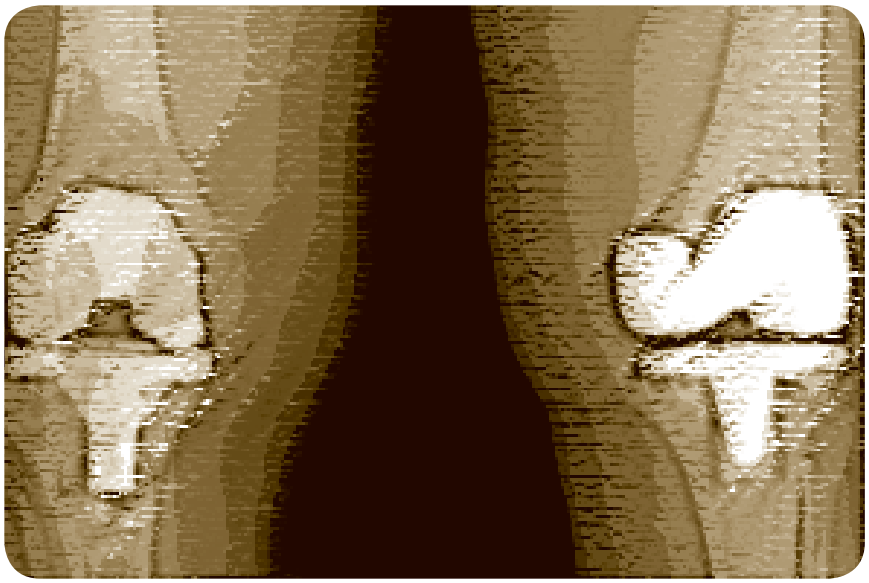
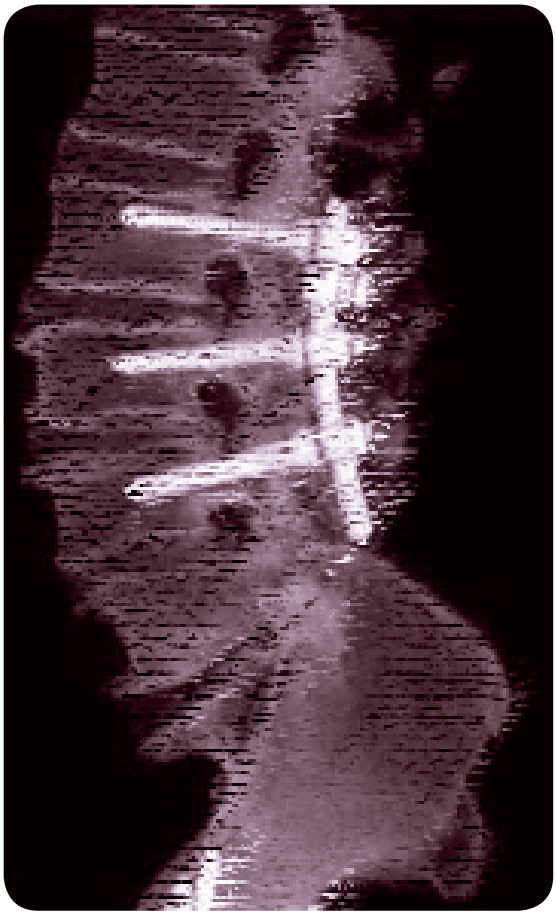
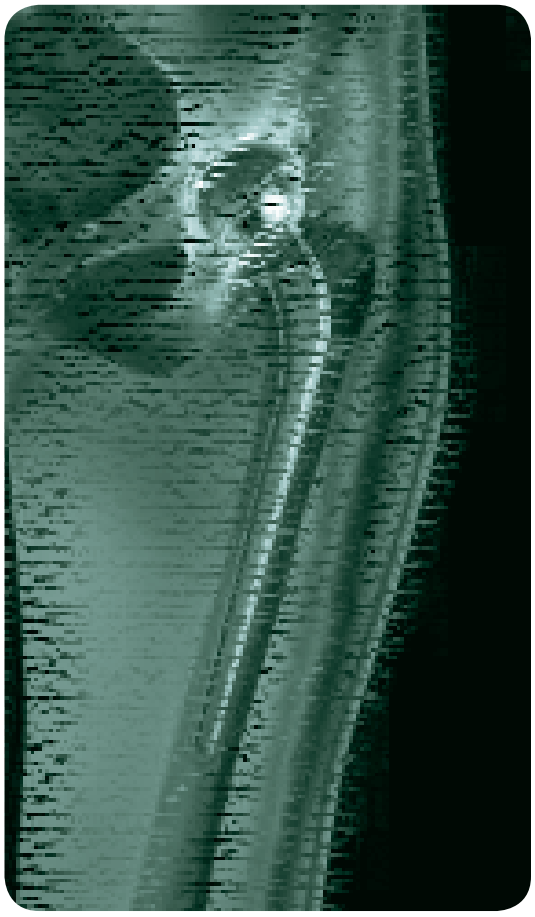
Orthopedic Surgery in Pennsylvania

Total Joint Replacement and Common Spine Procedures

2010







Pennsylvania Health Care Cost Containment Council

April 2012

About PHC4

The Pennsylvania Health Care Cost Containment Council (PHC4) is an independent state agency charged with collecting, analyzing, and reporting information that can be used to improve the quality and restrain the cost of health care in the state. It was created in the mid-1980s when Pennsylvania businesses and labor unions, in collaboration with other key stakeholders, joined forces to enact market-oriented health care reforms. As a result of their years of effort, the General Assembly passed legislation (Act 89 of 1986) creating PHC4.

The primary goal is to empower purchasers of health care benefits, such as businesses or labor union health/welfare funds, as well as other stakeholders, with information they can use to improve quality and restrain costs. Nearly 100 organizations and individuals annually utilize PHC4's special requests process to access and use data. More than 600,000 public reports on patient treatment results are downloaded from the PHC4 website each year. Today, PHC4 is a recognized national leader in public health care reporting.

It is governed by a 25-member board of directors representing business, labor, consumers, health care providers, insurers, and state government.

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Scan this Quick Response Code with your smartphone (using a QR code reader app) or visit www.phc4.org to learn more about PHC4.

Key Findings
Total Joint Replacement and Common Spine Procedures in PA

A report from the Pennsylvania Health Care Cost Containment Council on total joint replacement and common spine procedures performed in 2010 on patients 18 years and older.

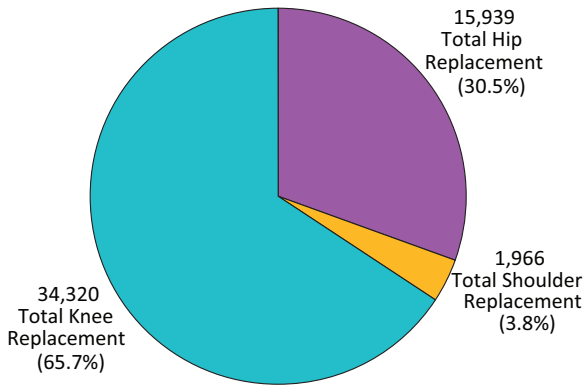
1 in 200

About 1 in 200 PA residents age 18 and older (48,572) underwent a total joint replacement of the knee, hip, or shoulder in 2010. The rate for patients age 65 and older was approximately 1 in 75.

Between 2006 and 2010, the number of hospitalizations for total joint replacement of the knee, hip, or shoulder increased:

- 16.1 percent for total knee replacement.
- 22.2 percent for total hip replacement.
- Over 100 percent for total shoulder replacement.

52,225 Patients Underwent Total Joint Replacement in 2010*



1 in 350

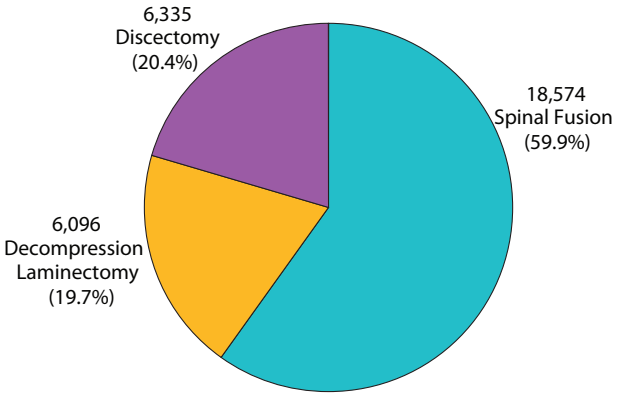
About 1 in 350 PA residents age 18 and older (28,090) underwent common spine procedures – fusion, discectomy, or decompression laminectomy – in 2010. The rate for patients age 65 and older was approximately 1 in 220.

Between 2006 and 2010, hospitalizations for spinal fusion increased 31.6 percent.

Between 2006 and 2010, hospitalizations decreased:

- 29.9 percent for discectomy.
- 8.6 percent for decompression laminectomy.

31,005 Patients Underwent Common Spine Procedures in 2010*



* Includes both PA residents and non-residents who underwent a procedure in a PA hospital.

Rates vary across 3 PA regions

Western PA had the highest hospitalization rates for total joint replacement and common spine procedures in 2010.

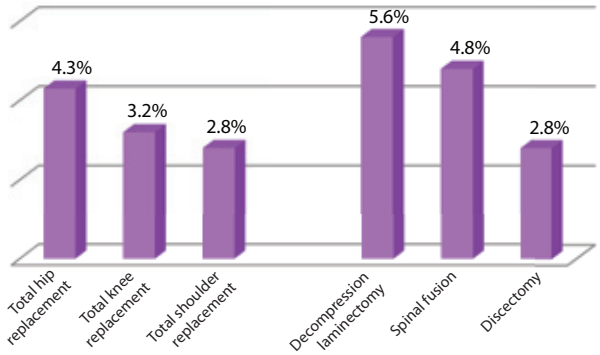
- **Total joint replacement:**
  - 55.1 per 10,000 Western PA residents.
  - 53.3 per 10,000 Central & Northeastern PA residents.
  - 45.6 per 10,000 Southeastern PA residents.
- **Common spine procedures:**
  - 40.2 per 10,000 Western PA residents.
  - 28.4 per 10,000 Central & Northeastern PA residents.
  - 21.7 per 10,000 Southeastern PA residents.

Key Findings
Total Joint Replacement and Common Spine Procedures in PA

1 in 18

About 1 in 18 patients (5.6 percent) who underwent decompression laminectomy were readmitted to the hospital within 30 days for a complication or infection – the highest rate of the total joint replacement and common spine procedures examined in this report.

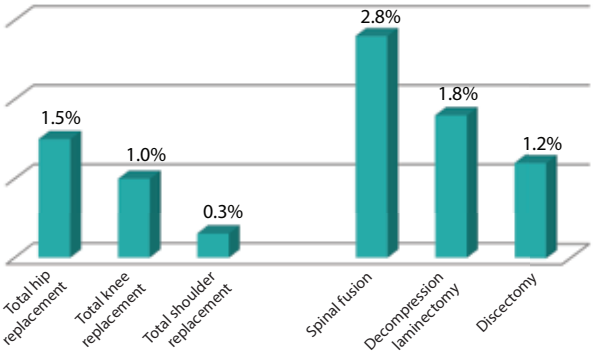
Percent of Patients Readmitted for a Complication or Infection, 2010



1 in 36

About 1 in 36 patients (2.8 percent) who underwent spinal fusion contracted a healthcare-associated infection – the highest percent of the total joint replacement and common spine procedures examined in this report.

Percent of Patients with a Healthcare-Associated Infection, 2010



$193 million

In 2009, Medicare fee-for-service (FFS) payments totaled more than $193 million for total joint replacement hospitalizations; Medicaid FFS payments totaled approximately $4.8 million.

$100 million

In 2009, Medicare FFS payments totaled approximately $100 million for common spine procedure hospitalizations; Medicaid FFS payments totaled more than $10.5 million.

$9.6 million

In 2009, Medicare FFS paid $9.6 million for patients who were readmitted within 30 days for a complication or infection: $5.7 million for patients who underwent total joint replacement and $3.9 million for patients who underwent common spine procedures.

Procedure	Average Medicare FFS Payment	Average Medicaid FFS Payment
Total Knee Replacement	$11,840	$11,320
Total Hip Replacement	$11,882	$11,838
Total Shoulder Replacement	$13,277	NR
Spinal Fusion	$23,258	$15,283
Discectomy	$7,026	$5,350
Decompression Laminectomy	$8,000	$10,620*

Average payments reported here are for the hospital stays in which these procedures were performed. Depending on individual patient needs, physical therapy and rehabilitation after discharge from the hospital may add to the overall costs.

NR: Not reported; too few cases with payment data (less than 13).

*Average payment was affected by two atypical cases.

Notes: 2009 is the most recent Medicare FFS and Medicaid FFS payment data available to PHC4. Readmission payment figures may be slightly underreported since payment data was not available for readmissions that occurred in January 2010.

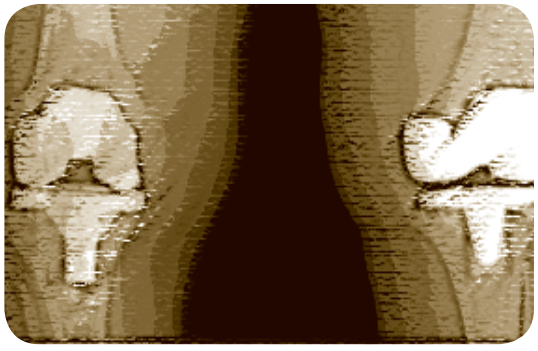
Introduction

Joint pain, along with back and neck pain, are common ailments that affect tens of millions of Americans in varying degrees of severity ranging from discomfort to disability. While different types of treatment options are used to address those conditions, the past several decades have seen a significant increase throughout the United States in orthopedic surgeries, especially hip and knee replacements and spinal fusions.

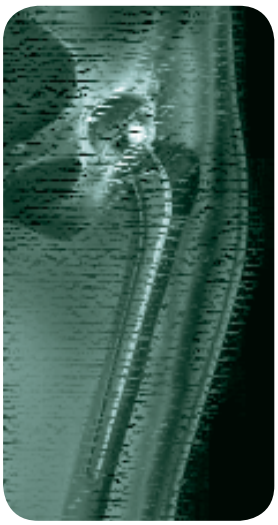
A growing elderly population, plus other factors such as the reliability of Medicare as a payment source, rising rates of obesity among all age groups, advances in surgical techniques, and high levels of post-operative patient satisfaction have combined to make orthopedic surgery routine and popular after more conservative options have been tried and failed.

Joint Conditions and Treatment

Degenerative joint disease is a chronic condition impacting 43 million Americans at a cost of about $60 billion per year.[1] Several diseases account for a large portion of joint problems. Osteoarthritis is the most common form of joint disease and is a leading cause of disability among the elderly. Found typically in the hands, hips, knees, and spine, it results from a breakdown of cartilage and subsequent bone changes. The symptoms include pain, swelling, and stiffness. It occurs in the middle aged and elderly, and can run in families. Obesity is also a factor.[2]



Osteoporosis is a bone disease that, while it affects both sexes, is four times more common in women than men, usually as they grow older. It is marked by a loss of bone mass and, because it has no apparent symptoms, may go unnoticed until a problem such as a fracture arises.[3]



Rheumatoid arthritis, which affects an estimated one percent of the world's population,[4] is caused when the immune system malfunctions and leads to swelling of the joint linings.

The American College of Rheumatology estimates that 27 million adults in the US have clinical osteoarthritis.[5] About 8 million women and 2 million men in the US have osteoporosis, leading to more than 300,000 hip fractures per year.[6] Several million more Americans have a variety of other rheumatological conditions.

The goal of treatment is to relieve pain and improve function. Initial efforts usually involve physical therapy, exercise, and medications alone or in some combination, and weight loss where obesity is present. Joint replacement is almost always offered as a last option rather than a first to patients who have tried other treatments but still have pain.

Joint replacement involves removal of worn cartilage and bone from the joint, and replacement with metal and plastic implants that function like a normal bone joint. Almost any joint is a candidate, but most replacements are to

1 Matlock D, Earnest M, Epstein A. Utilization of elective hip and knee arthroplasty by age and payer. *Clin Orthop Relat Res*. 2008; 466:914-919.
2 Srikulmontree T. Osteoarthritis. American College of Rheumatology. http://www.rheumatology.org/practice/clinical/patients/diseases_and_conditions/osteoarthritis.asp. Updated August 2009. Accessed November 7, 2011.
3 Amin S. Osteoporosis. American College of Rheumatology. http://www.rheumatology.org/practice/clinical/patients/diseases_and_conditions/osteoporosis.asp. Updated September 2009. Accessed November 7, 2011.
4 Torpy JM, Gabriela DP, Golub RM. Rheumatoid arthritis. *JAMA*. 2011; 305(17):1824.
5 Lawrence RC, Felson DT, Helmick CG, et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. *Arthritis Rheum*. 2008; 58(1):26-35.
6 Amin S. Osteoporosis. American College of Rheumatology. http://www.rheumatology.org/practice/clinical/patients/diseases_and_conditions/osteoporosis.asp. Updated September 2009. Accessed November 7, 2011.

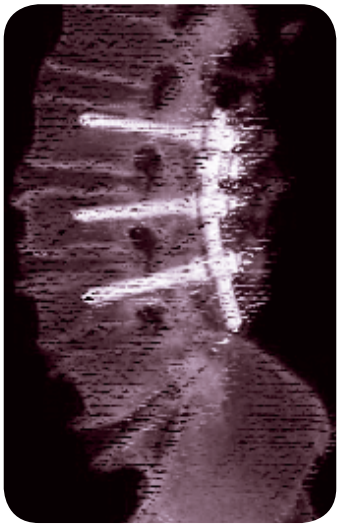
hips and knees. With advances in surgical techniques and implant materials over the past 30 years, it is now considered one of the most reliable and durable of surgeries.[7] More than 500,000 persons have a knee replaced each year in the US, making it the most common replacement surgery, and the numbers continue to rise steadily, especially among the Medicare-eligible population, for knees, hips, and shoulders.

Back and Neck Pain

Eighty percent of Americans experience lower back pain at some time in their life,[8] with about 59 million Americans having it at some point during a three-month period in one study.[9] The cause is often muscle strain, but can also include herniated lumbar discs, sciatica (a compressed nerve that causes pain down the leg), and spinal stenosis (a narrowing of the spinal canal). Degenerative disease of the spine (e.g., osteoarthritis), trauma, tumors, and in a small percentage of cases, congenital deformities also come into play.

Neck pain affects about 10 percent of the US population each year.[10]

In the large majority of cases, people recover from back and neck pain over a period of several weeks or months without surgery. Usually, the treatment begins with exercise, massage therapy, or anti-inflammatory drugs. Surgical options exist for those who fail to gain relief from other treatments, and in recent years there has been a trend toward increased use of spinal operations, especially spinal fusion surgeries for the lower back.



Understanding this Report

Data

The hospital discharge data used in this analysis was submitted to the Pennsylvania Health Care Cost Containment Council (PHC4) by the 173 general acute care hospitals in PA that performed orthopedic surgery from 2006 to 2010. Information on discharges from January 1, 2006 to December 31, 2010 was subjected to PHC4's validation and correction processes. Healthcare-associated infection data was reported by hospitals via the Centers for Disease Control and Prevention's (CDC) National Healthcare Safety Network (NHSN) and subjected to validation and correction processes by the PA Department of Health. Hospitalization rates for PA residents were calculated using PHC4 hospitalization data and the US Census Bureau data.

US hospitalization data came from the Healthcare Cost and Utilization Project (HCUP), which is sponsored by the Agency for Healthcare Research and Quality (AHRQ). National data was included to provide comparisons; the most recent US figures available were for 2009.

The Medicare fee-for-service payment data was provided by the Centers for Medicare and Medicaid Services, and the Medicaid fee-for-service payment data was provided by the PA Department of Public Welfare. The most recent Medicare and Medicaid payment data available to PHC4 for use in this report was for 2009.

[7] Kraay MJ. Joint Surgery. American College of Rheumatology. http://www.rheumatology.org/practice/clinical/patients/diseases_and_conditions/jointsurgery.asp. Published March 2007. Accessed November 7, 2011.

[8] Chang HJ, Lynm C, Glass RM. Osteoarthritis of the lumbar spine. *JAMA*. 2010; 304(1):114.

[9] Borenstein D. Back Pain. American College of Rheumatology. http://www.rheumatology.org/practice/clinical/patients/diseases_and_conditions/backpain.asp. Updated May 2008. Accessed November 7, 2011.

[10] Borenstein D. Neck Pain. American College of Rheumatology. http://www.rheumatology.org/practice/clinical/patients/diseases_and_conditions/neckpain.asp. Updated August 2009. Accessed November 7, 2011.

Measures Reported

Number of Patients – The number of inpatients 18 years and older who underwent particular types of orthopedic surgery as their principal procedure.

Hospitalization Rates – The number of hospitalizations for patients undergoing a particular surgery per 10,000 residents. Rates are for procedures performed in the inpatient setting, unless otherwise noted. Patients who did not reside in PA were excluded in calculations for PA rates. When analyzing county/region rates, the rates were adjusted for age and sex differences among county/region populations. Hospitalization rates for a specific segment of the population take into account the proportional differences among demographics, such as age, gender, and race/ethnicity. The rates for a specific demographic only include residents for that demographic.

Average Post-Surgical Length of Stay – The number of days, on average (mean), a patient stayed in the hospital after the day the procedure was performed.

Percent of Readmissions for Complication or Infection – The percent of patients who were readmitted specifically with the principal diagnosis of a complication or infection to a PA general acute care hospital, where the admit date was within 30 days of the discharge date of the original hospitalization. While these codes are used to describe a complication or infection, their use does not always indicate poor quality of care or a defective device.

Percent of Patients with a Healthcare-Associated Infection – The percent of patients who contracted a healthcare-associated infection as identified and reported by the hospital. The healthcare-associated infections reported are for infections that patients acquired during a hospital stay, with the exception of surgical site infections. Surgical site infections may have been detected either during the hospitalization in which the procedure was performed or after discharge during post-discharge surveillance, that is, a readmission to the same or a different hospital, a follow-up visit to a physician office, or a surgeon survey via mail or phone. When a different hospital, physician, or surgeon office identifies the infection, they report it back to the hospital where the procedure was performed. The hospital where the procedure was performed attributes the infection to a particular procedure category and reports the infection into NHSN. The extent of a hospital's post-discharge surveillance may affect the number of surgical site infections reported.

Per NHSN instructions, with the exception of surgical procedures involving implants (e.g., metal rods or screws), the period for reporting surgical site infections is 30 days from the date of the procedure. For surgeries with implants, the eligible period for reporting extends to 365 days from the date of the procedure. This report includes surgical site infections for procedures performed in 2010 that were identified and reported during 2010 or during the first quarter of 2011. As such, the number of post-discharge surveillance surgical site infections identified for surgical procedures involving implants may be underreported.

Average Medicare Fee-for-Service Payment – The average (mean) amount hospitals were paid for care of Medicare patients in the Medicare fee-for-service (FFS) system. Patient liabilities (e.g., coinsurance and deductible dollar amounts) were not included. Payments from Medicare Advantage plans (Medicare HMOs) were not included. Medicare FFS was assigned as the primary payer when the primary payer listed in the discharge record was Medicare FFS, the Medicare payment was greater than zero, and the payment value was greater than the Medicaid FFS payment (if present). The Medicare payment data reported is for 2009 hospitalizations (the most recent data available to PHC4).

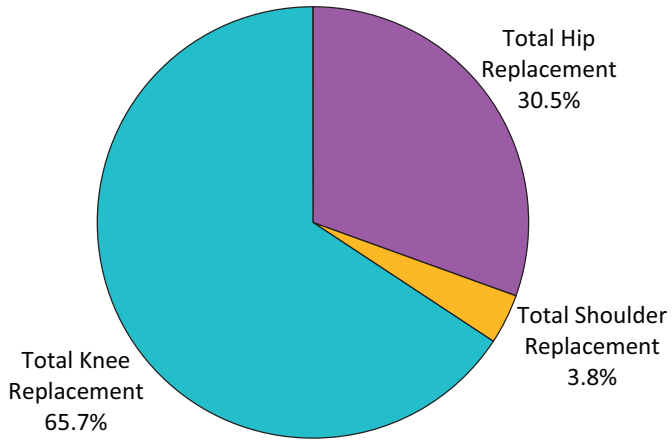
Average Medicaid Fee-for-Service Payment – The average (mean) amount hospitals were paid for care of Medicaid patients in the Medicaid fee-for-service (FFS) system. Medicaid FFS was assigned as the primary payer when the payer (Medicaid) indicated the primary payer was Medicaid FFS, the payment was greater than zero, and the payment value was greater than the Medicare FFS payment (if present). The Medicaid payment data reported is for 2009 hospitalizations (the most recent data available to PHC4).

Total Joint Replacement of Knee, Hip, and Shoulder

- In 2010, there were 52,225 adult patients (18 years and older) who underwent total joint replacement procedures in PA:
  - **Knee:** 34,320 total knee replacements (65.7 percent of hospitalizations for total joint replacement).
  - **Hip:** 15,939 total hip replacements (30.5 percent of hospitalizations for total joint replacement).
  - **Shoulder:** 1,966 total shoulder replacements (3.8 percent of hospitalizations for total joint replacement).
- Patients who underwent total joint replacement accounted for 33.1 percent of adult patients who underwent orthopedic surgery and 6.5 percent of adults who underwent any type of surgery in 2010.

52,225 Patients Underwent Total Joint Replacement in 2010

Figure 1.



Procedure Descriptions

Total Knee Replacement: The knee joint consists of three parts: the lower end of the thigh bone (femur), the upper end of the shin bone (tibia), and the knee cap (patella). In a knee replacement procedure, all three parts of the knee can be replaced or just one or two parts. When the femur and the tibia are replaced, a portion of the bone is removed and metal components are inserted. If the patella is replaced, a plastic component is inserted.

Total Hip Replacement: The hip joint consists of two main parts: a ball (femoral head) which is located at the upper end of the femur (thigh bone) and a socket (acetabulum) located in the pelvis. In a total hip replacement procedure, the ball is removed and replaced with a ball component and a cup/liner is inserted into the socket.

Total Shoulder Replacement: The shoulder joint consists of two main parts: a ball (humeral head) which is located at the upper end of the humerus (upper arm bone) and socket (glenoid) located in the shoulder blade (scapula). In a total shoulder replacement procedure, the diseased ball is removed and replaced with a ball component and a cup/liner is inserted into the socket.

Total Joint Replacement for Pediatric Patients in PA

While not common, total joint replacements are performed on pediatric patients for a variety of reasons including juvenile rheumatoid arthritis, bone cancer, and avascular necrosis (death of bone cells from loss of blood flow).

In 2010, 19 patients less than age 18 underwent a total joint replacement:

- 13 total hip replacements
- 3 total knee replacements
- 3 total shoulder replacements

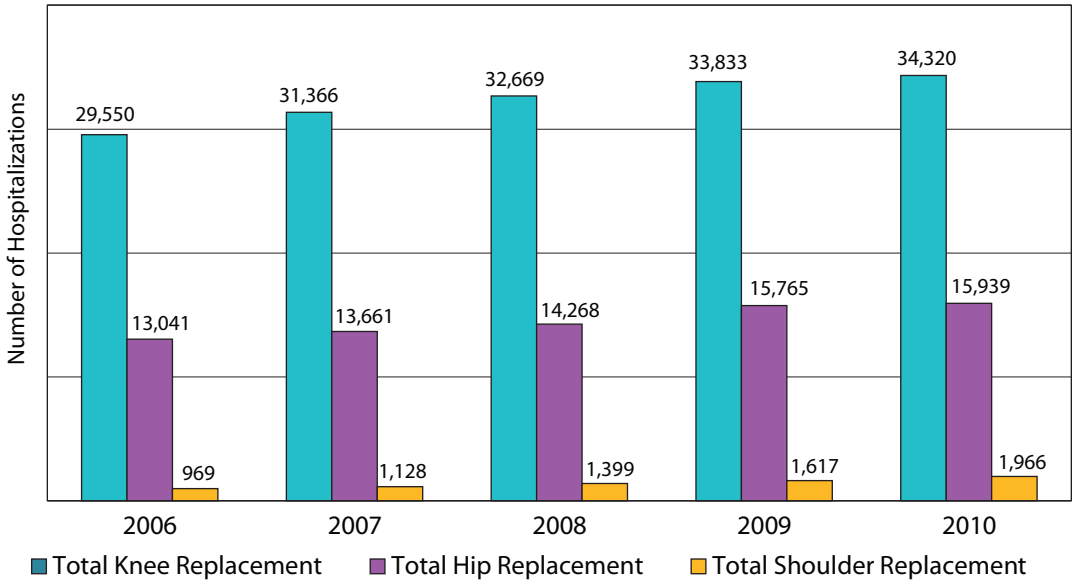
Hospitalization Trends

How has the number of hospitalizations for total joint replacement changed over time?

In PA, hospital admissions for patients who underwent total joint replacement increased steadily between 2006 and 2010 (Figure 2).

- Hospitalizations for total knee replacement increased 16.1 percent, from 29,550 hospitalizations in 2006 to 34,320 hospitalizations in 2010.
- Total hip replacement hospitalizations increased 22.2 percent, from 13,041 in 2006 to 15,939 in 2010.
- Hospitalizations for total shoulder replacement increased from 969 in 2006 to 1,966 in 2010 – an increase of more than 100 percent.

Figure 2.
Total Joint Replacement, 2006 - 2010
Number of PA Hospitalizations



Osteoarthritis is the number one reason adults undergo total joint replacement. In 2010, osteoarthritis was the principal reason for admission for:

- 98.7 percent of total knee replacements
- 88.6 percent of total hip replacements
- 82.1 percent of total shoulder replacements

Hospitalization Trends

How has the rate of hospitalizations for total joint replacement changed over time?

Another way to look at changes in the volume of hospitalizations is to examine population-based rates, which, unlike the number of hospitalizations, take into account population changes. Table 1 displays PA and US hospitalization rates for total joint replacement. To allow for comparison, 2006 rates are compared to 2009, since 2009 was the most recent US hospitalization data available for use in this report. PA rates for 2010 are also displayed.

- Hospitalization rates for total joint replacement increased between 2006 and 2009 in PA and in the US.
- PA had higher hospitalization rates than the US for total knee replacement and total hip replacement in 2006 and 2009. PA rates were also higher when adjusted to account for differences between PA and the US in the proportion of elderly residents. The age-adjusted rate for PA residents who underwent total knee replacement was 25.7 in 2006 and 29.4 in 2009. For total hip replacement, the age-adjusted rate was 11.1 in 2006 and 13.4 in 2009 (data not shown).
- The hospitalization rate for total knee replacement increased:
  - 12.5 percent in PA, from 28.8 to 32.4 per 10,000 residents.
  - 20.8 percent in the US, from 22.1 to 26.7 per 10,000 residents.
- The hospitalization rate for total hip replacement increased:
  - 19.5 percent in PA, from 12.3 to 14.7 per 10,000 residents.
  - 20.8 percent in the US, from 10.1 to 12.2 per 10,000 residents.
- The hospitalization rates for total shoulder replacement increased:
  - 55.6 percent in PA and in the US, from 0.9 to 1.4 per 10,000 residents (with a 100 percent increase in PA between 2006 and 2010).

Table 1.
Total Joint Replacement
PA and US Hospitalization Rates per 10,000 Residents

	2006		2009			2010
Procedure	PA	US	PA	US		PA
Total Knee Replacement	28.8	22.1	32.4	26.7		32.5
Total Hip Replacement	12.3	10.1	14.7	12.2		14.6
Total Shoulder Replacement	0.9	0.9	1.4	1.4		1.8

Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. US rates were calculated using HCUP discharge data (2009 was the most recent data available) and US Census Bureau data.

Hospitalization Trends

Rates by Age

Figure 3.
Total Knee Replacement, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents

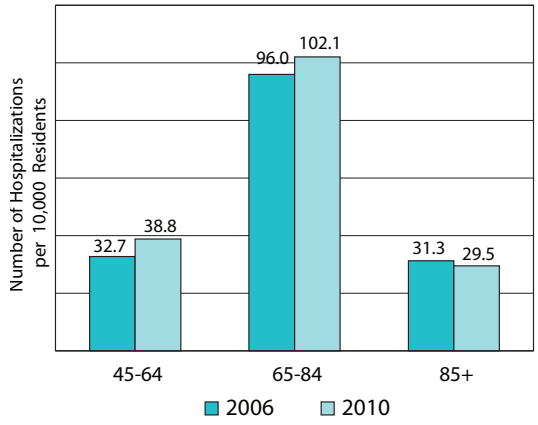


Figure 4.
Total Hip Replacement, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents

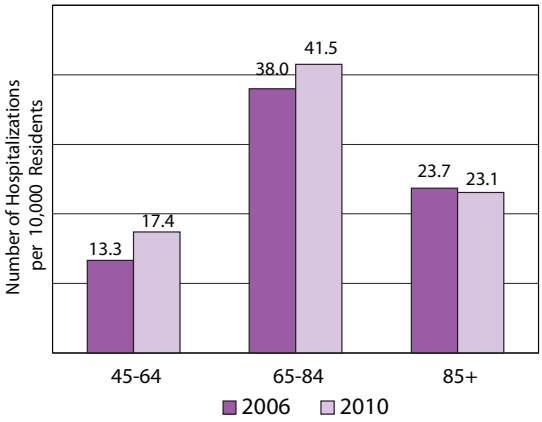
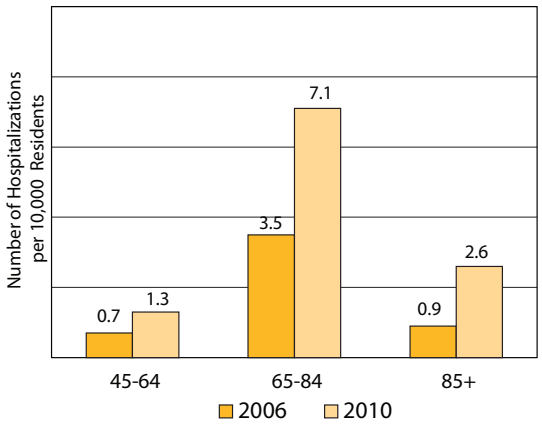


Figure 5.
Total Shoulder Replacement, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents



- Among PA residents 45 years and older, those 65 to 84 years had the highest hospitalization rates for each of the total joint replacements.

- Residents age 45 to 64 experienced the largest rate increases between 2006 and 2010 for total knee (Figure 3) and total hip (Figure 4) replacement:
  - 18.7 percent increase for total knee replacement, from 32.7 to 38.8 per 10,000 residents.
  - 30.8 percent increase for total hip replacement, from 13.3 to 17.4 per 10,000 residents.

- Total shoulder replacement (Figure 5) had the largest increase in hospitalization rates from 2006 to 2010 for each age group displayed.

- In 2010, the hospitalization rates for PA residents who underwent any of the three total joint replacements were (data not shown):
  - 57.6 per 10,000 residents for those age 45 to 64.
  - 150.7 per 10,000 residents for those age 65 to 84.
  - 55.3 per 10,000 residents for those age 85 and older.

US Hospitalization Rates per 10,000 Residents, 2009

The 2009 US rates (the most recent US data available) provide insight into differences and similarities between the US and PA, when compared to the 2010 PA rates displayed in Figures 3, 4, and 5.

	Total Knee Replacement	Total Hip Replacement	Total Shoulder Replacement
45-64 years	32.0	14.5	1.2
65-84 years	99.5	41.5	6.4
85 years and older	30.1	25.0	2.8

Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. US rates were calculated using 2009 HCUP discharge data (the most recent data available) and US Census Bureau data.

Total Joint Replacement of Knee, Hip, and Shoulder

Hospitalization Trends

Rates by Gender

- Females had higher hospitalization rates than males for all three total joint replacements in 2006 and 2010.
- Males had a larger percent increase than females in hospitalization rates for total knee replacement:
  - 15.7 percent for males, from 21.0 to 24.3 per 10,000 residents.
  - 12.0 percent for females, from 35.9 to 40.2 per 10,000 residents.

Rates by Race/Ethnicity

- Between 2006 and 2009, hospitalization rates for total joint replacement increased for each race/ethnicity group displayed in Table 3:
  - **Knee replacement:**
    - 11.5 percent for white non-Hispanic residents, from 31.2 to 34.8 per 10,000.
    - 27.3 percent for black non-Hispanic residents, from 16.1 to 20.5 per 10,000.
    - 76.2 percent for Hispanic residents, from 4.2 to 7.4 per 10,000.
  - **Hip replacement:**
    - 18.0 percent for white non-Hispanic residents, from 13.3 to 15.7 per 10,000.
    - 32.9 percent for black non-Hispanic residents, from 7.3 to 9.7 per 10,000.
    - 64.7 percent for Hispanic residents, from 1.7 to 2.8 per 10,000.
  - **Shoulder replacement:**
    - 77.8 percent for white non-Hispanic residents, from 0.9 to 1.6 per 10,000.
    - 133.3 percent for black non-Hispanic residents, from 0.3 to 0.7 per 10,000.
    - 100.0 percent for Hispanic residents, from 0.1 to 0.2 per 10,000.

Table 2.
Total Joint Replacement, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents by Gender

	Total Knee Replacement		Total Hip Replacement		Total Shoulder Replacement	
	2006	2010	2006	2010	2006	2010
Total	28.8	32.5	12.3	14.6	0.9	1.8
Female	35.9	40.2	13.3	15.7	0.9	2.1
Male	21.0	24.3	11.3	13.5	0.8	1.5

Table 3.
Total Joint Replacement, 2006 and 2009
PA Hospitalization Rates per 10,000 Residents by Race/Ethnicity*

	Total Knee Replacement		Total Hip Replacement		Total Shoulder Replacement	
	2006	2009	2006	2009	2006	2009
White non-Hispanic	31.2	34.8	13.3	15.7	0.9	1.6
Black non-Hispanic	16.1	20.5	7.3	9.7	0.3	0.7
Hispanic	4.2	7.4	1.7	2.8	0.1	0.2

* Internal PHC4 analysis suggests that Hispanic ethnicity may be slightly underreported.

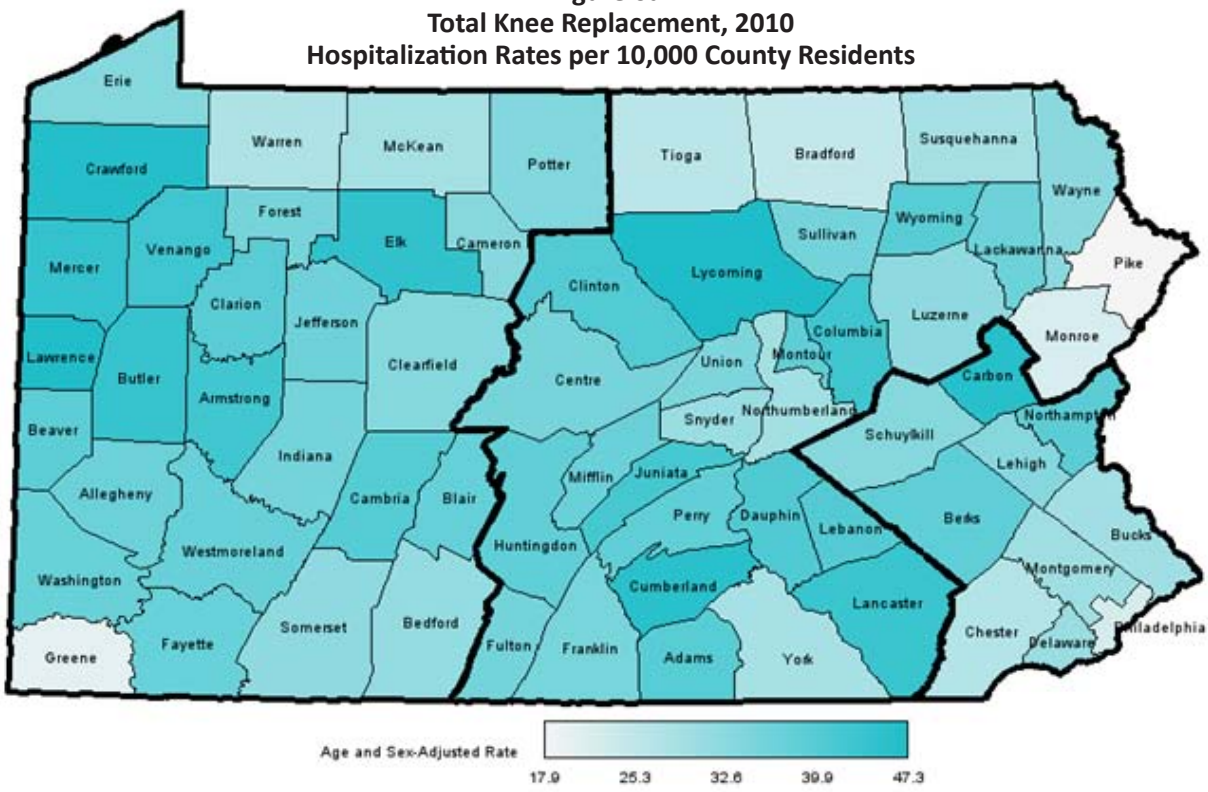
Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. Rates for race/ethnicity are for 2006 and 2009, since 2009 was the most recent US Census Bureau race/ethnicity data available for use in this report.

County and Region Hospitalization Rates

Figures 6a, 7a, and 8a display total knee replacement, total hip replacement, and total shoulder replacement rates per 10,000 residents for each of PA's 67 counties. Figures 6b, 7b, and 8b display changes in hospitalization rates over time for three PA regions – Western, Central & Northeastern, and Southeastern (as noted by the bolder outlines in the PA maps).

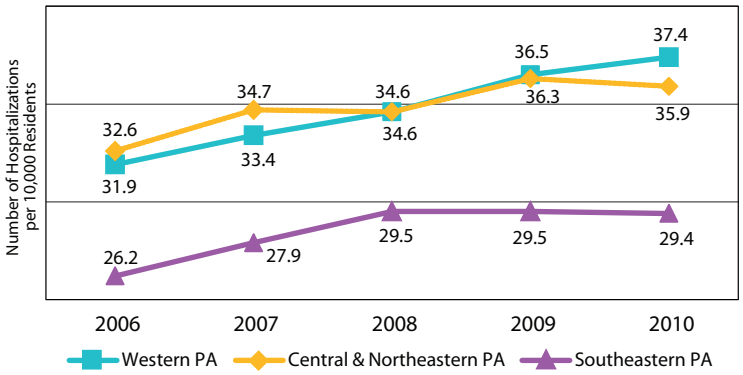
- The hospitalization rates for total knee replacement ranged from 17.9 to 47.3 per 10,000 county residents (Figure 6a).

Figure 6a.
Total Knee Replacement, 2010
Hospitalization Rates per 10,000 County Residents



- Hospitalization rates for total knee replacement were lower in Southeastern PA than in Western and Central & Northeastern PA for each year, 2006 to 2010 (Figure 6b).

Figure 6b.
Total Knee Replacement, 2006 - 2010
PA Region Hospitalization Rates per 10,000 Residents*



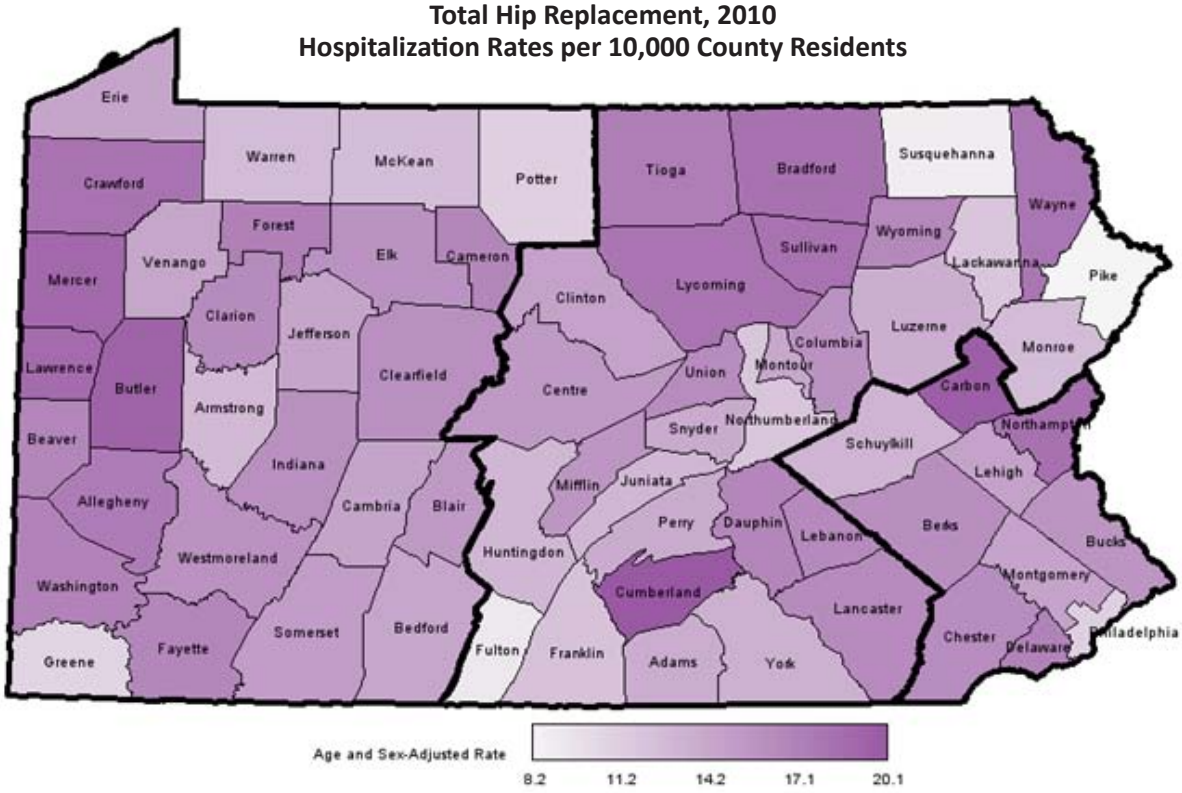
* Adjusted for age and sex differences.

Note: County/region rates were adjusted for age and sex differences among county/region populations. Rates include residents 20 years of age and older and were calculated using PHC4 discharge data and US Census Bureau data. Rates for counties with small populations are sensitive to small changes in the number of hospitalizations, so higher rates may be reflective of minor fluctuations in the number of hospitalizations.

County and Region Hospitalization Rates

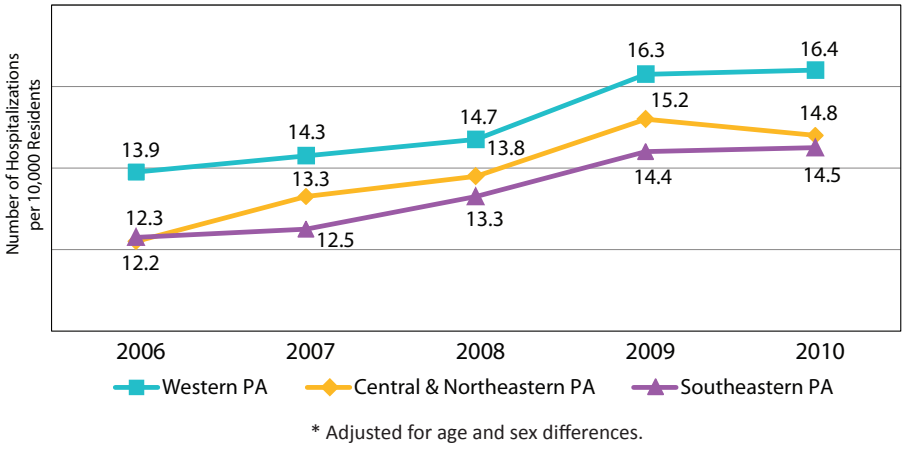
- The hospitalization rates for total hip replacement ranged from 8.2 to 20.1 per 10,000 county residents (Figure 7a).

Figure 7a.
Total Hip Replacement, 2010
Hospitalization Rates per 10,000 County Residents



- Western PA had the highest hospitalization rates for total hip replacement from 2006 to 2010 (Figure 7b).

Figure 7b.
Total Hip Replacement, 2006 - 2010
PA Region Hospitalization Rates per 10,000 Residents*



* Adjusted for age and sex differences.

Note: County/region rates were adjusted for age and sex differences among county/region populations. Rates include residents 20 years of age and older and were calculated using PHC4 discharge data and US Census Bureau data. Rates for counties with small populations are sensitive to small changes in the number of hospitalizations, so higher rates may be reflective of minor fluctuations in the number of hospitalizations.

County and Region Hospitalization Rates

- The hospitalization rates for total shoulder replacement ranged from zero to 4.7 per 10,000 county residents (Figure 8a).

Figure 8a.
Total Shoulder Replacement, 2010
Hospitalization Rates per 10,000 County Residents

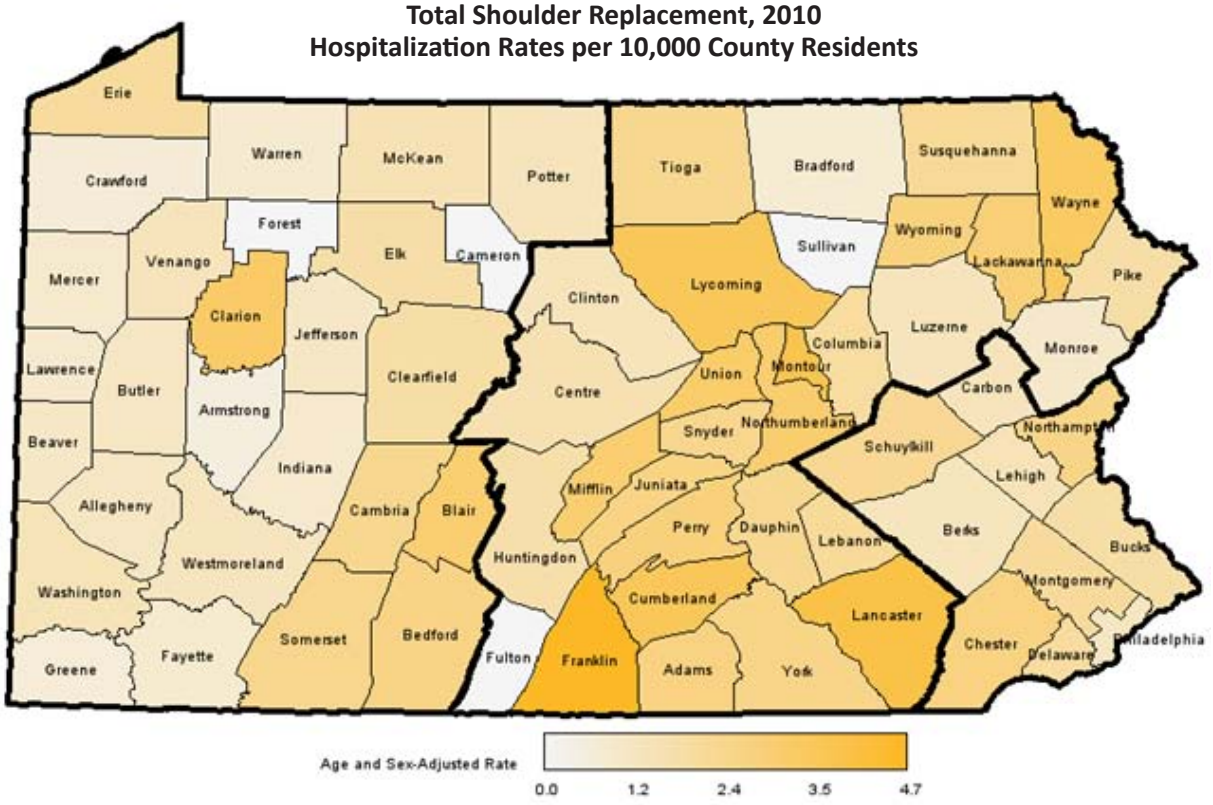
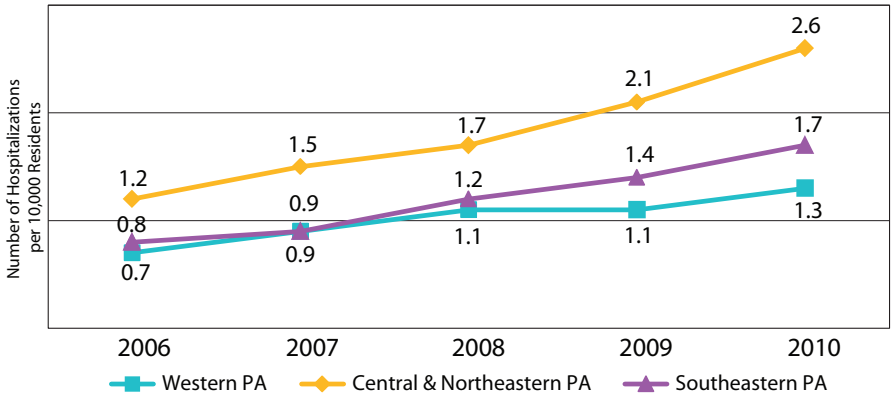


Figure 8b.
Total Shoulder Replacement, 2006 - 2010
PA Region Hospitalization Rates per 10,000 Residents*

- Central & Northeastern PA had the highest hospitalization rates for total shoulder replacement from 2006 to 2010 (Figure 8b). In 2010, the hospitalization rate in Central & Northeastern PA was twice the rate of Western PA.



* Adjusted for age and sex differences.

Note: County/region rates were adjusted for age and sex differences among county/region populations. Rates include residents 20 years of age and older and were calculated using PHC4 discharge data and US Census Bureau data. Rates for counties with small populations are sensitive to small changes in the number of hospitalizations, so higher rates may be reflective of minor fluctuations in the number of hospitalizations.

Patient Outcomes

Outcomes for patients who underwent total joint replacement in 2010 are presented in Table 4, including average post-surgical length of stay, the percent of patients readmitted within 30 days for a complication or infection, and the percent of patients with a healthcare-associated infection (HAI).

- Patients who underwent total hip replacement had higher rates of readmission specifically for a complication or infection at 4.3 percent, compared to patients who underwent total knee replacement (3.2 percent) or total shoulder replacement (2.8 percent).
- Total hip replacement patients also had a higher percent of HAIs at 1.5 percent, compared to patients who underwent total knee replacement (1.0 percent) or total shoulder replacement (0.3 percent).
- For each type of total joint replacement, patients age 85 and older stayed in the hospital longer and had higher readmission rates specifically for a complication or infection.
- Of the 52,225 total joint replacement patients, 576 patients (1.1 percent) contracted HAIs; the majority of those (425 patients) contracted surgical site infections.

The top principal **reasons patients were readmitted for complication or infection** after total knee, total hip, or total shoulder replacement in 2010 were:

- 35.0 percent for infection (e.g., infection of artificial joint)
- 20.1 percent for procedure and medical care complications (e.g., bleeding at site of incision)
- 14.2 percent for vascular complications (e.g., blood clot in lung)

In-hospital mortality for patients undergoing total joint replacement is typically low; in 2010 the rates were:

- 0.08 percent – total knee replacement
- 0.14 percent – total hip replacement
- 0.05 percent – total shoulder replacement

Table 4. Patient Outcomes for Total Joint Replacement, 2010

Procedure	Number of Patients	Average Post-Surgical Length of Stay (in Days)	Percent of Patients Readmitted within 30 Days for Complication or Infection	Percent of Patients with Healthcare-Associated Infections
Total Knee Replacement	**34,320**	**3.3**	**3.2%**	**1.0%**
18-44 years	632	3.1	2.2%	1.6%
45-64 years	14,862	3.2	2.5%	0.8%
65-84 years	17,883	3.4	3.6%	1.0%
85 years and older	943	3.6	6.0%	1.7%
Total Hip Replacement	**15,939**	**3.3**	**4.3%**	**1.5%**
18-44 years	792	3.0	2.7%	1.5%
45-64 years	6,920	3.1	3.5%	1.4%
65-84 years	7,461	3.5	4.7%	1.4%
85 years and older	766	4.1	7.7%	2.5%
Total Shoulder Replacement	**1,966**	**2.2**	**2.8%**	**0.3%**
18-44 years	22	1.8	0.0%	0.0%
45-64 years	554	1.9	1.5%	0.2%
65-84 years	1,299	2.3	3.3%	0.4%
85 years and older	91	3.2	3.7%	0.0%

Note: Healthcare-associated infections may be underreported. See page 5 for details on how healthcare-associated infections were collected and analyzed.

Partial Joint Replacement and Revision of Joint Replacement

As a group, total joint replacements make up the largest number of joint replacement procedures performed in PA; however, in 2010 more than 11,000 patients underwent partial joint replacement and revision of joint replacement (Table 5).

Table 5.
Partial Joint Replacement and Revision of Joint Replacement, 2010
Number of PA Hospitalizations

Partial hip replacement is performed when only one part of the hip joint, typically the ball, needs to be replaced.	4,696
Revision of knee replacement is performed when the artificial knee joint has been damaged. The total joint can be revised or just the damaged component.	3,529
Revision of hip replacement is performed when the artificial hip joint has been damaged. The ball and/or socket are replaced.	2,353
Partial shoulder replacement is performed when only one part of the shoulder joint, typically the ball, needs to be replaced.	952

- PA had higher hospitalization rates than the US for partial replacement and revision of joint replacement for both 2006 and 2009 (Table 6).
- Partial hip replacement rates decreased between 2006 and 2009 for both PA and the US.
- Hospitalization rates for revision of knee replacement increased:
  - 19.2 percent in PA, from 2.6 to 3.1 per 10,000 residents.
  - 22.2 percent in the US, from 1.8 to 2.2 per 10,000 residents.
- Between 2006 and 2009, rates for revision of hip replacement increased:
  - 17.6 percent in PA, from 1.7 to 2.0 per 10,000 residents.
  - 6.3 percent in the US, from 1.6 to 1.7 per 10,000 residents.

Table 6.
Partial Joint Replacement and Revision of Joint Replacement, 2006 and 2009
PA and US Hospitalization Rates per 10,000 Residents

	2006		2009	
Procedure	**PA**	**US**	**PA**	**US**
Partial Hip Replacement	5.0	4.6	4.8	4.4
Revision of Knee Replacement	2.6	1.8	3.1	2.2
Revision of Hip Replacement	1.7	1.6	2.0	1.7
Partial Shoulder Replacement	0.9	0.8	0.9	0.8

Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. US rates were calculated using HCUP discharge data (2009 was the most recent data available) and US Census Bureau data.

Resurfacing of Hip Joint

Advances in surgical technique and technology have introduced an alternative procedure for total hip replacement. Rather than replacing the entire ball (femoral head) as is done in a total hip replacement, hip resurfacing reshapes the damaged ball, and a metal device is inserted over the newly shaped end. The insertion of a cup/liner into the hip socket (acetabulum) is the same as the total hip replacement procedure. By preserving the ball, hip resurfacing may be beneficial for younger patients who may need a total hip replacement in the future. The number of patients in PA who underwent these procedures from 2006 to 2010 is shown below.

	2006	2007	2008	2009	2010
Resurfacing of hip joint	3*	69	114	172	163

* Procedure codes specific to these types of procedures were not available prior to October 1, 2006.

Partial Joint Replacement and Revision of Joint Replacement

How do outcomes for patients who underwent partial joint replacement or revision of joint replacement differ from outcomes for patients who underwent total joint replacement?

- On average, patients who underwent partial hip replacement stayed in the hospital more than a day longer than patients who underwent total hip replacement, 4.9 days compared 3.3 days.
- Readmission rates for complication or infection were 11.2 percent for partial hip replacement and 10.8 percent for revision of hip replacement, compared to 4.3 percent for total hip replacement. Similarly, the percent of patients with healthcare-associated infections was higher for partial hip replacement at 3.7 percent and revision of hip replacement at 3.3 percent than for total hip replacement at 1.5 percent.
- For revision of knee replacement, the readmission rate for complication or infection was 7.5 percent, compared to 3.2 percent for total knee replacement. The percent of patients with a healthcare-associated infection was 2.4 percent, compared to total knee replacement at 1.0 percent.

Table 7. Patient Outcomes for Partial Joint Replacement and Revision of Joint Replacement, 2010

Procedure	Number of Patients	Average Post-Surgical Length of Stay (in Days)	Percent of Patients Readmitted within 30 Days for Complication or Infection	Percent of Patients with Healthcare-Associated Infections
Partial Hip Replacement	**4,696**	**4.9**	**11.2%**	**3.7%**
18-44 years	28	6.1	8.3%	3.6%
45-64 years	335	5.2	10.3%	5.7%
65-84 years	2,234	4.8	10.6%	3.8%
85 years and older	2,099	5.0	12.1%	3.3%
Revision of Knee Replacement	**3,529**	**3.9**	**7.5%**	**2.4%**
18-44 years	115	3.9	2.9%	0.9%
45-64 years	1,591	3.6	7.5%	2.3%
65-84 years	1,698	4.0	7.7%	2.6%
85 years and older	125	5.3	7.3%	3.2%
Revision of Hip Replacement	**2,353**	**4.3**	**10.8%**	**3.3%**
18-44 years	113	3.8	14.3%	2.7%
45-64 years	866	3.9	9.0%	3.1%
65-84 years	1,157	4.4	11.8%	3.5%
85 years and older	217	5.1	11.0%	2.8%
Partial Shoulder Replacement	**952**	**2.7**	**3.3%**	**1.4%**
18-44 years	55	2.1	2.2%	1.8%
45-64 years	305	2.3	3.0%	1.6%
65-84 years	526	2.8	3.0%	1.3%
85 years and older	66	3.8	7.9%	0.0%

Note: Healthcare-associated infections may be underreported. See page 5 for details on how healthcare-associated infections were collected and analyzed.

Medicare and Medicaid Payment for Joint Replacement Procedures

Table 8 presents the average Medicare fee-for-service (FFS) and Medicaid FFS payment for hospitalizations in which patients underwent a joint replacement procedure. Average payments are for 2009 (the most recent payment data available to PHC4).

Table 8.
Joint Replacement Procedure Hospitalizations, 2009
Average Medicare Fee-for-Service and Medicaid Fee-for-Service Payment

Procedure	Average Medicare FFS Payment[1]	Average Medicaid FFS Payment[2]
Total Knee Replacement	$11,840	$11,320
Total Hip Replacement	$11,882	$11,838
Total Shoulder Replacement	$13,277	NR
Partial Hip Replacement	$13,535	$11,311
Revision of Knee Replacement	$16,416	$15,832
Revision of Hip Replacement	$18,160	$13,801
Partial Shoulder Replacement	$11,628	$8,971

[1] Medicare FFS was assigned as the primary payer when the primary payer listed in the discharge record was Medicare FFS, the Medicare payment was greater than zero, and the payment value was greater than the Medicaid FFS payment (if present).
[2] Medicaid FFS was assigned as the primary payer when the payer (Medicaid) indicated the primary payer was Medicaid FFS, the payment was greater than zero, and the payment value was greater than the Medicare FFS payment (if present).
NR: Not reported; too few cases with payment data (less than 13).

Physical Therapy and Rehabilitation Can Add to the Cost of Orthopedic Surgery

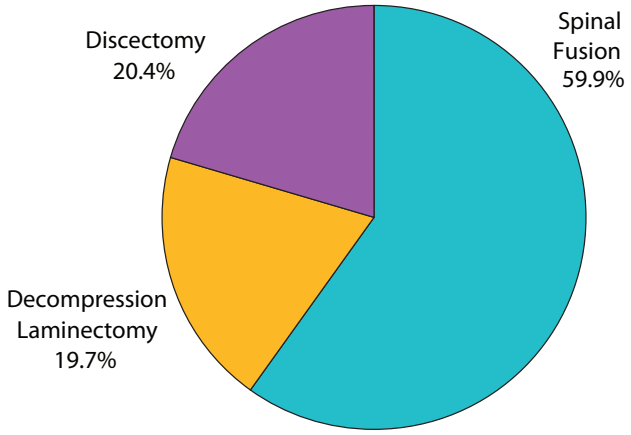
After orthopedic surgery, physical activity is an important part of the recovery process. Depending on the type of surgery and other factors related to patients' overall health, patients will usually undergo some type of physical therapy. This can range from participating in physical therapy prior to leaving the hospital, to starting or continuing physical therapy at an outpatient physical therapy office. If more intensive physical therapy and support is needed, an additional inpatient stay at a rehabilitation hospital or a nursing home facility that offers rehabilitative services may be recommended until the patient is well enough to resume safe physical activity in the home. Physical therapy and rehabilitation might therefore add to the cost of orthopedic surgery to varying degrees.

Common Spine Procedures

- In 2010, there were 31,005 adult patients (18 years and older) who underwent common spine procedures in PA:
  - **Spinal Fusion:** 18,574 spinal fusion procedures (59.9 percent of hospitalizations for spine procedures).
  - **Discectomy:** 6,335 discectomy procedures (20.4 percent of hospitalizations for spine procedures).
  - **Decompression Laminectomy:** 6,096 decompression laminectomy procedures (19.7 percent of hospitalizations for spine procedures).
- Patients who underwent these common spine procedures accounted for 19.6 percent of adult patients who underwent orthopedic surgery and 3.9 percent of adults who underwent any type of surgery in 2010.

31,005 Patients Underwent Common Spine Procedures in 2010

Figure 9.



Procedure Descriptions

Spinal Fusion: A spinal fusion is the joining of two or more vertebra (bones of the spine) to relieve pain by limiting movement in the diseased part of the spine. Metal screws, rods, and plates may be used to fixate (stabilize) the spine while allowing time for the bone grafts inserted during surgery to heal, resulting in a spinal fusion of the vertebra. The bone grafts can be made of synthetic material (ceramic or bone-forming proteins) or from actual bone taken from the patient or a donor.

Discectomy: A discectomy is the surgical removal of an entire intervertebral disc (a jelly-like cushion between the bones of the spine) or portions of disc material that have herniated (ruptured) into the spinal canal causing pressure on the spinal cord or nerve roots.

Decompression Laminectomy: A decompression laminectomy is the shaving down of or removal of the bone (lamina) in the affected area of the spine along with, if necessary, ligaments and tissue that are pressing on the spinal cord or nerve roots.

Common Spine Procedures for Pediatric Patients in PA

In 2010, 514 patients less than age 18 underwent a common spine procedure:

- 409 spinal fusions
- 80 decompression laminectomies
- 25 discectomies

In this age group, spinal fusion is typically performed to treat abnormal curvatures of the spine, decompression laminectomy is usually performed for degenerative disease of the spine, and discectomies are most often performed to treat herniated discs.

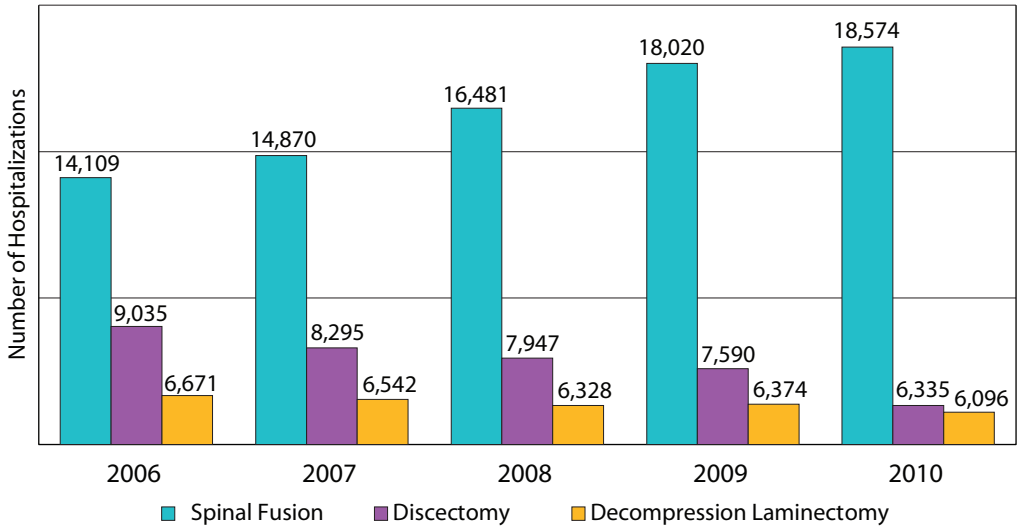
Hospitalization Trends

How has the number of hospitalizations for common spine procedures changed over time?

In PA, hospital admissions for patients who underwent spinal fusion increased between 2006 and 2010, while the number of hospitalizations for patients who underwent discectomy and decompression laminectomy procedures decreased (Figure 10).

- Spinal fusion increased 31.6 percent from 14,109 hospitalizations in 2006 to 18,574 hospitalizations in 2010.
- Discectomy decreased by 29.9 percent from 9,035 hospitalizations in 2006 to 6,335 hospitalizations in 2010.
- Hospitalizations for decompression laminectomy decreased 8.6 percent from 6,671 hospitalizations in 2006 to 6,096 hospitalizations in 2010.

Figure 10.
Common Spine Procedures, 2006 - 2010
Number of PA Hospitalizations



In 2010, herniated disc, spinal stenosis, and degenerative disease of the spine were the top reasons patients underwent one of the common spine procedures:

- For patients who underwent spinal fusion, the principal diagnosis was herniated disc for 28.4 percent, spinal stenosis for 19.0 percent, and degenerative disease of the spine for 17.4 percent.
- For patients who underwent discectomy, the principal diagnosis was herniated disc for 87.9 percent, spinal stenosis for 4.9 percent, and degenerative disease of the spine for 2.3 percent.
- For patients who underwent decompression laminectomy, the principal diagnosis was herniated disc for 8.7 percent, spinal stenosis for 54.7 percent, and degenerative disease of the spine for 16.2 percent.

Hospitalization Trends

How has the rate of hospitalizations for common spine procedures changed over time?

Another way to look at changes in the volume of hospitalizations is to examine population-based rates, which, unlike the number of hospitalizations, take into account population changes. Table 9 displays PA and US hospitalization rates for spine procedures. To allow for comparison, 2006 rates are compared to 2009, since 2009 was the most recent US hospitalization data available to PHC4 for use in this report. PA rates for 2010 are also displayed.

- PA had lower hospitalization rates than the US for spinal fusion procedures in both 2006 and 2009. The PA rate was also lower when adjusted to account for differences between PA and the US in the proportion of elderly residents. The age-adjusted rate for PA residents who underwent spinal fusion was 12.7 in 2006 and 16.0 in 2009 (data not shown).
- PA had higher hospitalization rates than the US for discectomy and decompression laminectomy in 2006 and 2009. PA rates were also higher when adjusted to account for differences between PA and the US in the proportion of elderly residents. The age-adjusted rate for PA residents who underwent discectomy was 8.4 in 2006 and 6.8 in 2009. For decompression laminectomy, the age-adjusted rate was 5.7 in 2006 and 5.4 in 2009 (data not shown).
- Between 2006 and 2009, the hospitalization rate for spinal fusion increased:
  - 26.5 percent in PA, from 13.2 to 16.7 per 10,000 residents.
  - 22.7 percent in the US, from 14.1 to 17.3 per 10,000 residents.
- The hospitalization rate for discectomy procedures decreased:
  - 18.6 percent in PA, from 8.6 to 7.0 per 10,000 residents (with further decreases in 2010).
  - 26.3 percent in the US, from 5.7 to 4.2 per 10,000 residents.
- For decompression laminectomy, the hospitalization rate:
  - Decreased 4.8 percent in PA, from 6.2 to 5.9 per 10,000 residents.
  - Remained the same in the US at 4.2 hospitalizations per 10,000 residents.

Table 9.
Common Spine Procedures
PA and US Hospitalization Rates
per 10,000 Residents

	2006		2009		2010
Procedure	PA	US	PA	US	PA
Spinal Fusion	13.2	14.1	16.7	17.3	17.0
Discectomy	8.6	5.7	7.0	4.2	5.8
Decompression Laminectomy	6.2	4.2	5.9	4.2	5.6

While the hospitalization rates for discectomy and decompression laminectomy have decreased over time in the inpatient setting (as shown in Table 9), the rate for these procedures in the outpatient setting has increased:

- Outpatient discectomy rates per 10,000 residents increased from 3.1 in 2008 to 4.1 in 2010 – a 32.3 percent increase.
- Outpatient decompression laminectomy rates per 10,000 residents increased from 1.0 in 2008 to 1.4 in 2010 – a 40.0 percent increase.

Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. US rates were calculated using HCUP discharge data (2009 was the most recent data available) and US Census Bureau data.

Hospitalization Trends

Rates by Age

Figure 11.
Spinal Fusion Procedures, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents

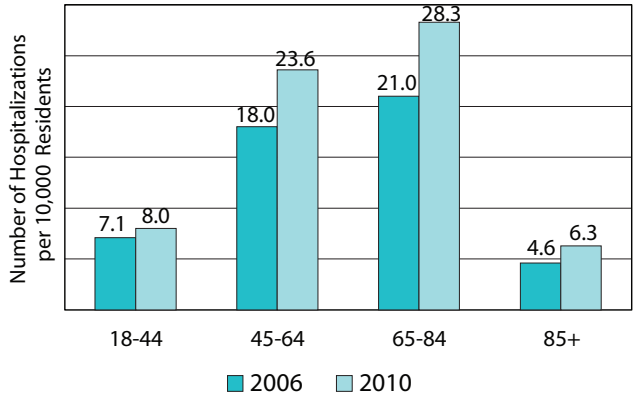


Figure 12.
Discectomy Procedures, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents

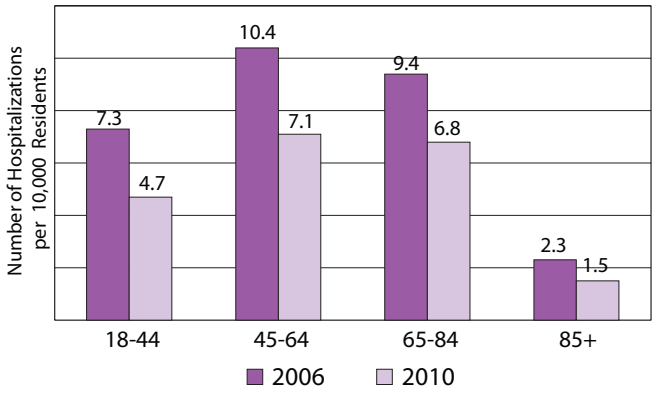
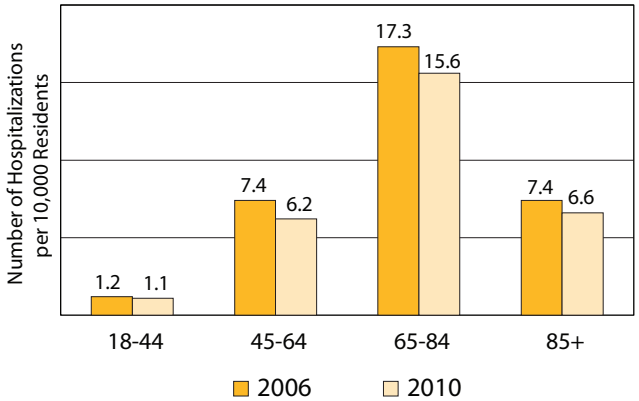


Figure 13.
Decompression Laminectomy Procedures, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents



- PA residents age 65 to 84 had the highest hospitalization rates for spinal fusion (Figure 11) and decompression laminectomy (Figure 13) in 2006 and 2010.
- Between 2006 and 2010, the hospitalization rates for spinal fusion increased for all age groups. Those 85 years and older had the highest increase at 37.0 percent, from 4.6 to 6.3 per 10,000 residents.
- PA residents age 45 to 64 had the highest hospitalization rates for discectomy procedures in 2006 and 2010 (Figure 12).
- Hospitalization rates for discectomy decreased for all age groups between 2006 and 2010. Those age 18 to 44 experienced the largest percent decrease at 35.6 percent, from 7.3 to 4.7 per 10,000 residents.
- Decompression laminectomy hospitalization rates decreased for all age groups between 2006 and 2010. The largest percent decrease at 16.2 percent occurred for those age 45 to 64, from 7.4 to 6.2 per 10,000 residents.

US Hospitalization Rates per 10,000 Residents, 2009

The 2009 US rates (the most recent US data available) provide insight into differences and similarities between the US and PA, when compared to the 2010 PA rates displayed in Figures 11, 12, and 13.

	Spinal Fusion	Discectomy	Decompression Laminectomy
18-44 years	7.7	3.0	0.8
45-64 years	25.3	5.1	4.6
65-84 years	32.2	6.4	14.2
85 years and older	6.5	1.9	7.3

Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. US rates were calculated using 2009 HCUP discharge data (the most recent data available) and US Census Bureau data.

Hospitalization Trends

Rates by Gender

- In both 2006 and 2010:
  - Females had higher hospitalization rates than males for spinal fusion.
  - Males had higher hospitalization rates than females for both discectomy and decompression laminectomy.
- Between 2006 and 2010, hospitalization rates for spinal fusion increased:
  - 28.9 percent for females, from 13.5 to 17.4 per 10,000 residents.
  - 28.9 percent for males, from 12.8 to 16.5 per 10,000 residents.
- Discectomy hospitalization rates decreased:
  - 33.8 percent for females, from 7.4 to 4.9 per 10,000 residents.
  - 31.6 percent for males, from 9.8 to 6.7 per 10,000 residents.

Table 10.
Common Spine Procedures, 2006 and 2010
PA Hospitalization Rates per 10,000 Residents by Gender

	Spinal Fusion		Discectomy		Decompression Laminectomy	
	2006	2010	2006	2010	2006	2010
Total	13.2	17.0	8.6	5.8	6.2	5.6
Female	13.5	17.4	7.4	4.9	5.6	4.8
Male	12.8	16.5	9.8	6.7	6.9	6.3

Rates by Race/Ethnicity

- White non-Hispanic residents had higher hospitalization rates than black non-Hispanic and Hispanic residents for all three spine procedures in 2006 and 2009.
- Between 2006 and 2009, spinal fusion hospitalization rates increased for the three race/ethnicity groups displayed in Table 11:
  - 28.3 percent for white non-Hispanic residents, from 13.8 to 17.7 per 10,000.
  - 19.4 percent for black non-Hispanic residents, from 9.3 to 11.1 per 10,000.
  - 62.2 percent for Hispanic residents, from 3.7 to 6.0 per 10,000.
- While the overall decompression laminectomy hospitalization rate decreased between 2006 and 2009, the rate increased for black non-Hispanic residents, from 2.9 to 3.4 per 10,000.

Table 11.
Common Spine Procedures, 2006 and 2009
PA Hospitalization Rates per 10,000 Residents by Race/Ethnicity*

	Spinal Fusion		Discectomy		Decompression Laminectomy	
	2006	2009	2006	2009	2006	2009
White non-Hispanic	13.8	17.7	9.2	7.5	6.7	6.4
Black non-Hispanic	9.3	11.1	4.0	3.5	2.9	3.4
Hispanic	3.7	6.0	3.0	2.9	1.2	1.2

* Internal PHC4 analysis suggests that Hispanic ethnicity may be slightly underreported.

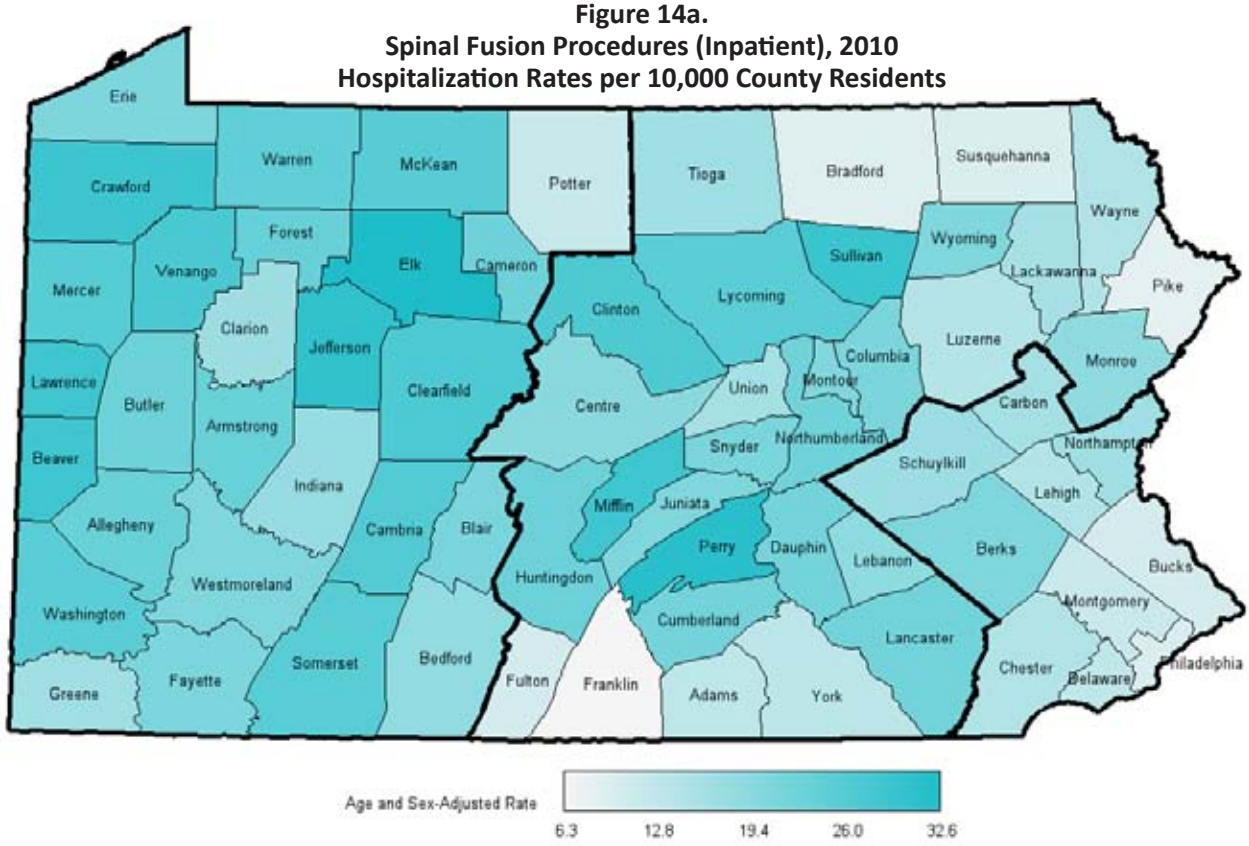
Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. Rates for race/ethnicity are for 2006 and 2009, since 2009 was the most recent US Census Bureau race/ethnicity data available for use in this report.

County and Region Hospitalization Rates

Figures 14a, 15a, and 16a display spinal fusion, discectomy, and decompression laminectomy rates per 10,000 residents for each of PA's 67 counties. Figures 14b, 15b, and 16b display changes in hospitalization rates over time for three PA regions – Western, Central & Northeastern, and Southeastern (as noted by the bolder outlines in the PA maps).

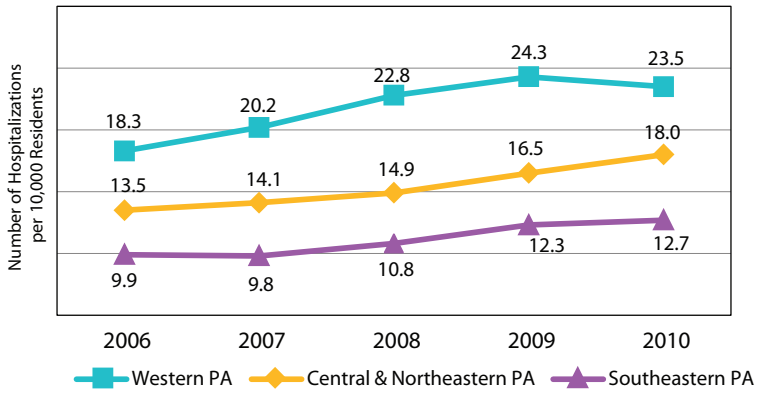
- The hospitalization rates for spinal fusion ranged from 6.3 to 32.6 per 10,000 county residents (Figure 14a).

Figure 14a.
Spinal Fusion Procedures (Inpatient), 2010
Hospitalization Rates per 10,000 County Residents



- Western PA had the highest inpatient hospitalization rates for spinal fusion from 2006 to 2010; these rates were approximately twice that of Southeastern PA during the same time period (Figure 14b).
- Western PA continued to have the highest rate in 2010 when inpatient and outpatient settings were evaluated together; the rate per 10,000 residents was 23.8 in Western PA, 19.8 in Central & Northeastern PA, and 12.9 in Southeastern PA (data not shown).

Figure 14b.
Spinal Fusion Procedures (Inpatient), 2006 - 2010
PA Region Hospitalization Rates per 10,000 Residents*



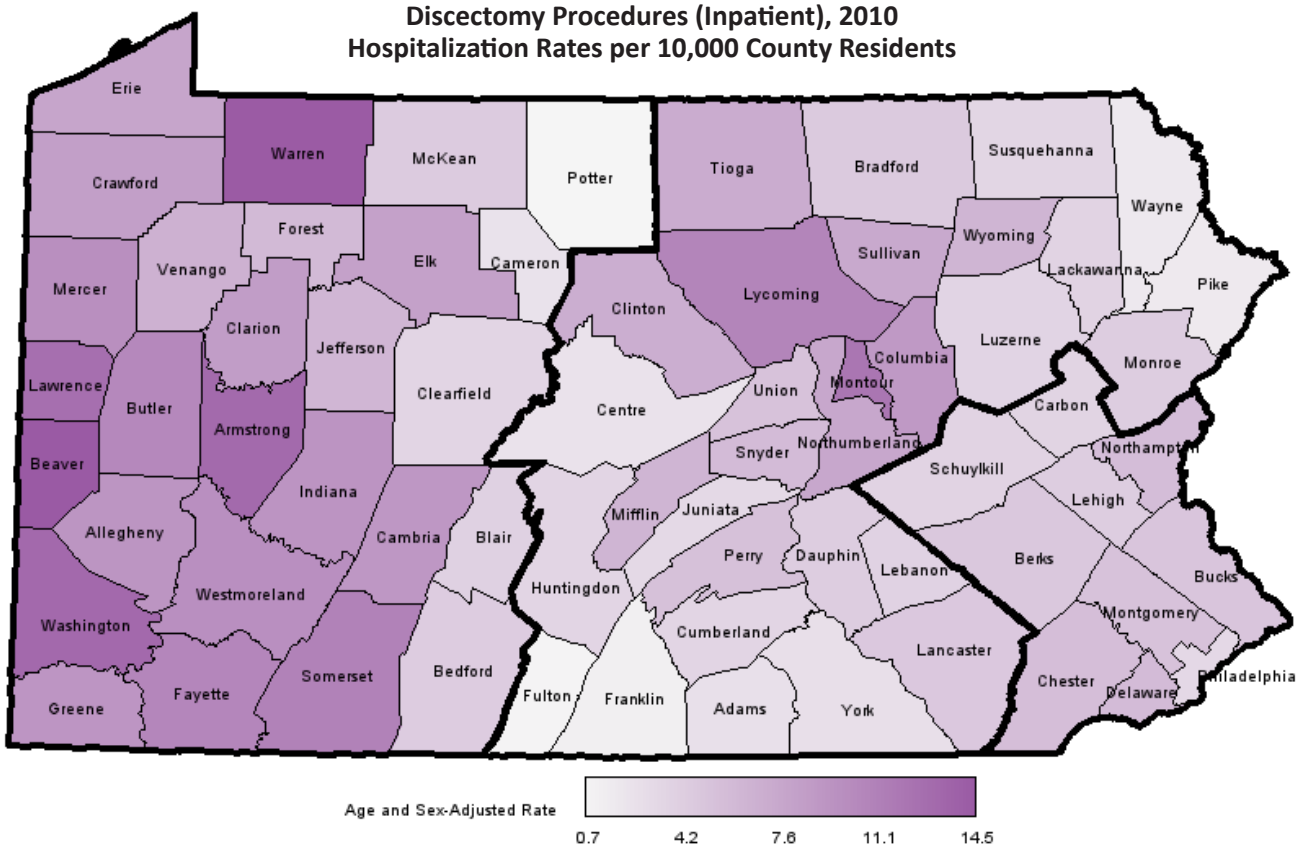
* Adjusted for age and sex differences.

Note: County/region rates were adjusted for age and sex differences among county/region populations. Rates include residents 20 years of age and older and were calculated using PHC4 discharge data and US Census Bureau data. Rates for counties with small populations are sensitive to small changes in the number of hospitalizations, so higher rates may be reflective of minor fluctuations in the number of hospitalizations.

County and Region Hospitalization Rates

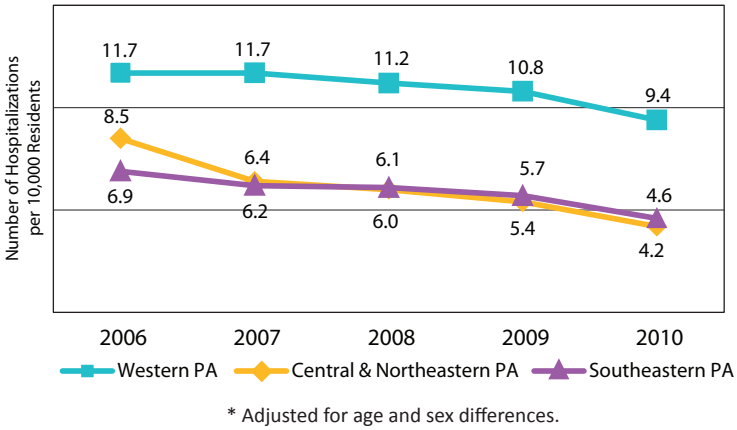
- The hospitalization rates for discectomy ranged from 0.7 to 14.5 per 10,000 county residents (Figure 15a).

Figure 15a.
Discectomy Procedures (Inpatient), 2010
Hospitalization Rates per 10,000 County Residents



- Western PA had the highest inpatient hospitalization rates for discectomy from 2006 to 2010 (Figure 15b). When inpatient and outpatient settings were evaluated together, in 2010 Western PA had the highest rate at 12.9 per 10,000 residents, followed by Central & Northeastern PA at 11.8, and Southeastern PA at 7.2 (data not shown).

Figure 15b.
Discectomy Procedures (Inpatient), 2006 - 2010
PA Region Hospitalization Rates per 10,000 Residents*



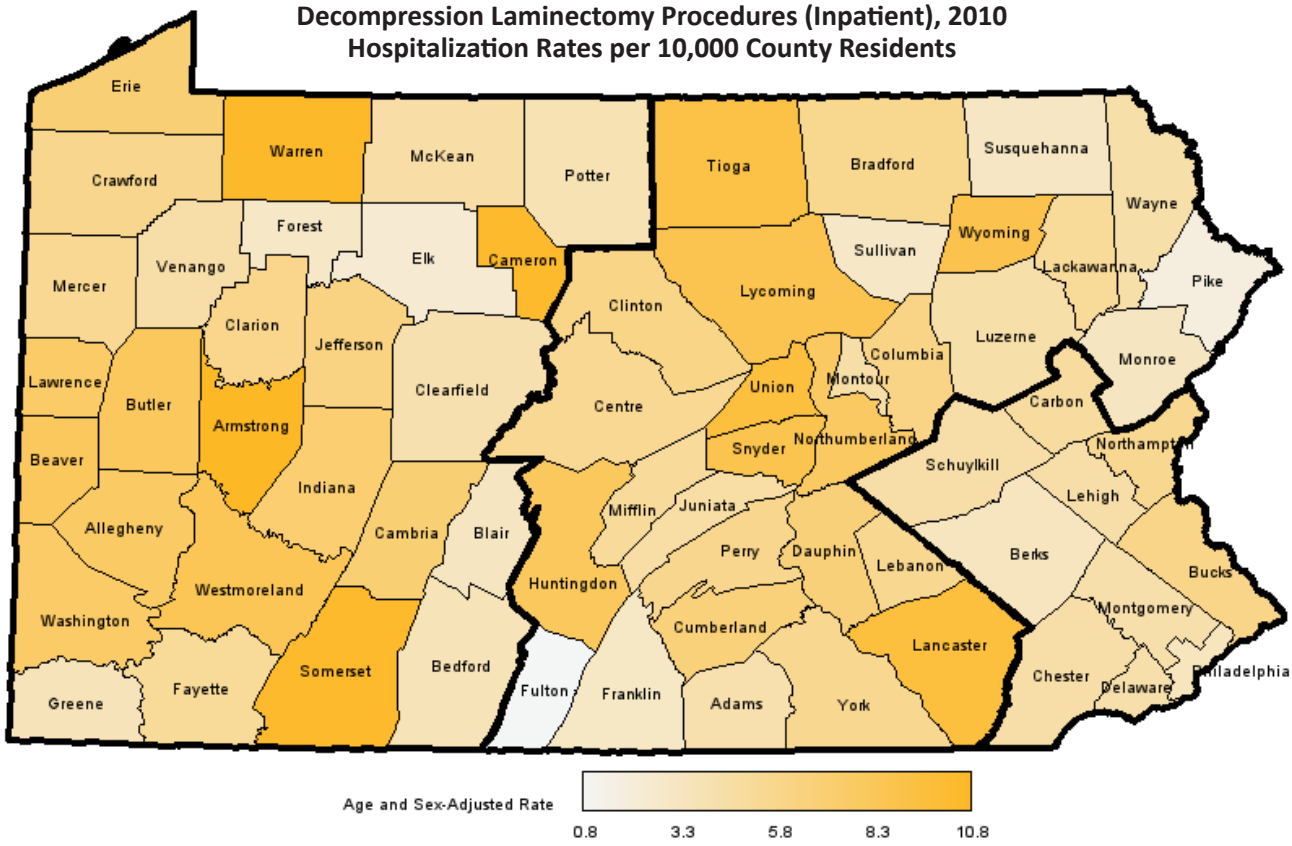
* Adjusted for age and sex differences.

Note: County/region rates were adjusted for age and sex differences among county/region populations. Rates include residents 20 years of age and older and were calculated using PHC4 discharge data and US Census Bureau data. Rates for counties with small populations are sensitive to small changes in the number of hospitalizations, so higher rates may be reflective of minor fluctuations in the number of hospitalizations.

County and Region Hospitalization Rates

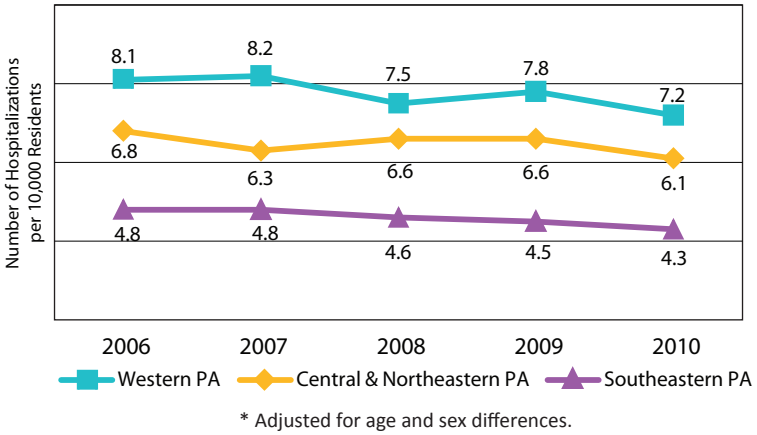
- The hospitalization rates for decompression laminectomy ranged from 0.8 to 10.8 per 10,000 county residents (Figure 16a).

Figure 16a.
Decompression Laminectomy Procedures (Inpatient), 2010
Hospitalization Rates per 10,000 County Residents



- Western PA had the highest inpatient hospitalization rates for decompression laminectomy from 2006 to 2010 (Figure 16b). However, in 2010 Central & Northeastern PA had the highest rate when inpatient and outpatient settings were evaluated together at 8.8 per 10,000 residents, followed by Western PA at 8.0, and Southeastern PA at 5.3 (data not shown).

Figure 16b.
Decompression Laminectomy Procedures (Inpatient), 2006 - 2010
PA Region Hospitalization Rates per 10,000 Residents*



* Adjusted for age and sex differences.

Note: County/region rates were adjusted for age and sex differences among county/region populations. Rates include residents 20 years of age and older and were calculated using PHC4 discharge data and US Census Bureau data. Rates for counties with small populations are sensitive to small changes in the number of hospitalizations, so higher rates may be reflective of minor fluctuations in the number of hospitalizations.

Patient Outcomes

Outcomes for patients who underwent a common spine procedure in 2010 are presented in Table 12, including average post-surgical length of stay, the percent of patients readmitted within 30 days for a complication or infection, and the percent of patients with a healthcare-associated infection (HAI).

- Patients who underwent decompression laminectomy had a higher percent of readmissions specifically for a complication or infection at 5.6 percent, compared to patients who underwent spinal fusion (4.8 percent) and patients who underwent discectomy (2.8 percent).
- A higher percent of patients who underwent spinal fusion acquired healthcare-associated infections at 2.8 percent, compared to patients who underwent decompression laminectomy (1.8 percent) and patients who underwent discectomy (1.2 percent).
- Of the 31,005 common spine procedure patients, 704 patients (2.3 percent) contracted HAIs; the majority of those (501 patients) contracted surgical site infections.

The top principal **reasons patients were readmitted for complication or infection** after spinal fusion, discectomy, or decompression laminectomy were:

- 47.3 percent for infection (e.g., bloodstream infection, postop wound infection)
- 20.1 percent for procedure and medical care complications (e.g., bleeding at site of incision)
- 10.6 percent for vascular complications (e.g., blood clot in the lung)

In-hospital mortality for patients undergoing common spine procedures is typically low; in 2010 the rates were:

- 0.24 percent – spinal fusion
- 0.06 percent – discectomy
- 0.39 percent – decompression laminectomy

Table 12. Patient Outcomes for Common Spine Procedures, 2010

Procedure	Number of Patients	Average Post-Surgical Length of Stay (in Days)	Percent of Patients Readmitted within 30 Days for Complication or Infection	Percent of Patients with Healthcare-Associated Infections
Spinal Fusion	**18,574**	**3.3**	**4.8%**	**2.8%**
18-44 years	3,870	2.7	3.0%	2.1%
45-64 years	9,326	3.1	4.3%	2.4%
65-84 years	5,170	4.2	6.8%	3.7%
85 years and older	208	6.1	9.4%	8.2%
Discectomy	**6,335**	**1.6**	**2.8%**	**1.2%**
18-44 years	2,251	1.4	2.1%	0.8%
45-64 years	2,800	1.6	2.5%	1.1%
65-84 years	1,236	2.2	4.4%	1.9%
85 years and older	48	2.8	11.1%	2.1%
Decompression Laminectomy	**6,096**	**2.9**	**5.6%**	**1.8%**
18-44 years	540	3.5	8.8%	2.8%
45-64 years	2,480	2.7	5.1%	2.0%
65-84 years	2,856	2.9	5.3%	1.6%
85 years and older	220	3.6	7.0%	1.4%

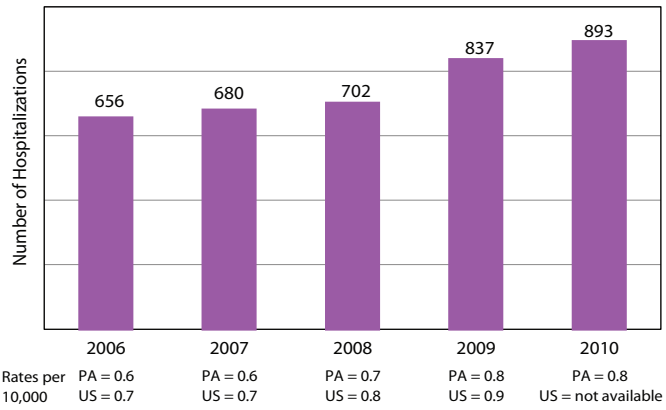
Note: Healthcare-associated infections may be underreported. See page 5 for details on how healthcare-associated infections were collected and analyzed.

Spinal Refusion Procedures

Spinal fusion is the most common spine procedure performed in PA. A spinal refusion is a surgical revision of a previous spinal fusion due to failure of the bone graft to properly heal or the loosening of the metal screws, rods, and plates used to stabilize the area of fusion. The procedure is the same as the fusion procedure except for the removal of the damaged or failed bone graft or metal devices.

- Between 2006 and 2010, the number of hospitalizations for patients who underwent spinal refusion increased 36.1 percent, from 656 to 893 hospitalizations.
- Hospitalization rates for spinal refusion have also increased:
  - 33.3 percent in PA, from 0.6 to 0.8 per 10,000 residents.
  - 28.6 percent in the US, from 0.7 in 2006 to 0.9 per 10,000 residents in 2009 (the most recent US data available).
- When compared to patients who underwent spinal fusion, patients who underwent spinal refusion:
  - Stayed in the hospital longer, 4.1 days compared to 3.3 days.
  - Had a higher rate of readmissions for a complication or infection, 7.6 percent compared to 4.8 percent.
  - Had a higher percent of patients who contracted a healthcare-associated infection, 3.7 percent compared to 2.8 percent.

Figure 17.
Spinal Refusion Procedures, 2006 - 2010
PA Hospitalizations



Note: PA rates were calculated using PHC4 discharge data and US Census Bureau data; non-PA residents were excluded. US rates were calculated using HCUP discharge data (2009 was the most recent data available) and US Census Bureau data.

Table 13.
Patient Outcomes for Spinal Refusion Procedures, 2010

	Number of Patients	Average Post-Surgical Length of Stay (in Days)	Percent of Patients Readmitted within 30 Days for Complication or Infection	Percent of Patients with Healthcare-Associated Infections
Total	**893**	**4.1**	**7.6%**	**3.7%**
18-44 years	161	3.4	2.2%	2.5%
45-64 years	460	4.1	9.2%	3.7%
65-84 years	270	4.5	8.2%	4.4%
85 years and older	2	Not reported; too few cases.		

Note: Healthcare-associated infections may be underreported. See page 5 for details on how healthcare-associated infections were collected and analyzed.

Artificial Disc Replacement and Insertion of Dynamic Stabilization Device

Advancements in technology have introduced alternative procedures for diseases of the spine that are traditionally treated with spinal fusion. With artificial disc replacement the diseased disc is replaced with a synthetic disc to reduce pain and allow for movement of the spine. Insertion of a dynamic stabilization device is done to stabilize areas of disease while preserving movement of the spine. The number of patients in PA who underwent these procedures from 2006 to 2010 is shown below.

	2006	2007	2008	2009	2010
Artificial Disc Replacement	113	115	169	196	145
Insertion of Dynamic Stabilization Device	*	56*	241	230	151

* Procedure codes specific to these types of procedures were not available prior to October 1, 2007.

Medicare and Medicaid Payment for Spine Procedures

Table 14 presents the average Medicare fee-for-service (FFS) and Medicaid FFS payment for hospitalizations in which patients underwent a spine procedure. Average payments are for 2009 (the most recent payment data available to PHC4).

Table 14.
Spine Procedure Hospitalizations, 2009
Average Medicare Fee-for-Service and Medicaid Fee-for-Service Payment

Procedure	Average Medicare FFS Payment[1]	Average Medicaid FFS Payment[2]
Spinal Fusion	$23,258	$15,283
Discectomy	$7,026	$5,350
Decompression Laminectomy	$8,000	$10,620[3]
Spinal Refusion	$25,123	$17,099

[1] Medicare FFS was assigned as the primary payer when the primary payer listed in the discharge record was Medicare FFS, the Medicare payment was greater than zero, and the payment value was greater than the Medicaid FFS payment (if present).

[2] Medicaid FFS was assigned as the primary payer when the payer (Medicaid) indicated the primary payer was Medicaid FFS, the payment was greater than zero, and the payment value was greater than the Medicare FFS payment (if present).

[3] Average payment was affected by two atypical cases.

Physical Therapy and Rehabilitation Can Add to the Cost of Orthopedic Surgery

After orthopedic surgery, physical activity is an important part of the recovery process. Depending on the type of surgery and other factors related to patients' overall health, patients will usually undergo some type of physical therapy. This can range from participating in physical therapy prior to leaving the hospital, to starting or continuing physical therapy at an outpatient physical therapy office. If more intensive physical therapy and support is needed, an additional inpatient stay at a rehabilitation hospital or a nursing home facility that offers rehabilitative services may be recommended until the patient is well enough to resume safe physical activity in the home. Physical therapy and rehabilitation might therefore add to the cost of orthopedic surgery to varying degrees.

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