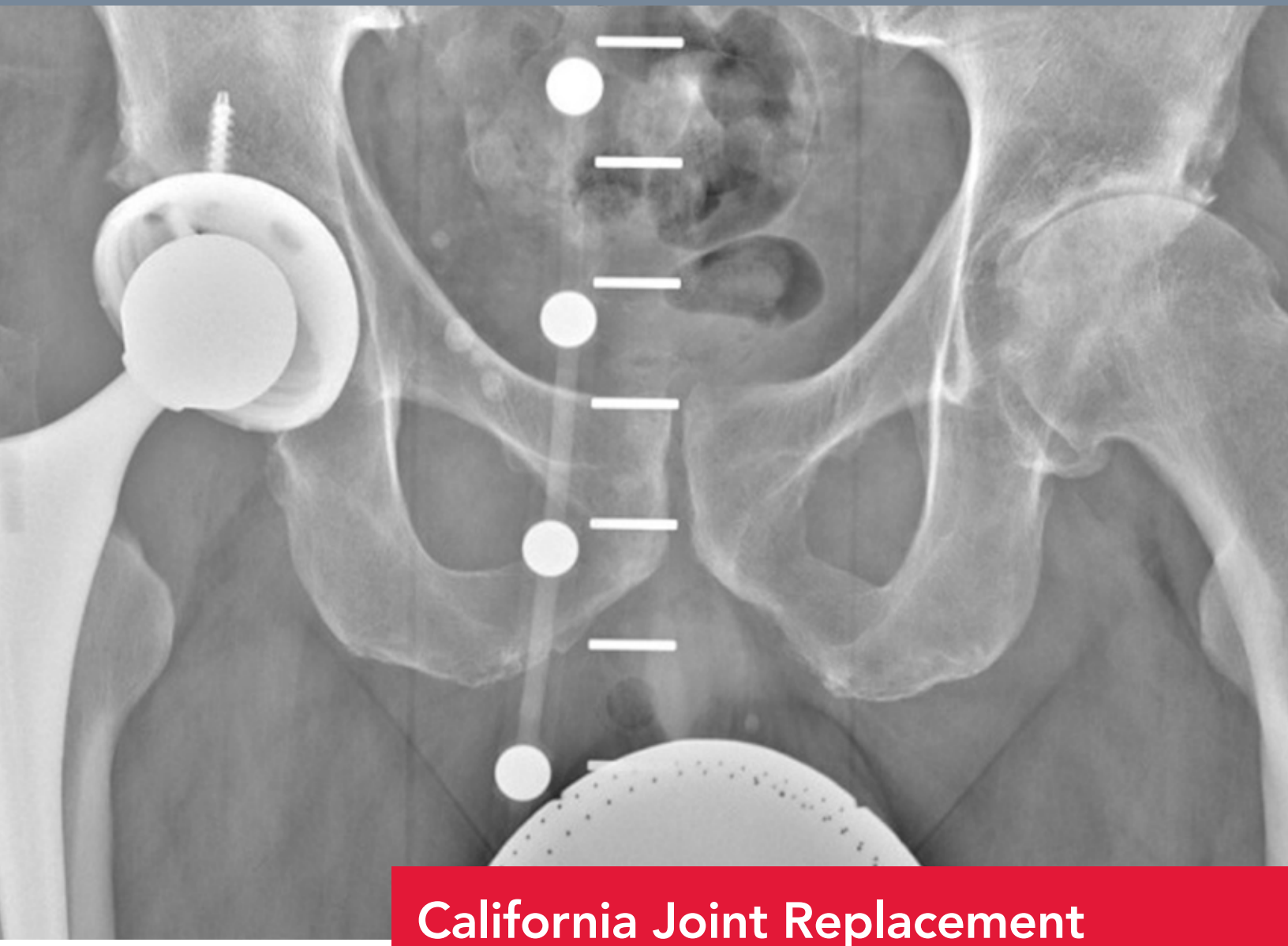
California
Joint Replacement
Registry



California Joint Replacement Registry: Progress Update

JUNE 2014

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About the Registry

The California Joint Replacement Registry (CJRR) collects and analyzes data from hip and knee replacement surgeries performed across California. The CJRR is one of only a handful of such registries nationwide that routinely collect patient-reported outcomes (PROs), as well as clinical information and data about implanted devices.

Learn more at www.caljrr.org.

From the CJRR Steering Committee

We are pleased to present you with a progress update on the California Joint Replacement Registry (CJRR). This report presents findings from our first two years of data collection, April 2011 to April 2013, and includes information about 5,100 hip and knee replacement surgeries from nine hospitals and 61 surgeons. Data is continuously reported to the registry and future reports will provide updated data.

The CJRR was created to meet the need for comprehensive, scientific assessment of devices, treatment protocols, surgical approaches, and patient factors that influence the outcomes of hip and knee replacement surgeries. Founded in 2009 by the California HealthCare Foundation (CHCF), the primary funder; the Pacific Business Group on Health (PBGH); and the California Orthopaedic Association (COA), the registry is designed to serve as a resource for evidence-based comparative effectiveness by pooling and analyzing data from surgeons and hospitals across California. The CJRR aims to enable better decision-making by patients, purchasers, physicians, hospitals, and other providers by making available and promoting the use of performance information on hip and knee replacements.

The CJRR plays a unique role because it collects and incorporates clinical information and direct feedback from patients about the outcomes of hip and knee replacements. The CJRR is at the forefront of this work, as it is one of only a handful of multi-institutional, orthopedic Level 3 registries in this country.[1] (Level 3 registries include patient-reported outcome data as well as payer, provider, clinical, surgical, laboratory, pharmacy, and device information.)

The CJRR is supported by many large purchasers of health care in California:

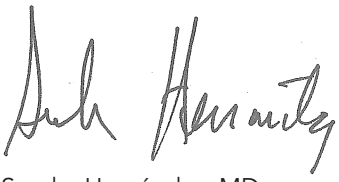
- Anthem, Blue Shield, and Cigna have provided funding to the CJRR;
- Model contracts for Covered California, the state-run individual health insurance exchange, include the CJRR;
- The PBGH Negotiating Alliance[2] has included the CJRR metrics in its selection criteria for its Center of Excellence programs; and
- The California Public Employees' Retirement System (CalPERS), an agency that manages health benefits for more than 1.6 million Californians, has highlighted CJRR participants in its member facing materials and on www.castlighthealth.com, indicating that CJRR participants collect patient-reported outcomes and participate in the registry.

Since the close of the data period informing this report, the CJRR has doubled in size (containing over 10,000 cases at the time of printing this report). By the end of 2014, we expect approximately 30 hospitals and affiliated participating surgeons to have joined the registry, representing hospitals that perform 30% of California's total volume of hip and knee replacements. In addition, Kaiser will report its hospital-level data with the CJRR, allowing the CJRR to report on procedures at hospitals that perform 50% of the total hip and knee replacements in California.

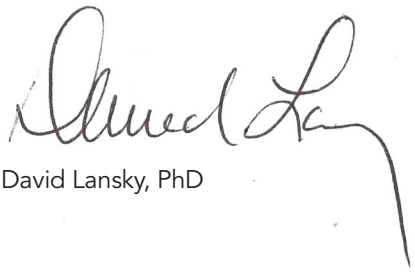
We hope you find this report useful and informative. For more information about the CJRR, please visit www.caljrr.org.

Regards,

Kevin Bozic, MD MBA



Sandra Hernández, MD



David Lansky, PhD

Introduction

The health care landscape is changing; new tools are available for measuring health outcomes, there is a rise in the public reporting of provider performance, and a strong focus on providing data on quality and value. While this data is becoming more readily available, there is still a dearth of actionable data on outcomes associated with joint replacement surgery. The CJRR is uniquely positioned to play a major role in making this information available to help surgeons and hospitals deliver better outcomes, patients to identify the highest quality providers, and payers to reward high-performing providers.

With more than 90,000 procedures performed and over $8.1 billion in annual hospital and surgeon charges each year in California alone, hip and knee replacements are among the highest volume and highest cost surgeries for both Medicare and private payers.[3] Moreover, the volume of joint replacements is expected to continue its rapid growth with a projected yearly rate of over 4 million procedures in the US by 2030. The CJRR is providing critical information on quality and patient outcomes that will enable better decision-making by patients, purchasers, physicians, hospitals, and other providers, thereby improving the overall quality of care for these surgeries.[4]

Research shows that hip and knee replacement procedures can successfully alleviate pain and improve function for patients who suffer from disabling arthritis of the hip and knee.[5] Despite these benefits, as volume and costs increase, there is a largely unmet need for continuous, comprehensive, scientific assessment of devices, treatment protocols, surgical approaches, and identification of patient factors influencing the outcomes of these surgeries.

Figure 1. Hospitals Currently Participating in the CJRR

Notes: See appendix for a list of the hospitals that contributed data to this report. For additional information about the CJRR and our participating hospitals, please visit our website at www.caljrr.org.

Currently Participating

Alta Bates Summit Medical Center
California Pacific Medical Center
Cedars-Sinai Medical Center
Dameron Hospital
Eisenhower Medical Center
Hoag Orthopedic Institute
Holy Cross Medical Center
John Muir Medical Center
Little Company of Mary Medical Center
Lodi Memorial Hospital
Long Beach Memorial
Memorial Medical Center
Methodist Hospital of Sacramento
Mills-Peninsula Medical Center
Novato Community Hospital
Orange Coast Memorial
Presbyterian Intercommunity Hospital
Saddleback Memorial
Scripps Green Hospital
Stanford Hospitals and Clinics
Stanislaus Surgical Hospital
St. Bernardine Medical Center
St. Joseph Medical Center
St. Joseph's Hospital of Orange
St. Jude Medical Center
St. Mary's Medical Center
Sutter Medical Center
Tahoe Forest Hospital
Tri-City Medical Center
USCF Medical Center

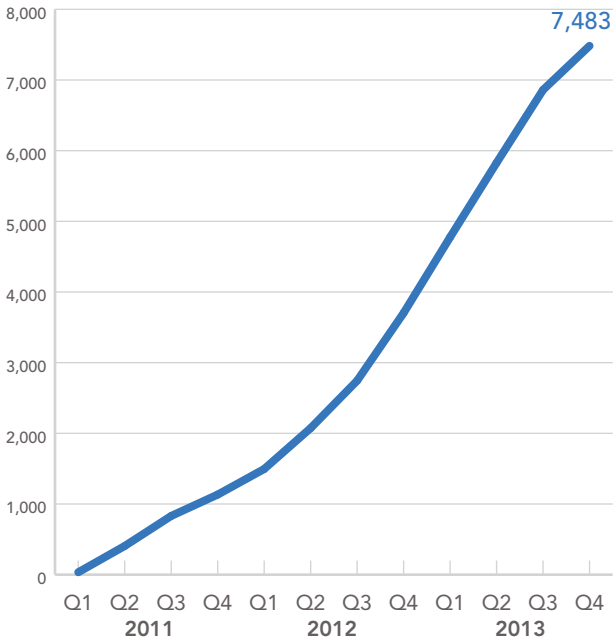
The Benefits of a Joint Registry for California

The CJRR started with a pilot from January through October 2011 in three hospitals. Following the pilot, the CJRR has been expanding across the state.

The CJRR collects detailed case information from its registered patients, including approximately 140 data elements related to patient demographics, clinical and surgical data, and patient-reported outcomes. Since the close of the data period informing this report, the CJRR has doubled in size (see Figure 2). The CJRR is one of only a handful of registries in the US that collects and reports feedback directly from patients concerning outcomes of their hip and knee replacement surgeries along with clinical and surgical data.

Participating hospitals, medical centers, and surgeons receive quarterly, confidential reports that show patients' improvement on functional status and pain measures, along with key clinical quality indicators. Benchmarks highlight how surgeons and sites compare to each other and to the CJRR overall. Participants are able to use CJRR reports to monitor key quality indicators, such as infection rates, compare their performance to benchmarks, and identify opportunities for continuous improvement.

Figure 2. CJRR Cumulative Case Volume



Source: The CJRR, April 2011 to December 2013.

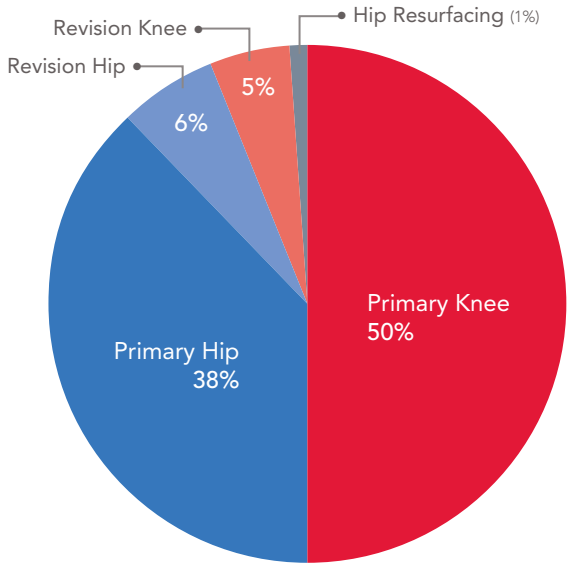
Key Findings

This report covers hip and knee replacement surgeries that were submitted to the CJRR for 5,100 cases performed between April 2011 and April 2013. The CJRR directly surveys patients about their pain and function before, and at set intervals after, their surgery. CJRR data is captured electronically from surgeons and hospitals and uses ICD-9 codes, as well as other clinical information submitted by hospitals and physicians. These data include information on implants and surgical approach that will be used to identify potential patient safety issues and contribute to comparative effectiveness research.

Key observations from the CJRR data presented in this report include:

- **More procedures, younger patients.** CJRR data suggest that California is following national trends with more and more patients having joint replacements and (on average) having them at a younger age.
- **Improvements in pain and function.** Patients undergoing surgery at hospitals participating in the CJRR report improvements in pain, function, and overall health.
- **An abundance of complex conditions.** Patients with knee or hip arthritis who undergo surgery at hospitals participating in the CJRR often have a variety of other medical conditions that make their operations more challenging. For example, 35% of CJRR patients fit the Centers for Disease Control and Prevention's definition of obesity.
- **Shorter lengths of stay.** A majority of patients who have hip or knee replacements at hospitals participating in the CJRR have a hospital stay of fewer than 3 days.

Figure 3. Joint Replacement Procedure, by Type CJRR Participating Hospitals



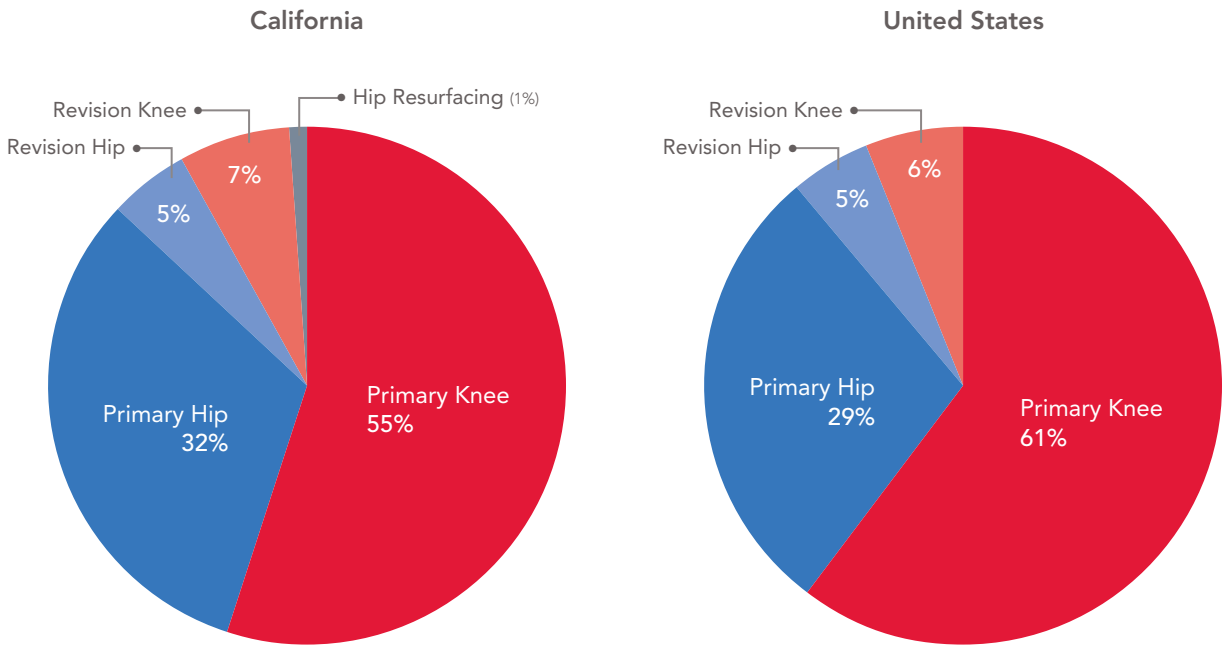
Source: The CJRR, April 2011 to December 2013.

As expected, most of the procedures being submitted to the CJRR are primary (first time) knee and hip replacements (Figure 3). This distribution is similar to both California and national distributions (Figure 4).

Patient-Reported Outcomes

As mentioned above, the CJRR surveys patients about their pain and function. Patient-reported outcome (PRO) surveys ask questions about physical, mental, and social health, including movement, pain, fatigue, depression, and satisfaction with ability to perform activities of daily living. CJRR collects PRO data about general quality of life using the SF-12 Health Survey and about a patient's experience of hip and knee pain and function using two additional surveys: the HOOS/KOOS Western Ontario and McMaster Universities Arthritis Scale (WOMAC), and the UCLA Activity Scale.

Figure 4. Joint Replacement Procedure, by Type, All California Hospitals vs. All US Hospitals



Sources: OSHPD, 2011 (California). HCUP, 2012 (US).

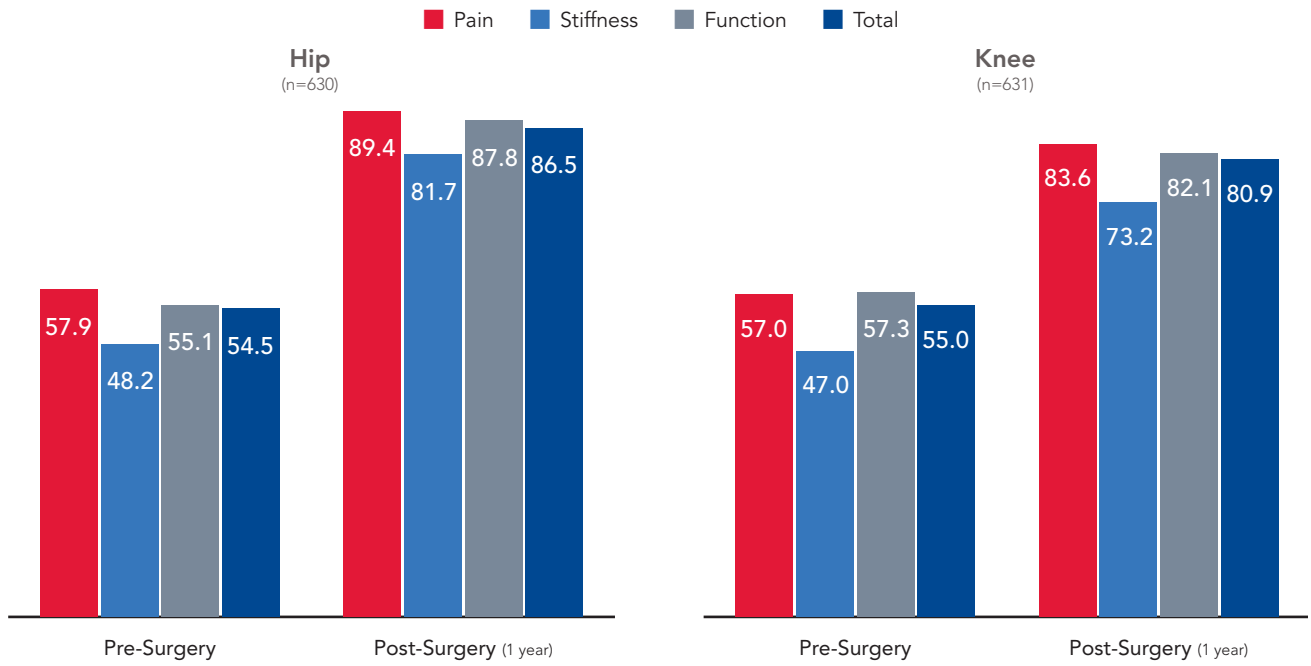
- The **Western Ontario & McMaster Universities Osteoarthritis Index (WOMAC)** assesses a patient's hip and knee pain and function on a scale of 1 to 100, with 100 being maximum function and minimum pain, by asking questions related to a patient's activities such as:
  - "How much pain do you have when walking on a flat surface? "…or sitting?"
  - "How severe is your stiffness when you first wake up in the morning?"
  - "How much difficulty do you have when getting up from a sitting position?"
- The **12-Item Short Form Health Survey (SF-12)** assesses a patient's general quality of life. As with the WOMAC, the SF-12 has a scale of 0 to 100, with 100 indicating a maximum positive score.
- The **UCLA Activity Score** surveys a patient's hip and knee pain and function on a 10-point scale from a 1 – "wholly inactive: dependent upon others; cannot leave residence," to a 5 – "sometimes participate in moderate activities," to a 10 – "regularly participate in impact sports, such as jogging, tennis, skiing, acrobatics, ballet, heavy labor, or backpacking."

The CJRR offers multiple options for PRO survey completion. Patients can complete their PRO surveys online using a secure CJRR web-based interface (on a phone, computer, or tablet) or in a paper form that can be sent directly to CJRR via secure electronic fax. This reduces the administrative burden on surgeons and staff and ensures that PRO collection is uniform and complete.

CJRR patients undergoing primary hip or knee replacement experienced dramatic increases in function and reductions in pain. Hip replacement patients experienced greater overall improvements than knee replacement patients, consistent with the findings from hip and knee replacement registries outside the US (Figure 5).[6]

Primary knee and hip replacement patients in the CJRR database who responded to the PRO survey questionnaire reported improvements in both physical and mental

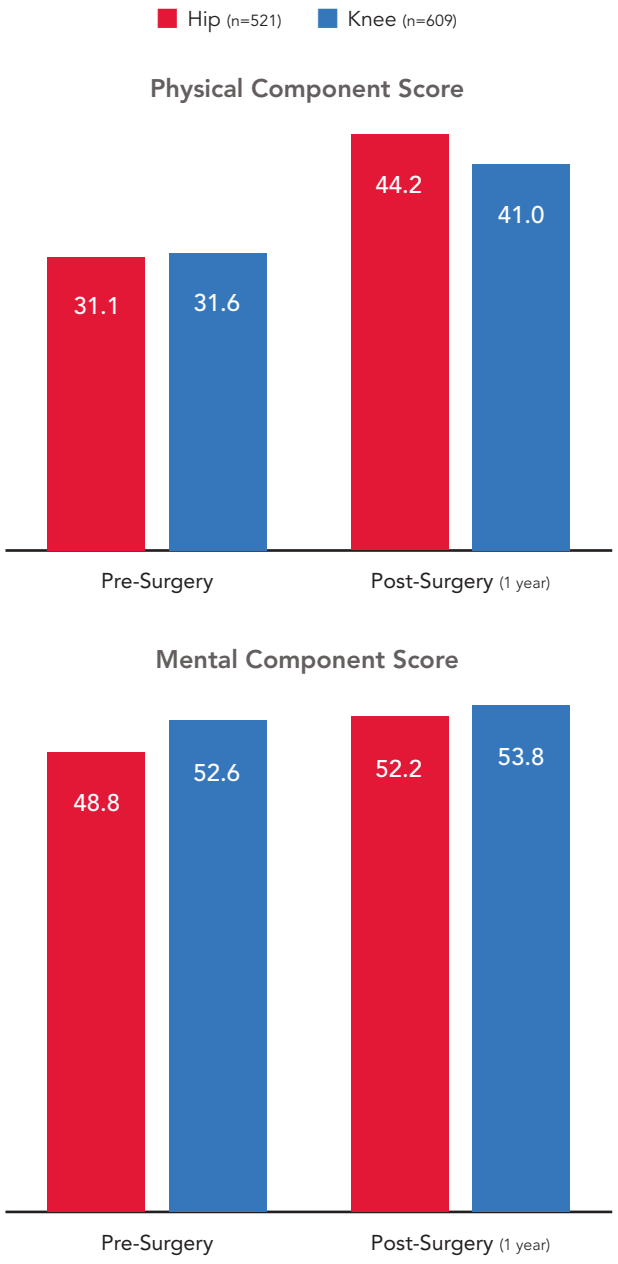
Figure 5. WOMAC Score, CJRR Patients Undergoing Primary Hip and Knee Replacements



Source: The CJRR, April 2011 to April 2013.

health status. Improvements in physical component scores were more dramatic than improvements in mental component scores, consistent with previously published literature based on patients who undergo primary hip and knee replacement (Figure 6).[7]

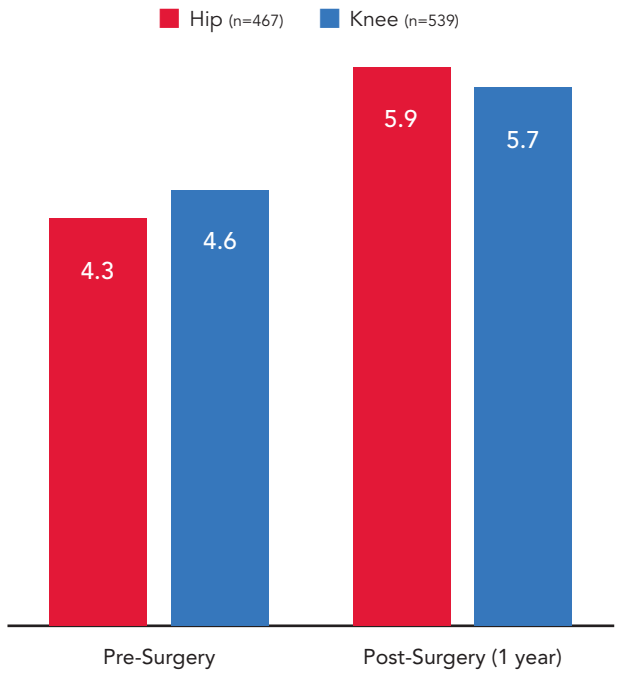
Figure 6. SF-12 Physical and Mental Component Score, CJRR Patients Undergoing Primary Hip and Knee Replacements



Source: The CJRR, April 2011 to April 2013.

The UCLA Activity Index also documents improvements in patients' overall activity levels for the same surgeries performed at CJRR hospitals. On average, knee replacement patients increased their activity score by roughly 23%, while hip replacement patients increased their activity score by roughly 37% (Figure 7).

Figure 7. UCLA Activity Score, CJRR Patients Undergoing Primary Hip and Knee Replacements



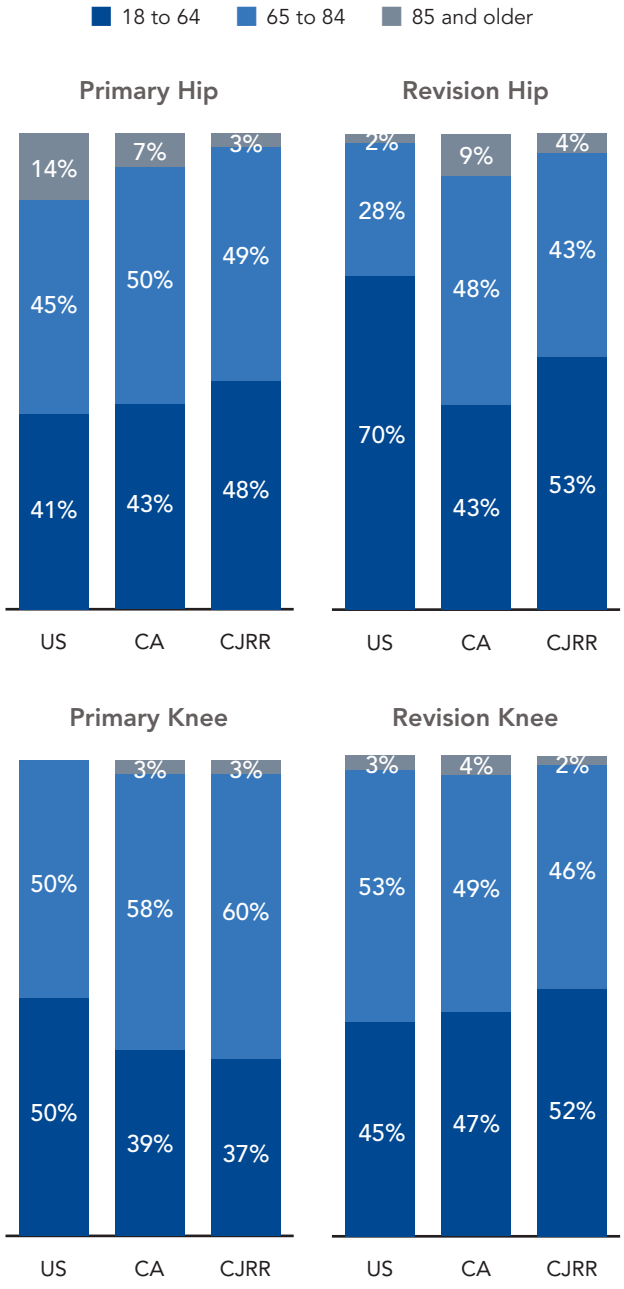
Source: The CJRR, April 2011 to April 2013.

Age Distribution

Patients having hip and knee replacements at CJRR hospitals are similar in age to those seen at other hospitals in California and also across the US (Figure 8, page 9).

National literature shows that patients are having total hip and knee replacements at younger ages. If the historical growth trajectory of joint replacement surgeries continues, demand for primary hip and knee replacement among patients in the US less than 65 years old is projected to exceed 50% of hip and knee replacement patients of all ages by 2016.[8]

Figure 8. Primary and Revision Hip and Knee Replacements, by Age, US, CA, and CJRR Patients



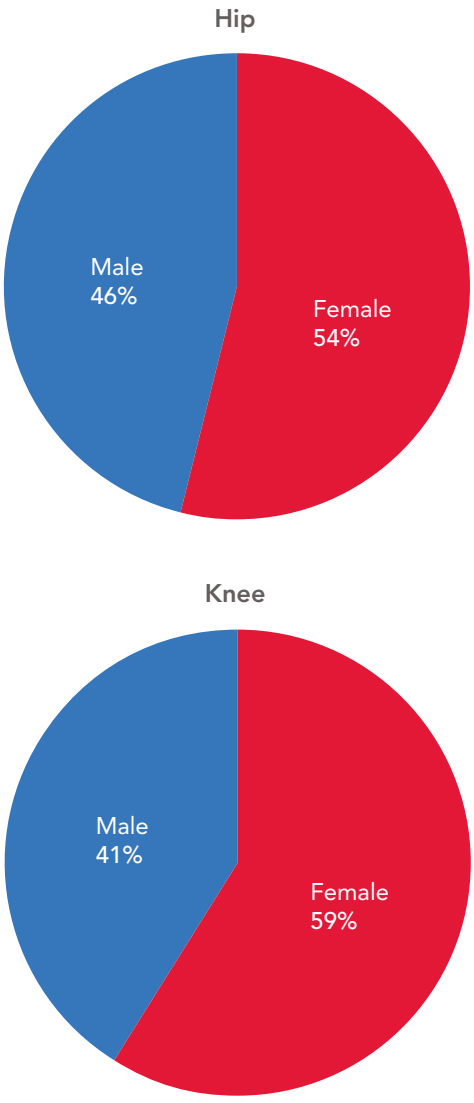
Sources: HCUP (US), 2011. OSHPD (CA), 2011. The CJRR, April 2011 to April 2013.

Gender Distribution

Hip and knee replacement patients in the CJRR data have roughly the same gender distribution (female 54%, male 46%) as seen nationally and in California (Figure 9).

Traditionally, more women than men have been the recipients of hip and knee replacements. Several factors contribute to this trend, including the fact that osteoarthritis is the primary driver for a hip or knee replacement and women, on average, suffer from arthritis at a rate higher than that of men.[9]

Figure 9. Hip and Knee Replacements, by Gender CJRR Patients



Source: The CJRR, April 2011 to April 2013.

Body Mass Index

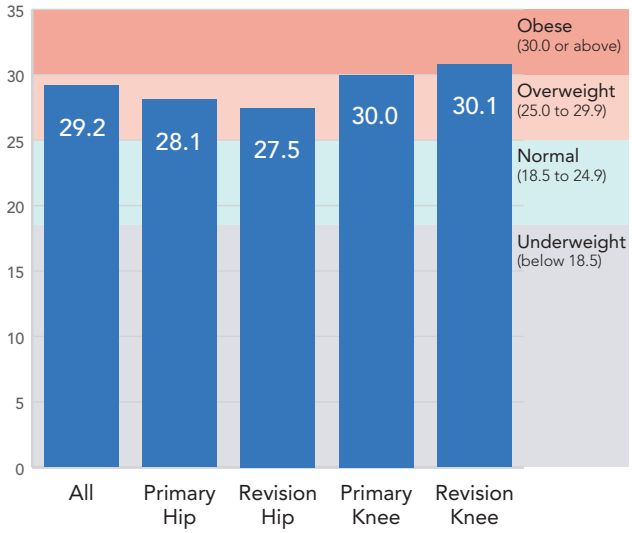
Body Mass Index is a known risk factor contributing both to the deterioration of joints, leading to the need for joint replacement, and to complications following surgery. Higher BMI is predictive of hip and knee replacement failure.[10] California's average BMI is currently assessed at 26.9.[11] In future reports, the CJRR will report on additional risk factors, such as diabetes and heart failure, that can affect a patient's joint replacement outcome.

As seen in Figure 10, CJRR joint replacement patients, on average, are 4% heavier than the state average.

- Eighty percent of patients presenting for a primary total knee replacement at CJRR hospitals are overweight.
- Sixty-seven percent of patients presenting for a primary total hip replacement at CJRR hospitals are overweight.

Patients who are clinically overweight or obese tend to have a higher prevalence of other health conditions, including heart disease, stroke, type 2 diabetes, high blood pressure, high cholesterol, certain types of cancer, and other health problems. The presence of these comorbidities can complicate the management of these patients before, during, and after a major surgery like joint replacement.

Figure 10. Body Mass Index, CJRR Patients



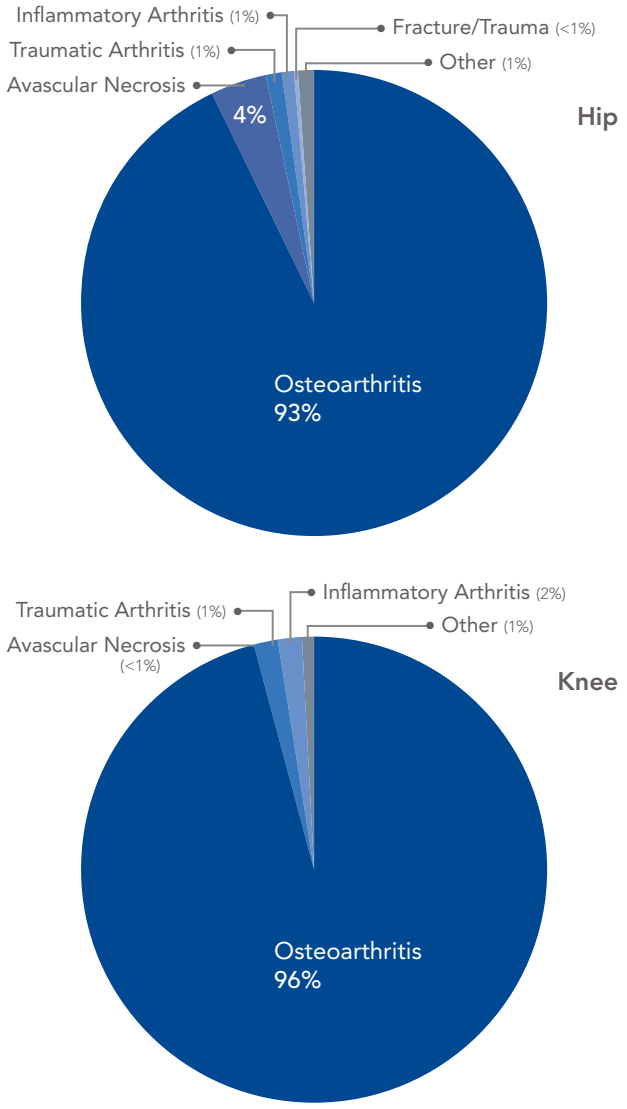
Source: Centers for Disease Control and Prevention. What Is BMI? www.cdc.gov.

Principal Diagnoses for Hip and Knee Replacements

Primary Replacements

Patients may require hip or knee replacements due to damage to the joints from a variety of causes. The most common diagnosis found in the CJRR for hip and knee replacement is osteoarthritis (Figure 11). The major diagnosis categories for patients in the CJRR are similar to national and international trends.

Figure 11. Principal Diagnosis for Total Hip and Knee Replacement, CJRR Patients



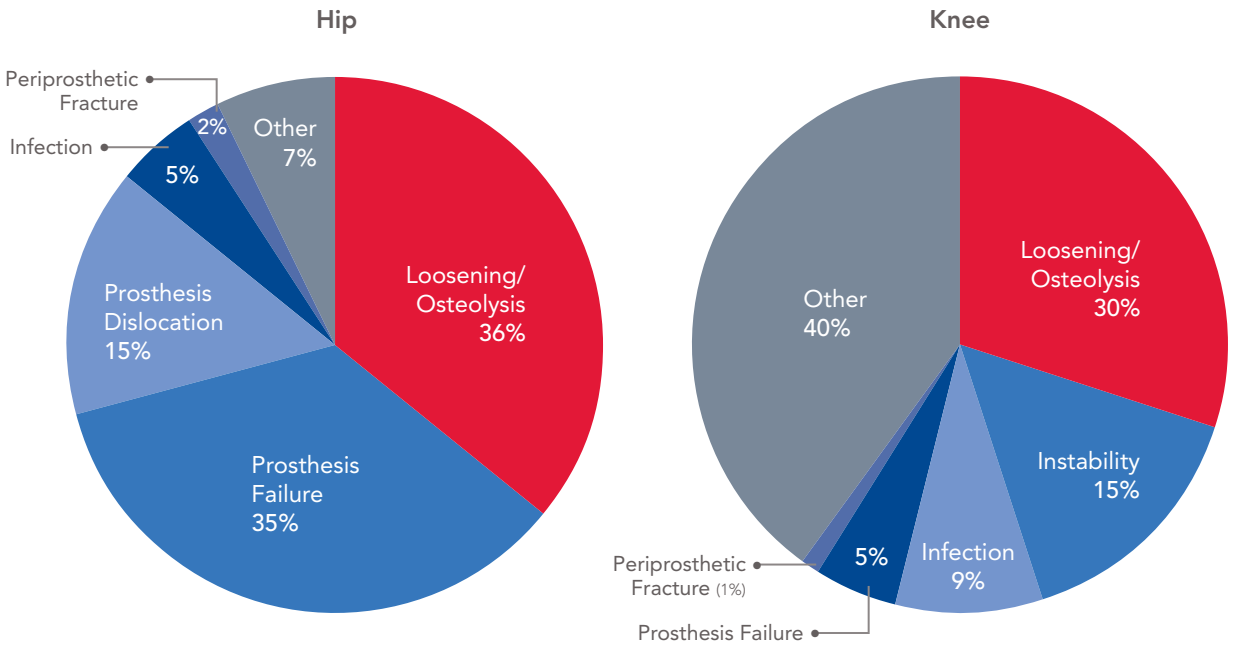
Source: The CJRR, April 2011 to April 2013.

Revisions

Unfortunately, many hip and knee replacements have to be revised (redone). For the time period between 1990 and 2002, the mean hip revision rate of 17.5% and the mean knee revision burden of 8.2% remained stable in the US.[12] In contrast, Sweden credits its registry programs for reducing the national hip revision rate to 7.5% and its knee revision rate to 6.4%.[13] In addition to the significant burden that a revision means to patients, such procedures are also very costly. Average hospital cost estimates for revision surgery range from $19,000 to $31,000.[14,15] Registries can be helpful in providing information on device failures and targeting areas for improvement.

The most common reasons for revision of total knee or total hip replacement are device loosening or failure, dislocation and instability, and infections (Figure 12).[16]

Figure 12. Principal Diagnosis for Revision of Total Hip and Knee Replacement, CJRR Patients

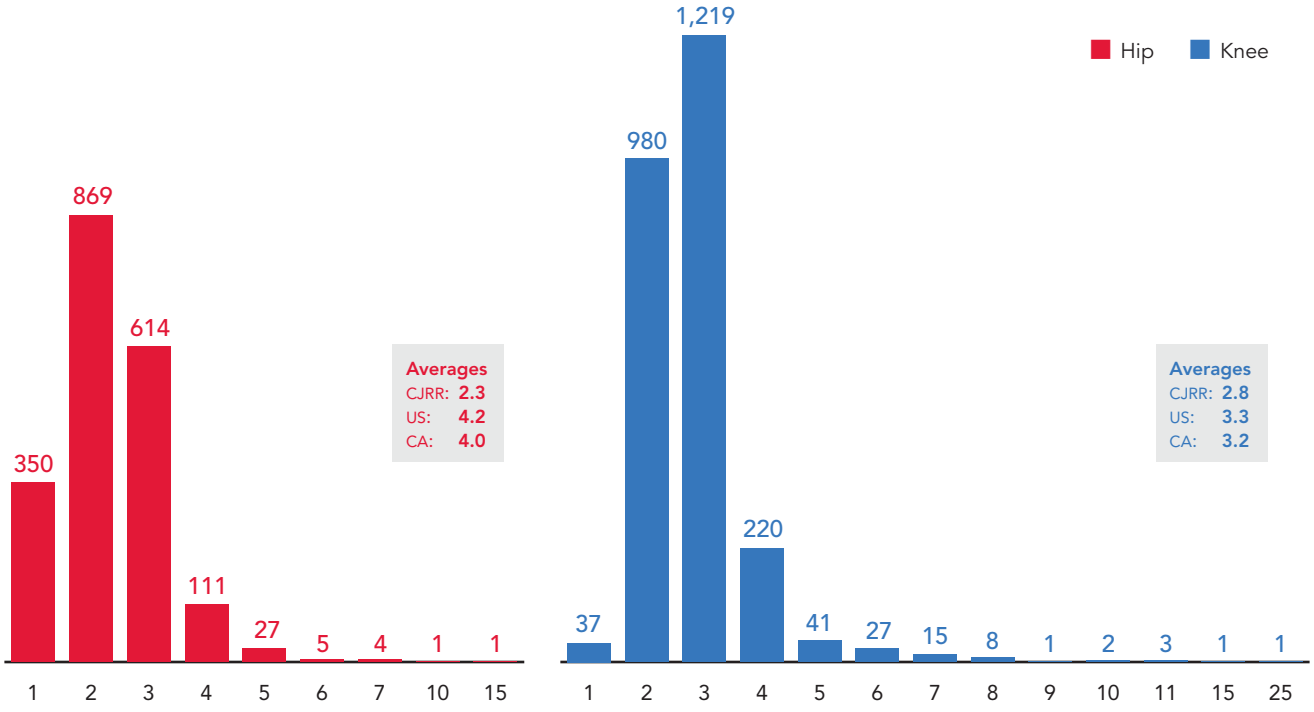


Source: The CJRR, April 2011 to April 2013.

Length of Stay

Much of the cost related to a total joint replacement comes from the length of stay (LOS) in a hospital. CJRR hospitals have lower lengths of stay than California and US hospitals.

Figure 13. Distribution of Patients by Length of Stay, in Days, Primary Hip and Knee Replacements, CJRR Patients



Sources: The CJRR, April 2011 to April 2013. HCUP State Inpatient Databases and Nationwide Inpatient Sample (US), 2010. OSHPD (CA), 2010.

Appendix: CJRR Participating Hospitals* and Cases Reported

FACILITY	DATE JOINED CJRR	CASES REPORTED
Alta Bates Summit Medical Center	11/14/2012	265
Cedars-Sinai Medical Center	1/1/2012	491
Hoag Orthopedic Institute	1/1/2012	2,747
John Muir Medical Center (two campuses reporting)	11/14/2012	187
Presbyterian Intercommunity Hospital (PIH)	3/31/2013	40
St. Joseph's Hospital of Orange	3/31/2013	61
Stanford Hospitals and Clinics	11/5/2012	304
UCSF Medical Center	1/1/2012	1,043

The CJRR is grateful to these hospitals for their participation in this voluntary effort. These hospitals constitute the first wave of hospitals to join the CJRR and this report is being published with their consent. The CJRR team also thanks the physician, executive, and service-line leadership at all of the participating sites and their surgeons for supporting this project. The CJRR continues to actively recruit hospitals throughout the state. For the most current list of participating hospitals, or for more information on joining the CJRR, please visit www.caljrr.org.

*Includes only those CJRR hospitals whose data is included in this report.

Endnotes

1. The other two multi-institutional orthopedic Level 3 registries actively collecting patient-reported outcomes are: FORCE – TJR and MARCQI (Michigan).
2. The PBGH Negotiating Alliance leverages the purchasing power of 15 large employers to achieve competitive pricing and health plan accountability for quality and data.
3. Healthcare Information Division Patient Discharge Data, 2011, California Office of Statewide Health Planning and Development.
4. S.M. Kurtz, K. Ong, E. Lau, F. Mowat, M. Halpern. "Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030." *Journal of Bone and Joint Surgery (Am).* April 2007; 89(4):780–5.
5. C.A. Jones, S. Pohar. "Health-related quality of life after total joint arthroplasty: a scoping review." *Clinical Geriatric Medicine.* August 2012; 28(3):395–429.
6. Robert B. Bourne, MD, FRCSC, Bert Chesworth, PhD, Aileen Davis, PhD, Nizar Mahomed, MD, FRCSC, and Kory Charron, DipMET. "Comparing patient outcomes after THA and TKA: Is there a difference?" Clinical Orthopaedics and Related Research; Rolfson, A., Rothwell, A.G., Chenok, K., Bohn, E., Bozic, K., Garellick, G. "Use of patient-reported outcomes in the context of different levels of data." *Journal of Bone and Joint Surgery (Am).* 2011; 93 Suppl 3(E):66–71.
7. Patricia D. Franklin, MD, Wenjun Li, PhD,and David C. Ayers, MD. "Functional outcome after total knee replacement varies with patient attributes." *Clinical Orthopaedics and Related Research.* November 2008; 466(11): 2597–2604.
8. S.M. Kurtz, K.J. Bozic, et al. "Young patient demand for primary and revision joint replacement: national projections from 2010 to 2030," *Clinical Orthopaedics and Related Research.* 2009; 467:2,606–12.
9. Who gets arthritis? Arthritis Foundation, www.arthritis.org; Medline Plus. Hip Joint Replacement, www.nlm.nih.gov.
10. J.R. Foran, M.A. Mont, G. Etienne, L.C. Jones, D.S. Hungerford. "The outcome of total knee arthroplasty in obese patients." *Journal of Bone and Joint Surgery (Am).* August 2004; 86-A(8):1,609–15.
11. Adult Obesity in California. Research Brief. Issue 111, September 2006. Public Policy Institute of California.
12. S.M. Kurtz, K. Ong, E. Lau, F. Mowat, M. Halpern, "Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030." *Journal of Bone and Joint Surgery.* April 2007; 89(4):780–5.
13. K.J. Bozic, P. Katz, M. Cisternas, L. Ono, M.D. Ries, J. Showstack. "Hospital resource utilization for primary and revision total hip arthroplasty." *The Journal of Bone and Joint Surgery (Am).* March 2005; 87(3):570–6.
14. K.J. Bozic; S.M. Kurtz; E. Lau; K. Ong; T.P. Vail; D.J. Berry, MD. The "Epidemiology of revision total hip arthroplasty in the United States." *The Journal of Bone and Joint Surgery (Am).* 2009; 91: 128–33.
15. K.J. Bozic, M.D. Ries. "The impact of infection after total hip arthroplasty on hospital and surgeon resource utilization." *Journal of Bone and Joint Surgery (Am).* August 2005; 87(8):1,746–51.
16. K.J. Bozic, MD, MBA. "CMS changes ICD-9 and DRG codes for revision TJA." AAOS Bulletin. June 2005.

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