

STATISTICAL BRIEF #165

October 2013

Most Frequent Procedures Performed in U.S. Hospitals, 2011

Anne Pfuntner, Lauren M. Wier, M.P.H., and Carol Stocks, R.N., M.H.S.A.

Introduction

When hospitalized, patients may undergo procedures for surgery, treatments (e.g., blood transfusions), or for diagnostic purposes (e.g., biopsy). The *principal procedure* is the procedure performed for definitive treatment. Hospitalizations usually involve multiple procedures, which together constitute the *all-listed* procedures performed during a hospital stay. Data on inpatient hospital procedures can help hospital administrators, health practitioners, researchers, and others understand how hospital care, including care related to diagnosis and treatment, is currently provided and what changes or consistencies in care delivery have occurred over time.

The present Statistical Brief presents 2011 data on the most common all-listed procedures performed during hospital stays in the United States, overall and by patient age. Changes between 1997 and 2011 in the number of stays and in the rate of hospitalizations with these procedures are also presented. All differences between estimates noted in the text are statistically significant at the .001 level or better.

Findings

Most frequent all-listed procedures performed during hospital stays, 2011

Table 1 shows the all-listed procedures that were performed most commonly during hospital stays in 2011, as well as the change in the rate of hospitalizations with these procedures since 1997. Procedures were performed in 63 percent of hospital stays in 2011. The hospitalization rate for stays with procedures remained stable since 1997 at 780 per 10,000 population.

Blood transfusion was the most common procedure performed during hospitalizations in 2011 (12 percent of stays with a procedure); the rate of hospitalizations with blood transfusion more than doubled since 1997.

Respiratory intubation and mechanical ventilation was the third most common procedure performed, occurring in 7 percent of stays with a procedure in 2011. The hospitalization rate for stays involving respiratory intubation and mechanical ventilation increased 56 percent since 1997.

Highlights

- Procedures were performed in 63 percent of hospital stays in 2011. The hospitalization rate for stays with procedures remained stable since 1997 at 780 per 10,000 population.
- Between 1997 and 2011, the hospitalization rate for stays with hemodialysis increased 68 percent.
- The hospitalization rates for stays with a blood transfusion increased 129 percent for adults aged 18–44 years and 45–64 years, 111 percent for adults aged 65–84 years, and 97 percent for adults aged 85 years and older.
- The hospitalization rate for stays with Cesarean section increased 39 percent between 1997 and 2011.
- Between 1997 and 2011, the most rapidly growing procedure was indwelling catheter—the rate of hospitalization for stays with this procedure more than tripled.
- Adults aged 65–84 years accounted for more than half of the total number of stays with knee arthroplasty in 2011; their hospitalization rate increased 59 percent since 1997.

Six of the most frequent procedures performed were associated with pregnancy, childbirth, and newborns. When combined, they accounted for 30 percent of stays with a procedure in 2011: prophylactic vaccinations and inoculations, repair of current obstetric laceration, Cesarean section, circumcision, artificial rupture of membranes to assist delivery, and fetal monitoring. Cesarean section was the most common major operating room procedure performed in 2011 (41 stays per 10,000 population); the hospitalization rate for stays with Cesarean section increased 39 percent since 1997.

Four cardiovascular procedures also were among the most frequently performed in 2011, constituting almost 15 percent of all stays with a procedure: diagnostic cardiac catheterization, coronary arteriography; hemodialysis; diagnostic ultrasound of the heart (echocardiogram); and percutaneous transluminal coronary angioplasty (PTCA). Between 1997 and 2011, the hospitalization rate for stays with hemodialysis increased 68 percent, but the rate fell 24 percent for stays with diagnostic cardiac catheterization.

Table 1. Number of stays, stays per 10,000 population, and percentage change in rate of the most frequent all-listed procedures for hospital stays, 1997 and 2011

All-listed Clinical Classifications Software (CCS) procedures	Number of stays with the procedure in thousands		Number of stays with the procedure per 10,000 population		Change in rate, %
	1997	2011	1997	2011	1997–2011
All stays (with and without procedures)	34,679	38,591	1,272	1,239	–3
All stays with any procedure	21,257	24,312	780	780	0
Stays with a procedure, %	61	63			
Blood transfusion*	1,097	2,929	40	94	134
Prophylactic vaccinations and inoculations	567	1,860	21	60	187
Respiratory intubation and mechanical ventilation	919	1,635	34	52	56
Repair of current obstetric laceration	1,137	1,315	42	42	1
Cesarean section	800	1,272	29	41	39
Diagnostic cardiac catheterization, coronary arteriography	1,461	1,261	54	40	–24
Upper gastrointestinal endoscopy, biopsy	1,105	1,225	41	39	–3
Circumcision	1,164	1,108	43	36	–17
Artificial rupture of membranes to assist delivery	747	948	27	30	11
Hemodialysis	473	909	17	29	68
Diagnostic ultrasound of heart (echocardiogram)	632	869	23	28	20
Fetal monitoring	1,002	780	37	25	–32
Arthroplasty knee	329	718	12	23	91
Enteral and parenteral nutrition	277	586	10	19	85
Percutaneous transluminal coronary angioplasty (PTCA)	581	560	21	18	–16
Colonoscopy and biopsy	531	525	19	17	–13
Laminectomy, excision intervertebral disc	425	525	16	17	8
Spinal fusion	202	489	7	16	112
Incision of pleura, thoracentesis, chest drainage	349	476	13	15	19
Hip replacement, total and partial	291	467	11	15	40

* The number of stays with blood transfusion does not reflect the number of units of blood transfused.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 1997 and 2011

All-listed procedures with the most rapid growth, 1997–2011

Although the hospitalization rate for all stays and stays during which any procedure was performed remained relatively stable between 1997 and 2011, the hospitalization rate for stays during which some specific procedures were performed grew rapidly during this timeframe. Table 2 highlights the procedures that underwent the most rapid growth in the number of stays per 10,000 population.

Six of the procedures with rapid growth in hospitalization rates were also among the most frequently performed during hospital stays: prophylactic vaccinations and inoculations, blood transfusion, spinal fusion, knee arthroplasty, enteral and parenteral nutrition, and hemodialysis.

The most rapid growth in a procedure between 1997 and 2011 was for indwelling catheter—the rate of hospitalization with this procedure more than tripled (from 2 to 8 stays per 10,000 population). The hospitalization rate for stays during which any of the following four procedures were performed more than doubled since 1997: prophylactic vaccinations and inoculations, blood transfusion, spinal fusion, and abdominal paracentesis (a procedure to remove fluid from the abdominal cavity).

Table 2. Number of stays, stays per 10,000 population, and percentage change in rate for procedures with the most rapid growth, 1997 and 2011

All-listed Clinical Classifications Software (CCS) procedures	Number of stays with the procedure in thousands		Number of stays with the procedure per 10,000 population		Change in rate, %
	1997	2011	1997	2011	1997–2011
All stays (with and without procedures)	34,679	38,591	1,272	1,239	–3
All stays with any procedure	21,257	24,312	780	780	0
Procedures with the most rapid growth in stays per population*					
Indwelling catheter	60	236	2	8	241
Prophylactic vaccinations and inoculations	567	1,860	21	60	187
Blood transfusion**	1,097	2,929	40	94	134
Spinal fusion	202	489	7	16	112
Abdominal paracentesis	117	277	4	9	107
Arthroplasty knee	329	718	12	23	91
Incision and drainage, skin and subcutaneous tissue	118	257	4	8	90
Enteral and parenteral nutrition	277	586	10	19	85
Arterio- or venogram (not heart and head)	143	279	5	9	70
Hemodialysis	473	909	17	29	68

* Includes procedures performed during at least 100,000 hospital stays in either 1997 or 2011

** The number of stays with blood transfusion does not reflect the number of units of blood transfused.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 1997 and 2011

Most frequent all-listed procedures performed during hospital stays by patient age, 2011

Table 3 shows the most frequent all-listed procedures performed during hospitalizations in 2011 by patient age, as well as the change in the rate of hospitalization for stays with these procedures since 1997. Although some procedures were common across several age groups, others were age specific.

Blood transfusion was among the top five procedures performed for children aged 1–17 years and adults aged 18–44 years, and it was the most common procedure in stays for adults aged 45 years and older. The hospitalization rates for stays with a blood transfusion increased rapidly between 1997 and 2011 for adults aged 18 years and older: 129 percent for adults aged 18–44 years and 45–64 years, 111 percent for adults aged 65–84 years, and 97 percent for adults aged 85 years and older.

Among infants (under age 1 year), prophylactic vaccinations and inoculations were the most frequent procedures performed during hospital stays for this age group. The hospitalization rate for stays with this procedure more than doubled since 1997 to 3,623 stays per 10,000 population in 2011. The hospitalization rate for stays with enteral and parental nutrition, the fourth most frequent procedure among infants, nearly tripled between 1997 and 2011 (from 104 to 301 stays per 10,000 population). The rate of hospital stays with a diagnostic spinal tap, however, experienced a 56-percent decrease since 1997, to 172 stays per 10,000 population in 2011.

Appendectomy was the most frequent procedure performed during hospital stays for children aged 1–17 years in 2011 (10 stays per 10,000 population). Blood transfusion, repair of current obstetric laceration, and cancer chemotherapy were each performed at 6 stays per 10,000 population in this age group. Since 1997, the hospitalization rate for stays with repair of current obstetric laceration fell 31 percent.

Among adults aged 18–44 years, four of the top five procedures were related to pregnancy and childbirth: repair of current obstetric laceration, Cesarean section, artificial rupture of membranes to assist delivery, and fetal monitoring. Since 1997, the hospitalization rate increased 58 percent for stays with a Cesarean section.

Several procedures were common in hospitalizations among adults aged 45 years and older. Diagnostic cardiac catheterization with coronary arteriography was the second most common procedure for adults aged 45–64 years and the third most common procedure for adults aged 65–84 years in 2011; however, the hospitalization rates for this procedure decreased by over one-third for these age groups since 1997. Respiratory intubation and mechanical ventilation and upper gastrointestinal endoscopy with biopsy also were common procedures among adults aged 45 years and older. The hospitalization rate for respiratory intubation and mechanical ventilation increased for each age group between 1997 and 2011: 80 percent for adults aged 45–64 years, 41 percent for adults aged 65–84 years, and 53 percent for adults aged 85 years and older. The hospitalization rates for stays with upper gastrointestinal endoscopy, biopsy, however, decreased for adults aged 65–84 years and 85 years and older (by 22 and 24 percent, respectively).

Musculoskeletal procedures were frequent in stays for adults aged 65 years and older. Knee arthroplasty was performed in 374,000 stays for adults aged 65–84 years—more than half of the total number of stays with this procedure (see Table 1). The hospitalization rate within this age group for stays with knee arthroplasty increased 59 percent since 1997. Treatment of a fracture or dislocation of hip and femur was the fifth most common procedure for adults aged 85 years and older, but the hospitalization rate decreased 28 percent since 1997.

Table 3. Number of stays, stays per 10,000 population, and percentage change in rate of the most frequent all-listed procedures for hospital stays by age, 1997 and 2011

Age group and all-listed Clinical Classifications Software (CCS) procedures	Number of stays with the procedure in thousands		Number of stays with the procedure per 10,000 population		Change in rate, %
	1997	2011	1997	2011	1997–2011
All ages, total stays	34,679	38,591	1,272	1,239	–3
< 1 year, total stays*	4,426	4,262	11,799	10,665	–10
Prophylactic vaccinations and inoculations	549	1,448	1,463	3,623	148
Circumcision	1,159	1,105	3,089	2,765	–10
Respiratory intubation and mechanical ventilation	163	175	434	439	1
Enteral and parenteral nutrition	39	120	104	301	190
Diagnostic spinal tap	147	69	391	172	–56
1–17 years, total stays	1,821	1,402	271	201	–26
Appendectomy	74	68	11	10	–12
Blood transfusion**	26	45	4	6	64
Repair of current obstetric laceration	58	42	9	6	–31
Cancer chemotherapy	43	40	6	6	–11
Respiratory intubation and mechanical ventilation	30	33	4	5	6
18–44 years, total stays	9,444	9,385	850	827	–3
Repair of current obstetric laceration	1,079	1,271	97	112	15
Cesarean section	773	1,248	70	110	58
Artificial rupture of membranes to assist delivery	706	919	64	81	27
Fetal monitoring	952	758	86	67	–22
Blood transfusion**	147	343	13	30	129
45–64 years, total stays	6,496	9,695	1,154	1,171	1
Blood transfusion**	247	833	44	101	129
Diagnostic cardiac catheterization, coronary arteriography	578	544	103	66	–36
Respiratory intubation and mechanical ventilation	186	493	33	60	80
Upper gastrointestinal endoscopy, biopsy	275	403	49	49	–1
Hemodialysis	154	363	27	44	60
65–84 years, total stays	10,121	10,533	3,319	2,954	–11
Blood transfusion**	514	1,270	169	356	111
Respiratory intubation and mechanical ventilation	366	603	120	169	41
Diagnostic cardiac catheterization, coronary arteriography	738	563	242	158	–35
Upper gastrointestinal endoscopy, biopsy	530	483	174	135	–22
Arthroplasty knee	201	374	66	105	59
85+ years, total stays	2,362	3,283	6,047	5,723	–5
Blood transfusion**	138	400	353	697	97
Respiratory intubation and mechanical ventilation	65	147	168	256	53
Upper gastrointestinal endoscopy, biopsy	122	136	313	237	–24
Diagnostic ultrasound of heart (echocardiogram)	65	101	165	176	7
Treatment, fracture or dislocation of hip and femur	87	91	222	159	–28

* Excludes ophthalmologic and otologic diagnosis and treatment, for which data was suppressed in 1997.

** The number of stays with blood transfusion does not reflect the number of units of blood transfused.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 1997 and 2011

Data Source

The estimates in this Statistical Brief are based upon data from the Healthcare Cost and Utilization Project (HCUP) 2011 Nationwide Inpatient Sample (NIS). Historical data were drawn from the 1997 Nationwide Inpatient Sample (NIS). The statistics were generated from HCUPnet, a free, online query system that provides users with *immediate access* to the largest set of publicly available, all-payer national, regional, and State-level hospital care databases from HCUP.¹ The data for the number of stays with any procedure, presented in Table 1, were not available in HCUPnet for 1997 and 2011; these statistics were separately calculated using the full HCUP 1997 and 2011 NIS. Supplemental data sources included population denominator data for use with HCUP databases.²

Many hypothesis tests were conducted for this Statistical Brief. Thus, to decrease the number of false-positive results, we reduced the significance level to .001 for individual tests.

Definitions

Procedures, ICD-9-CM, and Clinical Classifications Software (CCS)

All-listed procedures include all procedures performed during the hospital stay whether for definitive treatment or for diagnostic or exploratory purposes.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to procedures. There are approximately 4,000 ICD-9-CM procedure codes.

CCS categorizes procedure codes into clinically meaningful categories.³ This "clinical grouper" makes it easier to quickly understand patterns of procedure use. CCS categories identified as "Other" typically are not reported; these categories include miscellaneous, otherwise unclassifiable procedures that may be difficult to interpret as a group.

Types of hospitals included in HCUP

HCUP is based on data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for psychiatric or chemical dependency conditions in a community hospital, the discharge record for that stay will be included in the Nationwide Inpatient Sample (NIS).

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.

Major operating room procedure

The Procedure Classes assign all ICD-9-CM procedure codes to one of four broad categories (Minor Diagnostic, Minor Therapeutic, Major Diagnostic, and Major Therapeutic) based on whether a procedure is diagnostic or therapeutic, and a procedure is minor or major in terms of invasiveness and/or resource use.⁴

¹ Agency for Healthcare Research and Policy. HCUPnet. <http://hcupnet.ahrq.gov>. Accessed September 6, 2013.

² Barrett M, Lopez-Gonzalez L, Coffey R, Levit K. Population Denominator Data for use with the HCUP Databases (Updated with 2012 Population data). HCUP Methods Series Report #2013-01. Online. March 8, 2013. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/methods/2013_01.pdf. Accessed September 6, 2013.

³ HCUP Clinical Classifications Software (CCS). Healthcare Cost and Utilization Project (HCUP). U.S. Agency for Healthcare Research and Quality, Rockville, MD. Updated March 2013. <http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp>. Accessed September 6, 2013.

⁴ HCUP Procedure Classes. Healthcare Cost and Utilization Project (HCUP). U.S. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.hcup-us.ahrq.gov/toolssoftware/procedure/procedure.jsp>. Accessed April 24, 2013.

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.

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

Alaska State Hospital and Nursing Home Association
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Department of Public Health
Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Louisiana Department of Health and Hospitals
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Center for Health Information and Analysis
Michigan Health & Hospital Association
Minnesota Hospital Association
Mississippi Department of Health
Missouri Hospital Industry Data Institute
Montana MHA - An Association of Montana Health Care Providers
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Health Policy and Research
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina 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 Services
Wyoming Hospital Association

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, nonrehabilitation 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 more than 95 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 HCUPnet

HCUPnet is an online query system that offers instant access to the largest set of all-payer health care databases publicly available. HCUPnet has an easy step-by-step query system, allowing for tables and graphs to be generated on national and regional statistics as well as trends for community hospitals in the United States. HCUPnet generates statistics using data from HCUP's Nationwide Inpatient Sample (NIS), the Kids' Inpatient Database (KID), the Nationwide Emergency Department Sample (NEDS), the State Inpatient Databases (SID), and the State Emergency Department Databases (SEDD).

For More Information

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

For additional HCUP statistics, visit HCUPnet, our interactive query system, at <http://hcupnet.ahrq.gov/>.

For information on other hospitalizations in the United States, download HCUP Facts and Figures: Statistics on Hospital-Based Care in the United States in 2009, located at <http://www.hcup-us.ahrq.gov/reports.jsp>.

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

Introduction to the HCUP Nationwide Inpatient Sample, 2011. Online. June 2013. U.S. Agency for Healthcare Research and Quality. https://www.hcup-us.ahrq.gov/db/nation/nis/NIS_Introduction_2011.pdf. Accessed September 6, 2013.

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>. Accessed September 6, 2013.

Houchens RL, 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/methods/2006_05_NISTrendsReport_1988-2004.pdf. Accessed September 6, 2013.

Suggested Citation

Pfuntner A (Truven Health Analytics), Wier LM (Truven Health Analytics), Stocks C (AHRQ). Most Frequent Procedures Performed in U.S. Hospitals, 2011. HCUP Statistical Brief #165. October 2013. Agency for Healthcare Research and Quality, Rockville, MD.
<http://www.hcup-us.ahrq.gov/reports/statbriefs/sb165.pdf>.

* * *

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 hcup@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