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Most Frequent Operating Room Procedures Performed in U.S. Hospitals, 2003–2012

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Highlights

- Among hospitalizations for nonmaternal and nonneonatal conditions in 2012, more than one-fourth of stays and half of hospital costs involved stays that included operating room (OR) procedures.
- The most common inpatient OR procedures in 2012 involved the musculoskeletal system: knee arthroplasty, laminectomy, hip replacement, and spinal fusion.
- Between 2003 and 2012, the inpatient OR procedures with the greatest change in rate of occurrence overall were gastrectomy (+10.9 percent) and transurethral prostatectomy (TURP) (–10.4 percent).
- Comparing age groups—Spine and joint procedures were common among all age groups except infants. Brachytherapy (internal radiation therapy) among adults aged 45–84 years had the greatest change in rate of any inpatient OR procedure in any age group, decreasing by about 26 percent annually between 2003 and 2012.
- Comparing men and women—Musculoskeletal procedures were common among both men and women. The OR procedure with the greatest change in rate among men was brachytherapy (–30.2 percent) and among women was gastrectomy (+14.9 percent).
- Comparing payer groups—Knee arthroplasty was the most common OR procedure for stays paid by Medicare and by private insurance. Cholecystect-omy was most common for stays paid by Medicaid and for uninsured stays.

Introduction

Nearly two-thirds of all hospitalizations involve some type of procedure.[1] Many procedures that occur in the hospital setting, such as blood transfusions and vaccinations, are performed outside the operating room (OR). Other procedures, such as hip replacement and spinal fusion, are surgical in nature and are performed in the OR. In 2011, nearly 29 percent of hospital stays involved OR procedures and 48 percent of hospital costs were for stays that involved OR procedures.[2] Mean hospital costs for stays with OR procedures were more than double the mean costs for stays without OR procedures.[3]

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents data on OR procedures that were performed most frequently in U.S. hospitals in 2012 among all nonmaternal and nonneonatal stays. Only data on OR procedures associated with an inpatient hospital stay are included. The OR procedures with the greatest change in occurrence (either increasing or decreasing) from 2003 to 2012 are provided. Finally, the OR procedures that were performed most frequently and underwent the greatest change in occurrence are presented by patient age group, patient sex, and expected primary payer.

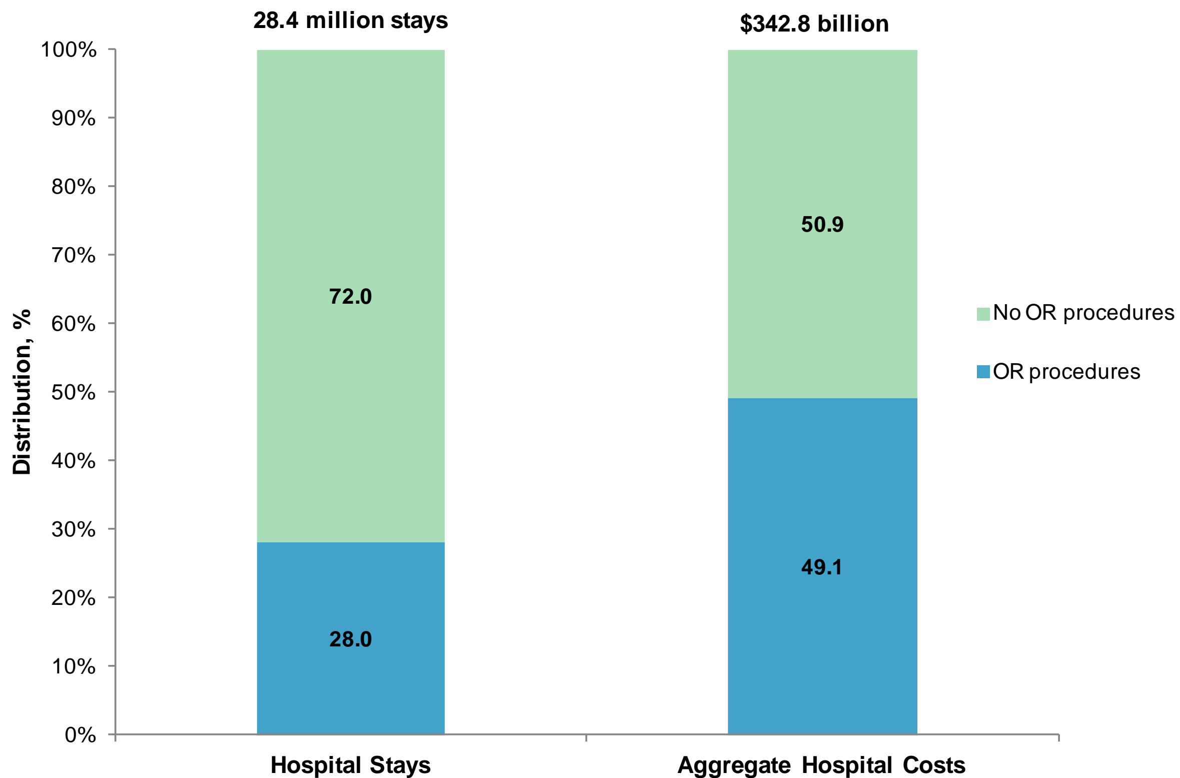
[1] Pfuntner A, Wier LM, Stocks C. Most Frequent Procedures Performed in U.S. Hospitals, 2011. HCUP Statistical Brief #165. October 2013. Agency for Healthcare Research and Quality. Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb165.pdf. Accessed August 5, 2014.
[2] Weiss AJ, Elixhauser A, Andrews RM. Characteristics of Operating Room Procedures in U.S. Hospitals, 2011. HCUP Statistical Brief #170. February 2014. Agency for Healthcare Research and Quality. Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb170-Operating-Room-Procedures-United-States-2011.pdf. Accessed August 5, 2014.
[3] Ibid.

Findings

Proportion of hospital stays and costs that involved OR procedures, 2012

Figure 1 presents information on hospital stays and costs with and without OR procedures among nonmaternal and nonneonatal hospitalizations.

Figure 1. Hospital stays and hospital costs with and without operating room procedures, 2012



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2012

- **OR procedures were performed during nearly 30 percent of hospital stays in 2012, and these stays accounted for about half of hospital costs.**

  In 2012, there were more than 28 million nonmaternal and nonneonatal hospital stays, which cost more than $342 billion. OR procedures were performed during 28.0 percent of these stays, and stays with OR procedures accounted for nearly half (49.1 percent) of total hospital costs.

OR procedures performed most frequently, 2012

Table 1 presents the all-listed OR procedures that were performed most frequently during hospital stays in 2012.

Table 1. Operating room procedures performed most frequently during hospital stays, 2012

Rank	Procedure	Stays with OR procedure, n	Rate per 100,000 population
Total stays		**7,958,700**	**2,535.7**
1	Arthroplasty knee	700,100	223.0
2	Percutaneous coronary angioplasty (PTCA)	534,600	170.3
3	Laminectomy, excision intervertebral disc	468,200	149.1
4	Hip replacement, total and partial	468,000	149.1
5	Spinal fusion	450,900	143.6
6	Cholecystectomy and common duct exploration	406,300	129.4
7	Partial excision bone	338,000	107.7
8	Hysterectomy, abdominal and vaginal	312,100	99.4
9	Colorectal resection	305,900	97.4
10	Excision, lysis peritoneal adhesions	305,800	97.4
11	Appendectomy	293,000	93.3
12	Treatment, fracture or dislocation of hip and femur	276,400	88.0
13	Oophorectomy, unilateral and bilateral	223,800	71.3
14	Coronary artery bypass graft (CABG)	202,900	64.6
15	Treatment, fracture or dislocation of lower extremity (other than hip or femur)	188,900	60.2

Notes: Includes only nonmaternal and nonneonatal stays. All-listed operating room procedures were identified using Clinical Classifications Software (CCS) procedure categories. Procedures designated as *Other* are not reported.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2012

- **The most common OR procedures involved the musculoskeletal system.**

  Of the 8 million total nonmaternal and nonneonatal hospital stays with an OR procedure, five of the seven most common procedures involved the musculoskeletal system—these were knee arthroplasty (700,100 stays), laminectomy (removal of part of a spinal vertebra, 468,200 stays), hip replacement (468,000 stays), spinal fusion (450,900 stays), and partial excision bone (338,000 stays). Two other common musculoskeletal procedures were trauma-related (treatment of hip fracture and treatment of other lower extremity fracture).

  Another 4 of the 15 most common OR procedures involved the digestive system: cholecystectomy (removal of the gall bladder, 406,300 stays); colorectal resection (305,900 stays); excision, lysis peritoneal adhesions (305,800 stays); and appendectomy (removal of the appendix, 293,000 stays).

  The remaining stays involved OR procedures related to the cardiovascular system—including the second most common procedure, percutaneous coronary angioplasty (PTCA, 534,600 stays), and coronary artery bypass graft (CABG, 202,900 stays)—and procedures involving female genital organs (hysterectomy and oophorectomy).

OR procedures with the greatest change in occurrence, 2003–2012

Table 2 presents the OR procedures with the greatest change in rate per 100,000 population between 2003 and 2012. The 10 procedures with the greatest increase in rate and the 10 procedures with greatest decrease in rate are presented. Only procedures with a minimum of 50,000 stays in either 2003 or 2012 are reported. Changes in procedure rates may be due to a number of factors, including changes in the prevalence of underlying health conditions treated in ORs and changes in hospital practices, such as a shift in certain procedures to outpatient settings.

Table 2. Operating room procedures with the greatest change in rate, 2003–2012

Rank	Operating room procedure	Stays, n		Rate per 100,000 population		Average annual % change in rate, 2003–2012
		2003	2012	2003	2012	
Procedure with the greatest increase in rate						
1	Gastrectomy, partial and total	26,900	74,100	9.3	23.6	10.9
2	Arthroplasty knee	421,700	700,100	145.4	223.0	4.9
3	Arthroplasty other than hip or knee	55,900	90,000	19.3	28.7	4.5
4	Partial excision bone	232,500	338,000	80.1	107.7	3.3
5	Spinal fusion	316,00	450,900	108.9	143.6	3.1
6	Hip replacement, total and partial	333,200	468,000	114.8	149.1	2.9
7	Nephrotomy and nephrostomy	37,200	50,200	12.8	16.0	2.5
8	Nephrectomy, partial or complete	54,300	68,900	18.7	22.0	1.8
9	Lobectomy or pneumonectomy	69,100	86,700	23.8	27.6	1.7
10	Heart valve procedures	98,900	123,000	34.1	39.2	1.6
Procedure with the greatest decrease in rate						
1	Transurethral prostatectomy (TURP)	103,800	42,000	35.8	13.4	–10.4
2	Genitourinary incontinence procedures	116,000	47,200	40.0	15.0	–10.3
3	Repair of cystocele and rectocele, obliteration of vaginal vault	134,500	59,600	46.4	19.0	–9.4
4	Oophorectomy, unilateral and bilateral	451,000	223,800	155.4	71.3	–8.3
5	Hysterectomy, abdominal and vaginal	587,700	312,100	202.6	99.4	–7.6
6	Debridement of wound, infection or burn	276,400	148,700	95.3	47.4	–7.5
7	Coronary artery bypass graft (CABG)	337,400	202,900	116.3	64.6	–6.3
8	Laparoscopy	85,500	55,400	29.5	17.6	–5.5
9	Peripheral vascular bypass	102,700	66,600	35.4	21.2	–5.5
10	Creation, revision and removal of arteriovenous fistula or vessel-to-vessel cannula for dialysis	68,000	44,700	23.4	14.2	–5.4

Notes: Includes only nonmaternal and nonneonatal stays. All-listed operating room procedures were identified using Clinical Classifications Software (CCS) procedure categories. Procedures designated as *Other* are not reported.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2003, 2012

- **The OR procedure with the greatest increase in rate was gastrectomy.**

  Between 2003 and 2012, gastrectomy (partial or total removal of the stomach) had the largest increase in rate of occurrence of any OR procedure, increasing by more than 150 percent over 10 years, from 9.3 to 23.6 stays per 100,000 population (10.9 percent average annual increase).

Procedures to remove other major organs (kidneys and lungs) also were among those with high increases in rate:

- Nephrectomy (removal of a kidney) was the procedure with the eighth highest increase in rate (1.8 percent average annual increase).
- Lobectomy (removal of a lung lobe) was the procedure with the ninth highest increase in rate (1.7 percent average annual increase).

■ **Five of the six OR procedures with the greatest increase in rate were related to the musculoskeletal system.**

Hospital stays involving knee arthroplasty increased from 421,700 in 2003 to 700,100 in 2012. This procedure underwent the second highest increase in rate, growing by more than 50 percent during the 10-year period, from 145.4 to 223.0 per 100,000 population (4.9 percent average annual increase).

The OR procedures with third through sixth greatest increase in rate also involved the musculoskeletal system:

- Arthroplasty, other than the hip or knee (4.5 percent average annual increase)
- Partial excision bone (3.3 percent average annual increase)
- Spinal fusion (3.1 percent average annual increase)
- Partial or total hip replacement (2.9 percent average annual increase)

■ **OR procedures involving female or male genital organs or the urinary system had the greatest decrease in rate.**

The OR procedure with the greatest decrease in rate was transurethral prostatectomy (TURP), which decreased by 62.6 percent between 2003 and 2012, from 35.8 to 13.4 per 100,000 population (10.4 percent average annual decrease).

Genitourinary incontinence OR procedures had the second greatest decrease in rate, decreasing by 62.5 percent from 40.0 to 15.0 per 100,000 population (10.3 percent average annual decrease).

The OR procedures with the third through fifth greatest decrease in rate involved the female genital system:

- Repair of cystocele and rectocele (9.4 percent average annual decrease)
- Oophrectomy (removal of an ovary, 8.3 percent average annual decrease)
- Hysterectomy (removal of the uterus, 7.6 percent average annual decrease)

OR procedures with the highest frequency and greatest change in occurrence by patient characteristics, 2012

Tables 3–5 present the OR procedures with the highest frequency and the greatest change in occurrence by patient age group (Table 3), patient sex (Table 4), and expected primary payer (Table 5). Only procedures with a minimum number of stays in either 2003 or 2012 are reported (see table footnotes for the number of minimum stays required for reporting in the three categories—patient age, sex, and payer).

Table 3. Operating room procedures performed most frequently, 2012, and operating room procedures with the greatest change in rate, 2003–2012, by patient age group

Rank	Procedures performed most frequently, 2012		Procedures with the greatest change in rate, 2003–2012	
	Procedure	n	Procedure	AAPC in rate
Age <1 (nonneonatal), total stays with an OR procedure		**55,800**		
1	Circumcision (on infants other than neonates)	3,300	Heart valve procedures	7.6
2	Insertion, replacement, or removal of extracranial ventricular shunt	2,800	Laparoscopy	3.8
3	Inguinal and femoral hernia repair	2,500	Circumcision (on infants other than neonates)	2.7
4	Colorectal resection	2,100	Colorectal resection	2.6
5	Heart valve procedures	1,800	Appendectomy	–2.5
Age 1–17 years, total stays with an OR procedure		**290,600**		
1	Appendectomy	68,800	Debridement of wound, infection or burn	–9.1
2	Partial excision bone	14,100	Treatment, fracture or dislocation of radius and ulna	–4.0
3	Treatment, fracture or dislocation of hip and femur	13,400	Partial excision bone	3.9
4	Tonsillectomy and/or adenoidectomy	13,300	Spinal fusion	3.8
5	Spinal fusion	11,600	Treatment, fracture or dislocation of lower extremity (not hip/femur)	–2.1
Age 18–44 years, total stays with an OR procedure		**1,353,800**		
1	Cholecystectomy and common duct exploration	134,800	Gastrectomy, partial and total	24.0
2	Hysterectomy, abdominal and vaginal	121,300	Genitourinary incontinence procedures	–11.9
3	Appendectomy	116,900	Repair of cystocele and rectocele, obliteration of vaginal vault	–11.0
4	Laminectomy, excision intervertebral disc	95,700	Oophorectomy, unilateral and bilateral	–10.8
5	Spinal fusion	82,300	Laparoscopy	–9.6
Age 45–64 years, total stays with an OR procedure		**2,935,600**		
1	Arthroplasty knee	292,300	Brachytherapy (internal radiation therapy)	–24.4
2	Percutaneous coronary angioplasty (PTCA)	235,500	Genitourinary incontinence procedures	–11.8
3	Spinal fusion	216,200	Gastrectomy, partial and total	11.0
4	Laminectomy, excision intervertebral disc	214,700	Transurethral prostatectomy (TURP)	–10.8
5	Hip replacement, total and partial	162,800	Repair of cystocele and rectocele, obliteration of vaginal vault	–10.7
Age 65–84 years, total stays with an OR procedure		**2,869,500**		
1	Arthroplasty knee	371,300	Brachytherapy (internal radiation therapy)	–27.3
2	Percutaneous coronary angioplasty (PTCA)	240,900	Transurethral prostatectomy (TURP)	–11.9
3	Hip replacement, total and partial	227,500	Debridement of wound, infection or burn	–9.6
4	Laminectomy, excision intervertebral disc	145,800	Repair of cystocele and rectocele, obliteration of vaginal vault	–9.4
5	Spinal fusion	136,200	Genitourinary incontinence procedures	–8.9
Age 85+ years with an OR procedure		**451,700**		
1	Treatment, fracture or dislocation of hip and femur	82,800	Lumpectomy, quadrantectomy of breast	–14.5
2	Hip replacement, total and partial	59,100	Debridement of wound, infection or burn	–10.8
3	Percutaneous coronary angioplasty (PTCA)	29,500	Transurethral prostatectomy (TURP)	–9.9
4	Colorectal resection	20,200	Heart valve procedures	9.3
5	Arthroplasty knee	18,300	Mastectomy	–9.2

Abbreviation: AAPC, average annual percentage change in the rate of stays per 100,000 population, 2003–2012

Notes: Includes only nonmaternal and nonneonatal stays. All-listed operating room (OR) procedures were identified using Clinical Classifications Software (CCS) procedure categories. Procedures designated as *Other* are not reported. Procedures with the greatest change in rate include those with a minimum of 1,000 stays (ages <1 years, 85+ years), 5,000 stays (age 1–17 years), or 10,000 stays (ages 18–44, 45–64, 65–84 years) in either 2003 or 2012. CCS 211 (therapeutic radiology) included only one OR procedure: ICD-9 CM procedure code 92.27, implantation or insertion of radioactive elements; this is listed in the table as Brachytherapy (internal radiation therapy).

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2003, 2012

- **Spine and joint OR procedures were common among all age groups except infants.**

  Spinal fusion was one of the five most common OR procedures performed in every age group except infants younger than 1 year and adults 85 years and older.

  Laminectomy was common among adults aged 18–84 years.

  Knee arthroplasty and hip replacement were in the top five OR procedures for adults aged 45 years and older.

- **Brachytherapy performed among adults aged 45–84 years had the greatest change in rate (a decrease) of any OR procedure for any age group between 2003 and 2012.**

  Between 2003 and 2012, the rate of hospital stays with brachytherapy (internal radiation therapy) had a 24.4 percent average annual decrease among adults aged 45–64 years and a 27.3 percent average annual decrease among adults aged 65–84 years.

  The OR procedure with the greatest increase in rate was partial or total gastrectomy among adults aged 18–44 years, with an average annual increase of 24.0 percent.

Table 4. Operating room procedures performed most frequently, 2012, and operating room procedures with the greatest change in rate, 2003–2012, by patient sex

Rank	Procedures performed most frequently, 2012		Procedures with the greatest change in rate, 2003–2012	
	Procedure	n	Procedure	AAPC in rate
Males, total stays with an OR procedure		**3,782,600**		
1	Percutaneous coronary angioplasty (PTCA)	357,100	Brachytherapy (internal radiation therapy)	–30.2
2	Arthroplasty knee	267,200	Transurethral prostatectomy (TURP)	–10.3
3	Laminectomy, excision intervertebral disc	235,000	Debridement of wound, infection or burn	–7.3
4	Spinal fusion	209,000	Coronary artery bypass graft (CABG)	–6.0
5	Hip replacement, total and partial	193,600	Arthroplasty knee	5.5
Females, total stays with an OR procedure		**4,175,600**		
1	Arthroplasty knee	432,800	Gastrectomy, partial and total	14.9
2	Hysterectomy, abdominal and vaginal	312,000	Genitourinary incontinence procedures	–10.6
3	Hip replacement, total and partial	274,400	Repair of cystocele and rectocele, obliteration of vaginal vault	–9.4
4	Cholecystectomy and common duct exploration	253,600	Oophorectomy, unilateral and bilateral	–8.2
5	Spinal fusion	242,000	Laparoscopy	–8.0

Abbreviation: AAPC, average annual percentage change in the rate of stays per 100,000 population, 2003–2012

Notes: Includes only nonmaternal and nonneonatal stays. All-listed operating room (OR) procedures were identified using Clinical Classifications Software (CCS) procedure categories. Procedures designated as *Other* are not reported. Procedures with the greatest change in rate include those with a minimum of 25,000 stays in either 2003 or 2012. CCS 211 (therapeutic radiology) included only one OR procedure: ICD-9 CM procedure code 92.27, implantation or insertion of radioactive elements; this is listed in the table as Brachytherapy (internal radiation therapy).

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2003, 2012

- **Musculoskeletal OR procedures were common among both men and women.**

  Knee arthroplasty, spinal fusion, and hip replacement were among the top five most frequently performed OR procedures for both men and women.

  Percutaneous coronary angioplasty (PTCA) and laminectomy were among the most frequently performed procedures for men, and hysterectomy and cholecystectomy were among the most frequently performed procedures for women.

- **Brachytherapy was the OR procedure with the greatest change in rate among men (decreasing), and gastrectomy was the OR procedure with the greatest change in rate among women (increasing).**

  From 2003 to 2012, men experienced a 30.2 percent average annual decrease in the rate of brachytherapy and a 10.3 percent average annual decrease in the rate of transurethral prostatectomy (TURP). During the same time period, women experienced a 14.9 percent average annual increase in the rate of partial or total gastrectomy and a 10.6 percent average annual decrease in the rate of genitourinary incontinence procedures.

Table 5. Operating room procedures performed most frequently, 2012, and operating room procedures with the greatest change in frequency, 2003–2012, by payer

Rank	Procedures performed most frequently, 2012		Procedures with the greatest change in number, 2003–2012	
	Procedure	n	Procedure	AAPC in number
Medicare, total stays with an OR procedure		**3,551,300**		
1	Arthroplasty knee	383,600	Brachytherapy (internal radiation therapy)	–25.4
2	Hip replacement, total and partial	283,200	Transurethral prostatectomy (TURP)	–9.8
3	Percutaneous coronary angioplasty (PTCA)	281,600	Spinal fusion	9.4
4	Treatment, fracture or dislocation of hip and femur	192,400	Arthroplasty other than hip or knee	8.4
5	Laminectomy, excision intervertebral disc	173,700	Repair of cystocele and rectocele, obliteration of vaginal vault	–7.5
Medicaid, total stays with an OR procedure		**778,000**		
1	Cholecystectomy and common duct exploration	57,800	Arthroplasty knee	7.3
2	Appendectomy	57,400	Spinal fusion	7.1
3	Hysterectomy, abdominal and vaginal	38,600	Partial excision bone	6.9
4	Percutaneous coronary angioplasty (PTCA)	35,900	Hip replacement, total and partial	6.0
5	Spinal fusion	32,300	Treatment, fracture or dislocation of lower extremity (not hip/femur)	–4.6
Private, total stays with an OR procedure		**2,866,700**		
1	Arthroplasty knee	261,300	Brachytherapy (internal radiation therapy)	–24.1
2	Laminectomy, excision intervertebral disc	208,600	Gastrectomy, partial and total	18.0
3	Spinal fusion	200,000	Genitourinary incontinence procedures	–11.0
4	Hysterectomy, abdominal and vaginal	194,900	Transurethral prostatectomy (TURP)	–10.0
5	Percutaneous coronary angioplasty (PTCA)	160,500	Repair of cystocele and rectocele, obliteration of vaginal vault	–9.9
Uninsured, total stays with an OR procedure		**396,700**		
1	Cholecystectomy and common duct exploration	44,400	Amputation of lower extremity	9.4
2	Percutaneous coronary angioplasty (PTCA)	38,600	Partial excision bone	6.9
3	Appendectomy	33,400	Transurethral excision, drainage, or removal urinary obstruction	6.3
4	Treatment, fracture or dislocation of lower extremity (other than hip or femur)	20,500	Cholecystectomy and common duct exploration	5.8
5	Hysterectomy, abdominal and vaginal	14,400	Skin graft	5.5

Abbreviation: AAPC: Average annual percentage change in the number of stays (rate is unavailable by payer), 2003–2012

Notes: Includes only nonmaternal and nonneonatal stays. All-listed operating room (OR) procedures were identified using Clinical Classifications Software (CCS) procedure categories. Procedures designated as *Other* are not reported. Procedures with the greatest change in number include procedures with a minimum 20,000 stays (Medicare), 10,000 stays (Medicaid), 15,000 stays (private), or 5,000 stays (uninsured) in either 2003 or 2012. CCS 211 (therapeutic radiology) included only one OR procedure: ICD-9 CM procedure code 92.27, implantation or insertion of radioactive elements; this is listed in the table as Brachytherapy (internal radiation therapy).

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2003, 2012

- **Knee arthroplasty was the most common OR procedure for hospital stays paid by Medicare and by private insurance.**

  Among hospitalizations that involved an OR procedure, knee arthroplasty was the OR procedure performed most frequently during hospital stays paid by Medicare (10.8 percent of stays) and by private insurance (9.1 percent). Knee arthroplasty was not among the top five most frequently performed OR procedures for stays paid by Medicaid or for uninsured stays.

- **Cholecystectomy was the most common OR procedure for hospital stays paid by Medicaid and for uninsured stays.**

  Cholecystectomy was the most frequently performed OR procedure during hospital stays paid by Medicaid (7.4 percent of stays involving an OR procedure) and during uninsured stays (11.2 percent). Cholecystectomy was not among the top five most frequently performed OR procedures for stays paid by Medicare or private insurance.

- **Percutaneous coronary angioplasty (PTCA) was among the most common procedures for hospital stays across all payers.**

  PTCA was among the five procedures that were performed most frequently during hospital stays that involved an OR procedure for all types of payers: Medicare (7.9 percent of stays), Medicaid (4.6 percent), private insurance (5.6 percent), and uninsured (9.7 percent)

- **Brachytherapy was the OR procedure with the greatest change in occurrence among hospital stays paid by Medicare and private insurance.**

  The number of hospital stays involving brachytherapy decreased by an average of approximately 25 percent annually among stays paid by Medicare and private insurance.

- **OR procedures related to the musculoskeletal system were among those with the greatest change in occurrence for stays paid by Medicaid and for uninsured stays.**

  The five OR procedures with the greatest change in occurrence for stays paid by Medicaid involved the musculoskeletal system, including knee arthroplasty (7.3 percent average annual increase), spinal fusion (7.1 percent average annual increase), and partial excision bone (6.9 percent average annual increase).

  Among uninsured hospital stays, the two OR procedures with the greatest change in occurrence also involved the musculoskeletal system: amputation of lower extremity (9.4 percent average annual increase) and partial excision bone (6.9 percent average annual increase).

Data Source

The estimates in this Statistical Brief are based upon data from the Healthcare Cost and Utilization Project (HCUP) 2012 National Inpatient Sample (NIS). Historical data were drawn from the 2003 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.[4]

Definitions

Procedures, ICD-9-CM, Clinical Classifications Software (CCS), major diagnostic categories (MDCs), and diagnosis-related groups (DRGs)
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 ICD-9-CM procedure codes into a manageable number of clinically meaningful categories.[5] 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.

MDCs assign ICD-9-CM principal diagnosis codes to one of 25 general diagnosis categories. For this report, maternal and neonatal discharges were excluded from the analysis. Maternal hospital stays were identified using MDC 14 (pregnancy, childbirth, and the puerperium), and neonatal hospital stays were identified using MDC 15 (newborns and other neonates with conditions originating during the perinatal period).

DRGs comprise a patient classification system that categorizes patients into groups that are clinically coherent and homogeneous with respect to resource use. DRGs group patients according to diagnosis, type of treatment (procedure), age, and other relevant criteria. Each hospital stay has one assigned DRG. For this report, major operating room (OR) procedures were defined using procedure classes that categorize each ICD-9-CM procedure code as major therapeutic, major diagnostic, minor therapeutic, or minor diagnostic.[6] Major OR procedures are considered to be valid OR procedures based on DRGs. This classification scheme relies on physician panels that classify ICD-9-CM procedure codes according to whether the procedure would be performed in a hospital OR in most hospitals. Major OR procedures were identified using all procedure fields (first-listed and secondary) that were available on the discharge record.

Types of hospitals included in the HCUP National (Nationwide) Inpatient Sample
The National (Nationwide) Inpatient Sample 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). The NIS includes obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Beginning in 2012, long-term acute care hospitals are also excluded. 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 NIS.

[4] Agency for Healthcare Research and Quality. HCUPnet Web site. http://hcupnet.ahrq.gov/. Accessed September 11, 2014.
[5] Agency for Healthcare Research and Quality. HCUP Clinical Classifications Software (CCS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated July 2014. http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Accessed September 11, 2014.
[6] Agency for Healthcare Research and Quality. HCUP Procedure Classes. Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated March 2014. http://www.hcup-us.ahrq.gov/toolssoftware/procedure/procedure.jsp. Accessed September 30, 2014.

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 & Medicaid Services (CMS).[7] *Costs* reflect the actual expenses incurred in the production of hospital services, such as wages, supplies, and utility costs; *charges* represent the amount a hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees.

How HCUP estimates of costs differ from National Health Expenditure Accounts
There are a number of differences between the costs cited in this Statistical Brief and spending as measured in the National Health Expenditure Accounts (NHEA), which are produced annually by the Centers for Medicare & Medicaid Services (CMS).[8] The largest source of difference comes from the HCUP coverage of inpatient treatment only in contrast to the NHEA inclusion of outpatient costs associated with emergency departments and other hospital-based outpatient clinics and departments as well. The outpatient portion of hospitals' activities has been growing steadily and may exceed half of all hospital revenue in recent years. On the basis of the American Hospital Association Annual Survey, 2012 outpatient gross revenues (or charges) were about 44 percent of total hospital gross revenues.[9]

Smaller sources of differences come from the inclusion in the NHEA of hospitals that are excluded from HCUP. These include Federal hospitals (Department of Defense, Veterans Administration, Indian Health Services, and Department of Justice [prison] hospitals) as well as psychiatric, substance abuse, and long-term care hospitals. A third source of difference lies in the HCUP reliance on billed charges from hospitals to payers, adjusted to provide estimates of costs using hospital-wide cost-to-charge ratios, in contrast to the NHEA measurement of spending or revenue. HCUP costs estimate the amount of money required to produce hospital services, including expenses for wages, salaries, and benefits paid to staff as well as utilities, maintenance, and other similar expenses required to run a hospital. NHEA spending or revenue measures the amount of income received by the hospital for treatment and other services provided, including payments by insurers, patients, or government programs. The difference between revenues and costs include profit for for-profit hospitals or surpluses for nonprofit 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 1 year will be counted each time as a separate discharge from the hospital.

Average annual percentage change
Average annual percentage change is calculated using the following formula:

$$\text{Average annual percentage change} = \left[\left(\frac{\text{End value}}{\text{Beginning value}}\right)^{\frac{1}{\text{change in years}}} -1\right] \times 100$$

Payer
Payer is the expected primary payer for the hospital stay. To make coding uniform across all HCUP data sources, payer combines detailed categories into general groups:

- Medicare: includes patients covered by fee-for-service and managed care Medicare
- Medicaid: includes patients covered by fee-for-service and managed care Medicaid
- Private Insurance: includes Blue Cross, commercial carriers, and private health maintenance organizations (HMOs) and preferred provider organizations (PPOs)

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[7] Agency for Healthcare Research and Quality. HCUP Cost-to-Charge Ratio (CCR) Files. Healthcare Cost and Utilization Project (HCUP). 2001–2011. Rockville, MD: Agency for Healthcare Research and Quality. Updated August 2014. http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp. Accessed September 11, 2014.
[8] For additional information about the NHEA, see Centers for Medicare & Medicaid Services (CMS). National Health Expenditure Data. CMS Web site May 2014. http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/index.html?redirect=/NationalHealthExpendData/. Accessed October 9, 2014.
[9] American Hospital Association. Trend Watch Chartbook, 2014. Table 4.2. Distribution of Inpatient vs. Outpatient Revenues, 1992–2012. http://www.aha.org/research/reports/tw/chartbook/2014/table4-2.pdf. Accessed October 9, 2014.

- Uninsured: includes an insurance status of *self-pay* and *no charge*
- Other: includes Worker's Compensation, TRICARE/CHAMPUS, CHAMPVA, Title V, and other government programs.

Hospital stays billed to the State Children's Health Insurance Program (SCHIP) may be classified as Medicaid, Private Insurance, or Other, depending on the structure of the State program. Because most State data do not identify patients in SCHIP specifically, it is not possible to present this information separately.

When more than one payer is listed for a hospital discharge, the first-listed payer is used.

About HCUP

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") is a family of health care databases and related software tools and products developed through a Federal-State-Industry partnership and sponsored by the Agency for Healthcare Research and Quality (AHRQ). HCUP databases bring together the data collection efforts of State data organizations, hospital associations, and private data organizations (HCUP Partners) and the Federal government to create a national information resource of encounter-level health care data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, State, and local market levels.

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 Revenue and Fiscal Affairs Office
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 Statistical Briefs

HCUP Statistical Briefs are descriptive summary reports presenting statistics on hospital inpatient and emergency department use and costs, quality of care, access to care, medical conditions, procedures, patient populations, and other topics. The reports use HCUP administrative health care data.

About the NIS

The HCUP National (Nationwide) Inpatient Sample (NIS) is a national (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 the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

The 2012 NIS was redesigned to optimize national estimates. The redesign incorporates two critical changes:

- Revisions to the sample design—the NIS is now a *sample of discharge records from all HCUP-participating hospitals*, rather than a sample of hospitals from which all discharges were retained.

- Revisions to how hospitals are defined—the NIS now uses the *definition of hospitals and discharges supplied by the statewide data organizations* that contribute to HCUP, rather than the definitions used by the American Hospital Association (AHA) Annual Survey of Hospitals.

The new sampling strategy is expected to result in more precise estimates than those that resulted from the previous NIS design by reducing sampling error: for many estimates, confidence intervals under the new design are about half the length of confidence intervals under the previous design. The change in sample design for 2012 necessitates recomputation of prior years' NIS data to enable analysis of trends that uses the same definitions of discharges and hospitals.

About HCUPnet

HCUPnet is an online query system that offers instant access to the largest set of all-payer health care databases that are publicly available. HCUPnet has an easy step-by-step query system that creates tables and graphs of national and regional statistics as well as data trends for community hospitals in the United States. HCUPnet generates statistics using data from HCUP's National (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, refer to the following HCUP Statistical Briefs located at http://www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp:

- Statistical Brief #180, Overview of Hospitalizations in the United States, 2012
- Statistical Brief #181, Costs for Hospital Stays in the United States, 2012
- Statistical Brief #170, Characteristics of Operating Room Procedures in U.S. Hospitals, 2011
- Statistical Brief #162, Most Frequent Conditions in U.S. Hospitals, 2011

For a detailed description of HCUP and more information on the design of the National (Nationwide) Inpatient Sample (NIS), please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the National (Nationwide) Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated July 2014. http://www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed September 11, 2014.

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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 hcup@ahrq.gov or send a letter to the address below:

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