

## STATISTICAL BRIEF #28

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### Procedures with the Most Rapidly Increasing Hospital Costs, 2000–2004

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#### Introduction

Approximately one-third of the U.S. health care dollar is spent on inpatient hospital care, making hospitalizations the single most expensive component of the health care system. Hospital costs reflect the amount of money expended by the hospital for patient care (excluding physician expenses). In 2004, total hospital costs grew to \$295 billion—an increase of 21.9 percent from 2000.

In 2004, more than 60 percent of the nearly 39 million hospital stays involved some type of procedure.<sup>1</sup> Some of these procedures have been associated with much more rapidly increasing hospital costs than others. Identifying the procedures that generate the most rapid increases in hospital costs may contribute to a more informed discussion of overall cost increases. The increasing costs associated with a specific procedure can be the result of several causes, including the extension of treatment to different types of patients, treating more severely ill patients, rising salaries and input costs, and the diffusion of newer technologies and more expensive equipment.

This Statistical Brief provides data from the Healthcare Cost and Utilization Project (HCUP) and identifies which procedures generated the most rapidly increasing hospital costs between 2000 and 2004. The brief shows estimates of the portion of the cost increase resulting from greater use of top procedures (higher volume) versus a rise in mean cost per stay. Information is presented for all payers and separately by four payer groups: Medicare, Medicaid, private insurance, and self-pay (uninsured). All differences between estimates noted in the text are statistically significant at the 0.05 level or better. Costs for 2000 were adjusted to 2004 dollars using the overall Consumer Price Index (CPI).

#### Findings

During the five-year period from 2000 to 2004, overall hospital costs grew by about 21.9 percent to \$295 billion, inflation adjusted (data not shown). The majority of this increase was due to a nearly 15

<sup>1</sup>Procedures are defined as any diagnostic or therapeutic intervention (invasive or non-invasive) that appears on the discharge record of a hospitalized patient.

#### Highlights

- From 2000 to 2004, overall hospital costs grew by 21.9 percent to \$295 billion (inflation adjusted). About two-thirds of the increase was due to increased mean cost per stay and one-third to an increase in admissions.
- For the top 10 procedures associated with stays that generated the largest increases in costs, the increases resulted largely from an increase in the volume of procedures, rather than a rise in the mean cost per stay. The combined increase in hospital costs for the top 10 procedures was 64.8 percent—two-thirds due to volume increases and one-third to increases in costs per stay.
- The uninsured had the most rapid increase in costs (135.7 percent) for the top 10 principal procedures.
- Among procedures, the largest increase in costs was for stays involving spinal fusion (93.6 percent). For Medicare-covered patients, spinal fusion was associated with the greatest increase in total costs (136.5 percent).
- Hospital stays for cardiac pacemaker or cardioverter/defibrillator procedures showed a high increase in total cost for all patient groups (87.0 percent), but especially for the uninsured (163.4 percent increase). For Medicaid and privately insured patients, these stays showed an increase of 105.1 percent and 91.5 percent, respectively, in total costs per stay.
- The top 10 procedures associated with hospital stays that generated the most rapidly increasing costs were similar for the different payer groups, but the ordering of procedures varied.

percent rise in the mean cost per stay; a smaller portion of the increase was accounted for by growth in the volume of hospitalizations.

#### *Growth in hospital costs associated with the top 10 procedures, 2000-2004*

However, when focusing on the top 10 procedures that generated the most rapid increases in total hospital costs, a different pattern emerges. For this subset of high-frequency procedures, the increase in hospital costs resulted largely from an increase in the volume of procedures, rather than a rise in the mean cost per stay. Figure 1 shows the overall increase for these top 10 procedures as well as the portion of the increase that was due to growth in the number of stays with each procedure versus the growth in mean cost per stay. The top 10 procedures experienced a 64.8 percent increase in total hospital costs overall—43.0 percent was due to an increase in the number of stays (volume) and 21.7 percent was due to an increase in the mean cost per stay.

The magnitude of change in total costs varied across payer types, especially when comparing uninsured patients with patients covered by Medicaid, Medicare, and private insurance. The largest cost increase associated with the top 10 procedures was for uninsured patients (135.7 percent), followed by stays billed to Medicaid (76.8 percent), private insurance (71.1 percent), and Medicare (65.8 percent). Across all payer categories, the increase in the volume of the procedures performed accounted for most of the rise in total costs.

#### *Procedures performed during hospital stays with the most rapidly increasing hospital costs*

Table 1 lists the 10 procedures generating the most rapid increases in hospital costs between 2000 and 2004. During this time period, the largest increase in total hospital costs occurred for stays involving spinal fusion—93.6 percent. In contrast, there was only a 44.0 percent increase in the number of hospitalizations during which spinal fusion was the principal procedure. (These procedures were most often performed on patients hospitalized for spinal arthritis, spinal disc disorders, and other back problems.)

Cost per case increased more than volume for three procedures: insertion and/or replacement of a cardiac pacemaker or cardioverter/defibrillator (87.0 percent total cost increase), skin grafts (66.3 percent), and percutaneous transluminal coronary angioplasty (PTCA) (44.7 percent). (Insertion and/or replacement of a cardiac pacemaker or cardioverter/defibrillator is most often performed on patients admitted with cardiac dysrhythmias, conduction disorders, and congestive heart failure. Skin grafts are often used to treat burn victims. PTCA uses a balloon catheter to relieve the narrowing and obstruction of coronary arteries.)

Otherwise, total hospital costs increased mostly due to increases in volume for the following procedures: incision and drainage of the skin and subcutaneous tissue, blood transfusion, arthroplasty of the knee, enteral and parenteral nutrition (nutritional support through an intravenous line or tube feeding), hemodialysis, and abdominal paracentesis (removal of fluid from the abdominal cavity). (Arthroplasty of the knee is primarily knee replacement surgery. Blood transfusions are used to treat anemia or blood loss. Enteral and parenteral nutrition is used for a range of chronic conditions. Hemodialysis is used for renal failure. Incision and drainage of the skin and subcutaneous tissue is most often used for skin infections and complications of surgical and medical care. Abdominal paracentesis is commonly performed on patients hospitalized for liver disease and cancers.)

#### *Procedures performed in hospital stays with the most rapidly increasing hospital costs, by primary payer*

Tables 2 through 5 list for each primary payer group the procedures associated with hospital stays that experienced the most rapidly increasing hospital costs between 2000 and 2004. The payer groups are Medicare, Medicaid, private insurance, and self-pay (uninsured). Some procedures appeared for all payers. For all four payer groups, spinal fusion and procedures related to cardiac pacemaker or cardioverter/defibrillator were among the top 10 procedures with the most rapidly increasing hospital costs. The percentage change in the total costs associated with stays involving spinal fusion was highest among uninsured stays (190.9 percent) and stays covered by Medicare (136.5 percent). Cardiac pacemaker or cardioverter/defibrillator procedures had the most rapidly increasing costs for uninsured stays (163.4 percent) and Medicaid-covered stays (105.1 percent).

Blood transfusions and parenteral/enteral nutrition also experienced the most rapidly increasing hospital costs for all four payer groups; however, they were highest for uninsured stays (152.9 percent and 127.1 percent, respectively). In fact, the cost increase for uninsured stays involving blood transfusions was more than twice the increase experienced for hospitalizations billed to Medicare (75.3 percent), Medicaid (69.3 percent), and private insurance (70.1 percent).

Among the procedures with rapidly increasing costs, PTCA generated the most costs in 2004, but it was not the most rapidly growing in any payer group and was not even in the top 10 list for privately insured patients. Uninsured stays also had the highest cost increases among hospitalizations involving incision and drainage of the skin and subcutaneous tissue (198.9 percent) and hemodialysis (134.0 percent). Also, cost increases for stays involving skin grafts were especially high for uninsured stays (128.1 percent) and Medicaid-covered stays (96.5 percent). Conversely, privately insured stays experienced the highest total hospital cost increase for stays during which arthroplasty of the knee was the principal procedure performed (79.5 percent).

## Data Source

The estimates in this Statistical Brief are based on data from the HCUP 2004 Nationwide Inpatient Sample (NIS). Historical data were drawn from the 2000 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.

### *Cost estimation*

Total hospital charges for any hospital discharge were converted to costs using cost-to-charge ratios (CCRs) based on hospital accounting reports from the Centers for Medicare and Medicaid Services (CMS).<sup>2</sup> Costs will tend to reflect the actual costs of production, while charges represent what the hospital billed for the case. When applied to all discharges at the hospital, the hospital-wide inpatient CCR removes the effects of well-known differences in markup between hospitals. In a subset of states, detailed charges for every case are reported. Each detailed charge at a hospital in those states can be converted to cost using CMS accounting data at the departmental level. Component costs for each hospital discharge in the states with detailed data are added and pooled by Diagnosis Related Group (DRG) category of the patient. This yields a set of adjustment factors by DRG that correct hospital-wide CCRs for systematic differences in the composition of services in different DRGs. Hospital cost and charges do not include professional (physician) fees.

All cost data are presented in 2004 dollars using the Bureau of Labor Statistics Consumer Price Index All Urban Consumers (CPI-U) U.S. city average and reported to the nearest hundreds. The increase in cost per case is approximately equal to the difference between the increase in total cost and the increase in number of cases.

### *Primary payer*

Each hospitalization and its related hospital bill are attributed to the payer who was expected by the hospital to pay the major portion of the bill (i.e., the expected primary payer). The expected primary source of payment at admission may not be the ultimate primary payer. In addition, other (secondary) payers may pay a portion of the bill. For this report, if the primary payer is listed as "self-pay" or "no charge," the payer is "uninsured."

### *Procedures and Clinical Classifications Software (CCS)*

The principal procedure is the procedure that was performed for definitive treatment rather than one performed for diagnostic or exploratory purposes (i.e., the procedure that was necessary to take care of a

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<sup>2</sup>HCUP 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](http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp).

complication). If two procedures appear to meet this definition, the procedure most related to the principal diagnosis was selected as the principal procedure.

CCS categorizes procedure codes into clinically meaningful categories.<sup>3</sup> This "clinical grouper" makes it easier to quickly understand patterns of procedure use.

## 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 about 90 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

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<sup>3</sup>HCUP CCS. Healthcare Cost and Utilization Project (HCUP). August 2006. U.S. Agency for Healthcare Research and Quality, Rockville, MD. [www.hcup-us.ahrq.gov/toolsoftware/ccs/ccs.jsp](http://www.hcup-us.ahrq.gov/toolsoftware/ccs/ccs.jsp).

**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  
**West Virginia** Health Care Authority  
**Wisconsin** Department of Health & Family Services

For additional HCUP statistics, visit HCUPnet, our interactive query system at [www.hcup.ahrq.gov](http://www.hcup.ahrq.gov).

## References

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 14, 2006. U.S. Agency for Healthcare Research and Quality.  
[http://www.hcup-us.ahrq.gov/db/nation/nis/reports/NIS\\_2004\\_Design\\_Report.pdf](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.  
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Houchens R.L., Elixhauser A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends. (Updated for 1988–2004)*. HCUP Methods Series Report #2006-05. Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality.  
[http://www.hcup-us.ahrq.gov/reports/2006\\_05\\_NISTrendsReport\\_1988-2004.pdf](http://www.hcup-us.ahrq.gov/reports/2006_05_NISTrendsReport_1988-2004.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](mailto:hcp@ahrq.gov) or send a letter to the address below:

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**Table 1. Commonly performed procedures with the most rapidly increasing hospital inpatient costs, 2000–2004**

Principal procedure category	Total costs (2004)	Total hospital stays (2004)	Percentage change in:	
			Total costs (2000-2004)*	Total hospital stays (2000-2004)
Spinal fusion	\$4,824,574,100	303,400	93.6%	44.0%
Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator	\$6,451,133,300	316,700	87.0%	36.1%
Blood transfusion	\$4,390,193,500	561,300	75.2%	58.8%
Skin graft	\$819,062,600	42,200	66.3%	25.0%
Incision and drainage, skin and subcutaneous tissue	\$731,839,200	120,600	65.8%	63.2%
Arthroplasty knee	\$5,263,185,700	481,400	64.0%	46.7%
Enteral and parenteral nutrition	\$1,108,212,800	79,800	60.0%	45.6%
Hemodialysis	\$2,256,351,600	290,100	49.7%	32.4%
Percutaneous transluminal coronary angioplasty (PTCA)	\$9,394,141,100	720,900	44.7%	19.8%
Abdominal paracentesis	\$980,789,500	103,600	41.1%	33.4%

\* 2000 costs were adjusted to 2004 dollars using the overall Consumer Price Index.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2000 and 2004.

**Table 2. Commonly performed procedures with the most rapidly increasing hospital inpatient costs among Medicare-covered stays, 2000–2004**

Principal procedure category	Total costs for stays billed to Medicare (2004)	Medicare's share of total costs	Total hospital stays (2004)	Percentage change in:	
				Total costs (2000-2004)*	Total hospital stays (2000-2004)
Spinal fusion	\$1,309,950,500	27.2%	77,300	136.5%	80.3%
Arthroplasty other than hip or knee	\$265,846,600	57.2%	29,000	83.8%	52.0%
Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator	\$4,667,976,400	72.4%	241,400	83.5%	34.2%
Blood transfusion	\$2,801,514,800	63.8%	361,000	75.3%	59.3%
Nephrotomy and nephrostomy	\$214,300,300	49.7%	14,900	60.6%	38.7%
Arthroplasty knee	\$3,093,325,000	58.8%	280,100	56.6%	43.0%
Enteral and parenteral nutrition	\$570,176,700	51.5%	43,700	55.3%	34.0%
Hemodialysis	\$1,677,741,500	74.4%	217,500	51.1%	33.6%
Percutaneous transluminal coronary angioplasty (PTCA)	\$4,896,485,900	52.1%	366,700	48.8%	24.5%
Magnetic resonance imaging	\$418,648,800	50.1%	51,600	44.1%	24.1%

\* 2000 costs were adjusted to 2004 dollars using the overall Consumer Price Index.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2000 and 2004.

**Table 3. Commonly performed procedures with the most rapidly increasing hospital inpatient costs among Medicaid-covered stays, 2000–2004**

Principal procedure category	Total costs for stays billed to Medicaid (2004)	Medicaid's share of total costs	Total hospital stays (2004)	Percentage change in:	
				Total costs (2000–2004)*	Total hospital stays (2000–2004)
Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator	\$263,393,000	4.1%	10,400	105.1%	57.2%
Skin graft	\$153,267,400	18.7%	6,200	96.5%	45.5%
Spinal fusion	\$317,363,700	6.6%	16,400	89.5%	65.0%
Incision and drainage, skin and subcutaneous tissue	\$152,044,300	20.8%	26,300	82.3%	112.2%
Enteral and parenteral nutrition	\$203,940,400	18.4%	13,100	77.2%	77.5%
Blood transfusion	\$523,370,900	11.9%	60,000	69.3%	60.1%
Percutaneous transluminal coronary angioplasty (PTCA)	\$432,174,800	4.6%	31,900	68.6%	47.2%
Arthroplasty knee	\$155,134,800	2.9%	13,300	66.6%	51.5%
Small bowel resection	\$128,674,600	10.0%	4,400	59.3%	47.7%
Partial excision bone	\$62,968,600	13.6%	4,500	51.6%	20.3%

\* 2000 costs were adjusted to 2004 dollars using the overall Consumer Price Index.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2000 and 2004.

**Table 4. Commonly performed procedures with the most rapidly increasing hospital inpatient costs among stays covered by private insurance, 2000–2004**

Principal procedure category	Total costs for stays billed to private insurers (2004)	Private insurers' share of total costs	Total hospital stays (2004)	Percentage change in:	
				Total costs (2000–2004)*	Total hospital stays (2000–2004)
Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator	\$1,308,736,400	20.3%	55,800	91.5%	38.8%
Spinal fusion	\$2,415,901,000	50.1%	160,900	79.8%	36.4%
Arthroplasty knee	\$1,789,757,900	34.0%	167,000	79.5%	56.8%
Blood transfusion	\$806,405,600	18.4%	106,000	70.1%	56.3%
Skin graft	\$271,373,200	33.1%	14,900	69.9%	25.7%
Incision and drainage, skin and subcutaneous tissue	\$211,921,800	29.0%	38,300	68.1%	55.6%
Enteral and parenteral nutrition	\$283,129,800	25.5%	19,900	52.9%	51.8%
Hip replacement, total and partial	\$1,266,744,900	28.8%	106,500	49.4%	35.8%
Abdominal paracentesis	\$317,634,800	32.4%	34,300	44.3%	41.1%
Aortic resection, replacement or anastomosis	\$230,199,600	21.5%	10,500	39.2%	30.7%

\* 2000 costs were adjusted to 2004 dollars using the overall Consumer Price Index.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2000 and 2004.

**Table 5. Commonly performed procedures with the most rapidly increasing hospital inpatient costs among uninsured stays, 2000–2004**

Principal procedure category	Total costs for stays among the uninsured (2004)	Uninsured patients' share of total costs	Total hospital stays (2004)	Percentage change in:	
				Total costs (2000–2004)*	Total hospital stays (2000–2004)
Incision and drainage, skin and subcutaneous tissue	\$105,460,700	14.4%	20,200	198.9%	113.3%
Spinal fusion	\$101,787,700	2.1%	5,400	190.9%	63.0%
Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator	\$119,854,900	1.9%	4,900	163.4%	72.4%
Blood transfusion	\$162,141,500	3.7%	21,000	152.9%	68.0%
Hemodialysis	\$46,571,500	2.1%	5,200	134.0%	69.8%
Skin graft	\$59,996,500	7.3%	2,700	128.1%	46.0%
Enteral and parenteral nutrition	\$34,431,300	3.1%	1,800	127.1%	98.1%
Cancer chemotherapy	\$66,973,000	4.3%	7,200	121.3%	33.4%
Percutaneous transluminal coronary angioplasty (PTCA)	\$406,940,900	4.3%	29,400	117.0%	53.7%
Debridement of wound, infection or burn	\$212,508,600	6.7%	18,500	113.5%	50.0%

\* 2000 costs were adjusted to 2004 dollars using the overall Consumer Price Index.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2000 and 2004.

