretics [‡]	56,000	4.6%	4,200	2.7%
2. Hormones and synthetic substitutes	170,700	14.1%	12,500	8.1%
Corticosteroids	140,400	11.6%	600	0.4%
Insulin and antidiabetic agents	24,100	2.0%	5,600	3.7%
3. Cardiovascular drugs	138,800	11.5%	14,600	9.5%
Other antihypertensive agents (e.g., clonidine, guanethidine, reserpine)	42,800	3.5%	3,600	2.3%
Cardiotonic glycosides and drugs of similar action (e.g., digitalis, digoxin)	41,000	3.4%	2,300	1.5%
Coronary vasodilators (e.g., nitroglycerin)	17,100	1.4%	900	0.6%
Cardiac rhythm regulators (e.g., propranolol, quinidine)	14,900	1.2%	600	0.4%
Other and unspecified agents primarily affecting the cardiovascular system [‡]	15,300	1.3%	6,700	4.4%

Table 2. Causes of adverse drug events (ADEs)* in U.S. hospitals, by adverse effects and poisoning, 2004

General causes of ADEs and rank overall Specific cause of ADE	Adverse effect		Poisoning	
	Number of events [†]	Percentage of all stays with adverse effects	Number of events [†]	Percentage of all stays with poisoning
4. Agents that affect blood constituents	124,300	10.3%	8,100	5.2%
Anticoagulants	113,300	9.4%	4,300	2.8%
5. Systemic agents	122,600	10.1%	4,800	3.1%
Antineoplastic and immunosuppressive drugs	115,900	9.6%	500	0.4%
6. Other and unspecified drugs and medicinal substances	92,200	7.6%	8,300	5.4%
Other drug or medicinal substance (specified or unspecified) [‡]	90,700	7.5%	6,400	4.1%
7. Psychotropic agents (other than hallucinogens, amphetamines, and caffeine)	51,300	4.3%	30,400	19.7%
Benzodiazepine-based tranquilizers	13,900	1.2%	15,000	9.7%
Antidepressants	11,900	1.0%	7,600	4.9%
Antipsychotic agents other than phenothiazine- and butyrophenone-based tranquilizers	9,800	0.8%	3,000	2.0%
Other psychotropic agents (specified or unspecified) [‡]	10,000	0.8%	2,000	1.3%
8. Antibiotics	76,700	6.3%	1,100	0.7%
Cephalosporin antibiotics	13,000	1.1%	100	0.1%
Penicillins	11,400	1.0%	200	0.2%
Other specified antibiotics (excluding antifungal, chloramphenicol, erythromycin, tetracycline, cephalosporin, antimycobacterial, and antineoplastic antibiotics) [‡]	43,000	3.6%	600	0.4%
9. Water, mineral, and uric acid metabolism drugs	64,500	5.3%	3,300	2.1%
Diuretics other than saluretics (e.g., ethacrynic acid, furosemide)	43,300	3.6%	900	0.6%
Saluretics (e.g., chlorothiazides)	13,500	1.1%	400	0.2%
10. Anticonvulsants and anti-Parkinsonism drugs	41,200	3.4%	8,700	5.6%
Hydantoin derivatives	23,400	1.9%	2,700	1.7%
Other anticonvulsants (specified or unspecified) [‡]	15,200	1.3%	5,700	3.7%
11. Sedatives and hypnotics	33,300	2.7%	6,700	4.3%
12. Other anti-infectives	27,600	2.3%	700	0.5%
13. Central nervous system depressants and anesthetics	14,400	1.1%	7,200	4.5%
14. Drugs affecting autonomic nervous system	18,800	1.6%	2,100	1.4%
Sympatholytics (antiadrenergics)	9,100	0.8%	500	0.4%

Table 2. Causes of adverse drug events (ADEs)* in U.S. hospitals, by adverse effects and poisoning, 2004

General causes of ADEs and rank overall Specific cause of ADE	Adverse effect		Poisoning	
	Number of events [†]	Percentage of all stays with adverse effects	Number of events [†]	Percentage of all stays with poisoning
15. Central nervous system stimulants (e.g., opiate antagonists)	2,000	0.2%	10,300	6.7%
16. Agents acting on smooth and skeletal muscles and respiratory system (e.g., muscle relaxants)	8,200	0.7%	2,200	1.4%
17. Agents affecting the gastrointestinal system (e.g., cathartics)	6,300	0.5%	1,100	0.7%
18. Agents affecting skin, mucous membranes, eye, ENT, and dental	4,700	0.4%	800	0.5%
19. Vaccines and biological substances	1,400	0.1%	--	--
Total number of hospital stays with adverse drug events	1,093,600		104,200	

* Specific causes of ADEs with a national estimate of at least 10,000 cases (across adverse effects and poisoning) are reported individually.

[†] More than one ADE can be recorded during a hospital stay. This is based on a total of 1,364,100 ADEs in 1,211,100 hospital stays with at least one ADE recorded. For 13,300 cases with neuropathy and dermatitis ADEs, a specific cause cannot be determined.

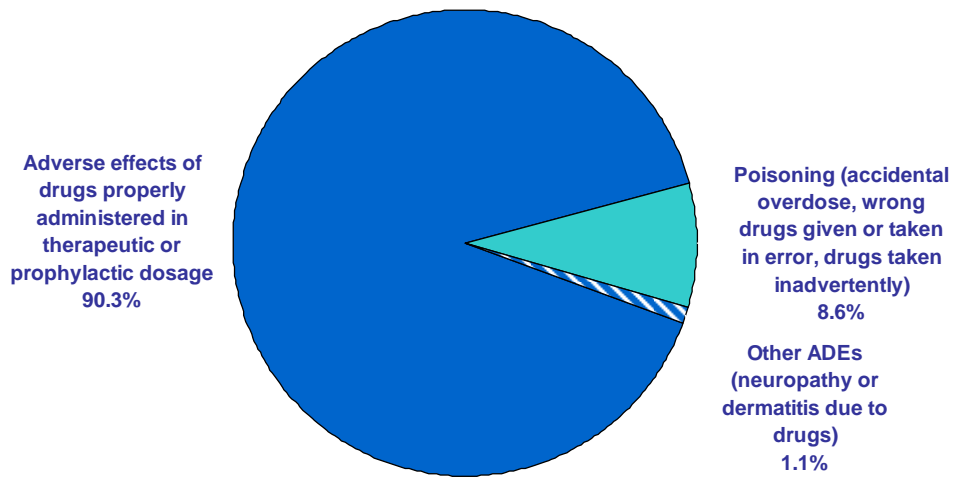
[‡] Diagnoses in these categories reflect adverse effects of unidentified drugs; more specific information is not available in the codes.

-- Estimate is unreliable.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2004.



Figure 1. Types of adverse drug events (ADEs)* in U.S. hospitals, by broad category, 2004

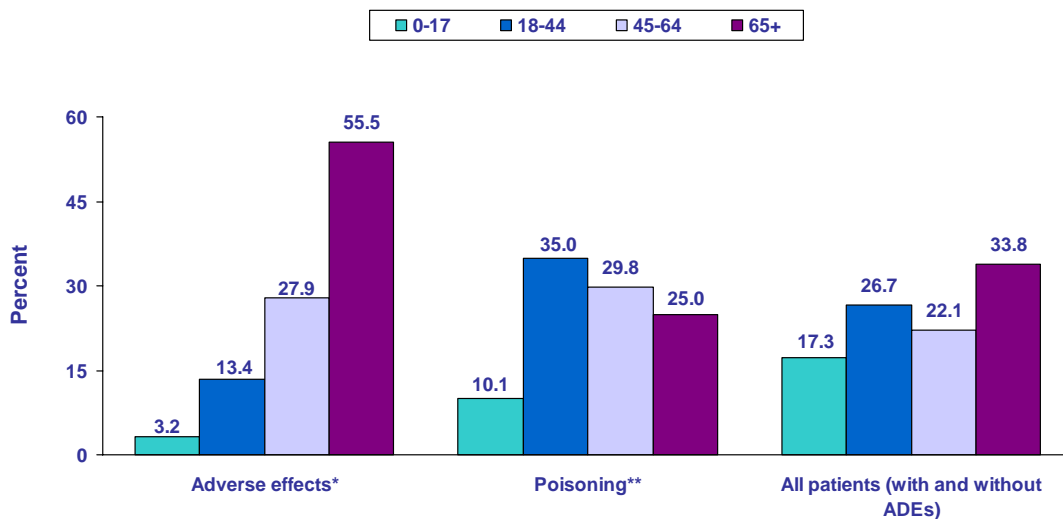


*Based on a total of 1,211,100 hospital stays with at least one ADE recorded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2004.



Figure 2. Distribution of adverse drug events (ADEs), by patient age, 2004



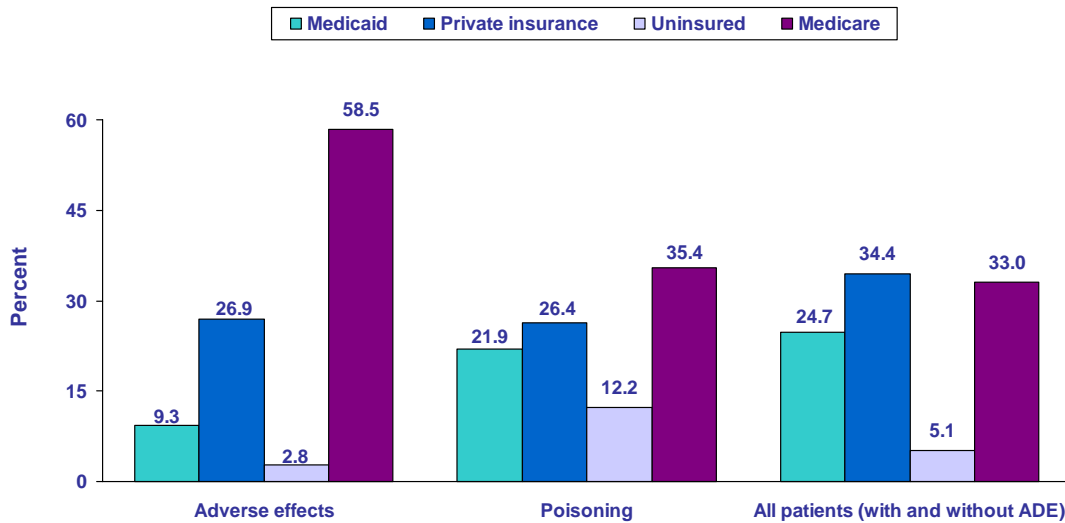
*Adverse effects = effects of drugs properly administered in therapeutic or prophylactic dosage.

** Poisoning = accidental overdose, wrong drugs given or taken in error, drugs taken inadvertently.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2004.



Figure 3. Distribution of adverse drug events (ADEs), by payer, 2004



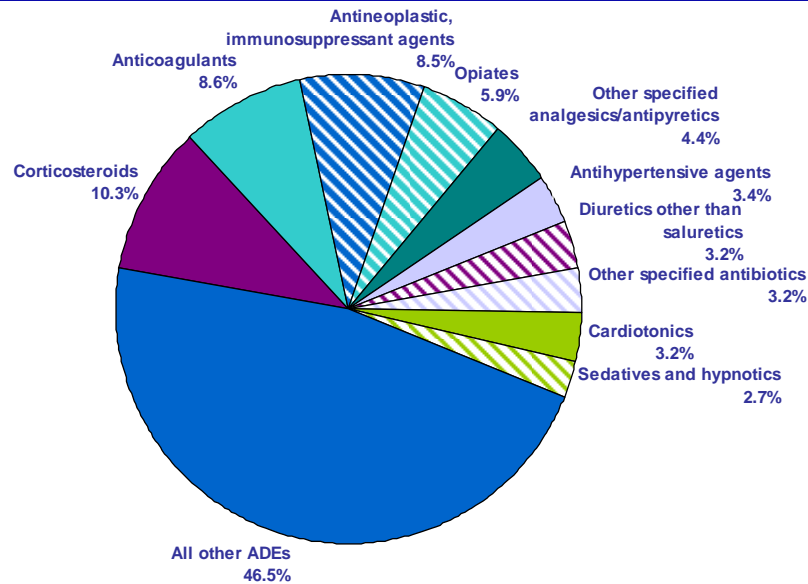
*Adverse effects = effects of drugs properly administered in therapeutic or prophylactic dosage.

** Poisoning = accidental overdose, wrong drugs given or taken in error, drugs taken inadvertently.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2004.



Figure 4. Most common specific causes of adverse drug events (ADEs)* in U.S. hospitals, 2004

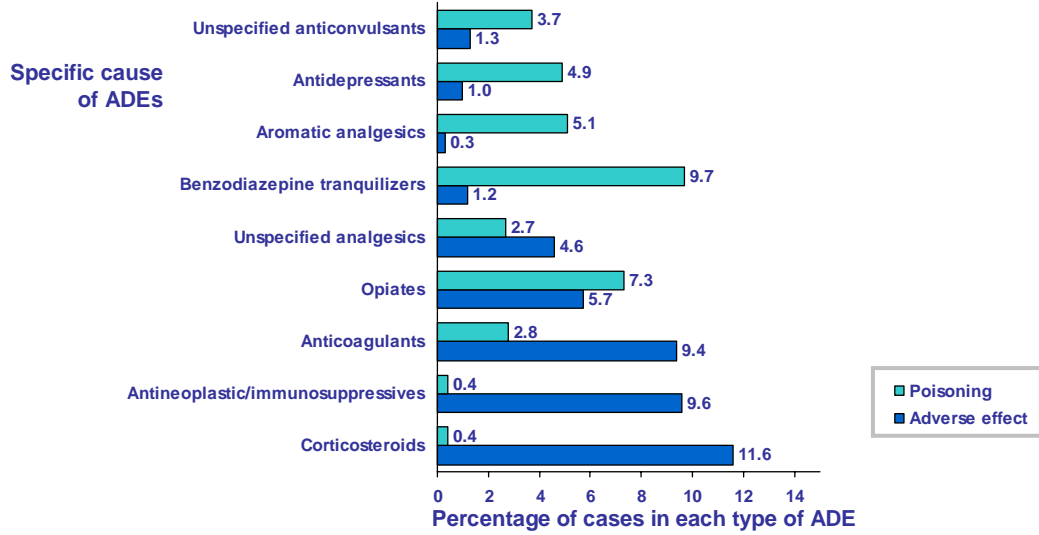


* More than one event can be recorded during a hospital stay. This is based on a total of 1,364,100 events in 1,211,100 hospital stays with at least one ADE event recorded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2004.



Figure 5. Most common specific causes of ADEs* in U.S. hospitals, by type of ADE, 2004



* More than one event can be recorded during a hospital stay. This is based on a total of 1,364,100 events in 1,211,100 hospital stays with at least one ADE event recorded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2004.