The Economic Burden of Osteoarthritis

Ryan Bitton, PharmD, MBA

Abstract

As the most common form of joint disease, osteoarthritis (OA) is associated with an extremely high economic burden. This burden is largely attributable to the effects of disability, comorbid disease, and the expense of treatment. Although typically associated with less severe effects on quality of life and per capita expenditures than rheumatoid arthritis, OA is nevertheless a more costly disease in economic terms because of its far higher prevalence. At the same time, the burden of OA is increasing. While direct and indirect per capita costs for OA have stabilized in recent years, the escalating prevalence of the disease—partly a function of the rapid increase in 2 major risk factors: aging and obesity—has led to much higher overall spending for OA. Approximately one-third of direct OA expenditures are allocated for medications, much of which goes toward pain-related agents. Hospitalization costs comprise nearly half of direct costs, although these expenditures are consumed by only 5% of OA patients who undergo knee or hip replacement surgery. However, while these surgeries are costly, they also appear to be quite cost-effective in the long term. Indirect costs for OA are also high, largely a result of work-related losses and home-care costs. Despite the need for wide-ranging and up-to-date data on the economics of OA treatment to clarify the most effective treatments and the best use of resources, this area of study has received insufficient research attention.

(Am J Manag Care. 2009;15:S230-S235)

For author information and disclosures, see end of text.

Osteoarthritis (OA) is a degenerative joint disease characterized by joint pain and dysfunction caused by a progressive and irreversible loss of articular cartilage.[1] OA is the most common form of arthritis, affecting nearly 27 million Americans or 12.1% of the adult population of the United States.[2] This compares to slightly less than 1.3 million Americans with rheumatoid arthritis representing 0.6% of the adult population.[3] A study conducted by the Centers for Disease Control and Prevention in cooperation with the Harvard School of Public Health found that OA is the fifth leading cause of disability in older Americans after cardiovascular, cerebrovascular, and pulmonary diseases.[4]

Although OA is both a common and highly burdensome disease, the study of costs associated with OA has been neglected to a surprising degree. This stems, in part, from the fact that OA has often been lumped in with other diseases under the rubric "musculoskeletal conditions" and cost-related studies frequently fail to separate the expenditures associated with OA.[5] The present article will attempt to clarify the direct and indirect costs of OA based on the available published data.

OA Epidemiology

Increased age is the primary risk factor for OA, but there are other important risk factors for the disease including obesity, injuries to joint areas, and rigorous physical activity such as engagement in intensive sports.[6] As the US population ages, and as the well-known obesity epidemic in this country continues to unfold, the prevalence and burden of OA has been steadily increasing. From 1995 to 2005, the number of adults with OA increased by approximately 6 million people.[2,7] This increase is paralleled by similar growth in the larger population suffering from arthritic and rheumatoid conditions which has increased from 36.8 million adults in 1997 (18.7% of US adults) to 46.1 million in 2003 (21.5% of US adults), a notably large proportional increase over a period of just 6 years.[8] This larger population consists of condition A, condition B, and related conditions, in addition to OA and rheumatoid arthritis. Indeed, the number of adults in the United States with clinically diagnosed arthritic conditions is expected to reach nearly 67 million people, or 25% of the adult population, by 2030 (**Figure 1**).[9] Twenty-five million of these, 9.3% of US adults, are projected to experience activity limitations as

DOCUMENTING THE FUTURE OF AMERICAN HEALTHCARE
ajmc.com
© Managed Care & Healthcare Communications, LLC

a result of their arthritis.[9] The consequent burden, in both quality-of-life and economic terms, great as they are now, can be expected to be very substantial indeed.

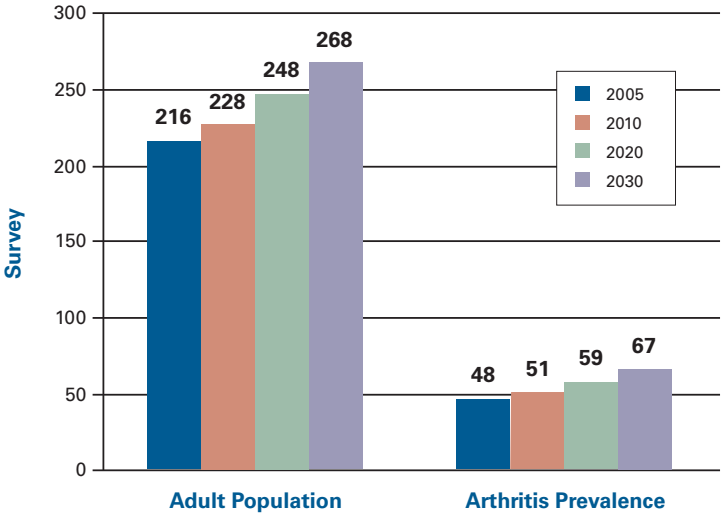
Cost of Care

A 1997 analysis of the economic costs of musculoskeletal disorders in 5 industrialized countries (Australia, Canada, France, United Kingdom, and United States), in which OA was the most common of these disorders, found a rising trend of costs that had, by then, reached between 1% and 2.5% of the gross national product of these countries.[10] A continued upward trend is reflected in data from the United States in which, in 1997, the total medical expenditures for arthritis and other rheumatic conditions were $233.5 billion.[8] By 2003, these costs had increased to $321.8 billion after factoring in inflation. A substantial part of these costs are specific to OA. One estimate, by Leigh et al, put the total annual costs of OA at $89.1 billion.[11] They further estimated that between $3.4 billion and $13.2 billion of that expenditure was due solely to job-related OA, making job-related OA more costly than asthma and pulmonary diseases, and also more than renal and neurologic diseases combined.[11]

Indirect Costs Analyses

The indirect cost burden discussed below refers to those costs incurred not as a result of medical management of the disease but rather of other incurred losses such as lost wages, lost productivity, and expenditures resulting from the need for home care and child care that would otherwise not be incurred. Taken together, these costs can be quite substantial. A Canadian study estimated the annual indirect costs for OA at US$1760 per person (compared with US$3952 direct annual costs).[12] A more recent analysis, based on a claims database comprising 5 million privately insured individuals, put the indirect costs of OA at $4603 per person annually.[13] An analysis of costs related to OA compared with patients without OA or rheumatoid arthritis, but who might have other illnesses, found that patients with OA required 3 more days of medical care per year than controls and experienced significantly greater costs for issues such as home care, child care, medical equipment, and home remodeling necessary to address

Figure 1. Projected US Adult Population (≥18 Years) and Prevalence of Doctor-Diagnosed Arthritis From 2005 to 2030 Based on National Health Interview Survey[9]



disability.[14] In addition, 9.4% of OA patients were unable to acquire jobs as a result of their illness compared with 5.2% of nonarthritic patients.

The impact of arthritic diseases on earnings has increased on aggregate in recent years, with $108 billion of earnings being lost in 2003 to people with arthritic conditions, an increase of $9 billion from 1997.[8] However, the amount of estimated lost wages on a per capita basis, although still highly significant, fell between 1997 and 2003 from $4551 to $3613 per person.

Costs of Comorbid Disease. The economic impact of comorbid disease may be defined as indirect to the extent that such costs are not directly related to the treatment of OA. The influence of comorbidities is underscored by results from a study based on the Olmsted County, in Minnesota Health Care Utilization and Expenditures database showing that people with OA incur costs at a much higher rate than all other body systems (ie, excluding the musculoskeletal system) compared with nonarthritic controls. These included respiratory, cardiovascular, gastrointestinal, neurological, endocrine, psychiatric, renal and digestive systems (P <.0001 for all systems, OA vs controls).[15] These data also underscore the fact that OA patients incur statistically significantly more costs for diagnostic and therapeutic procedures, in-hospital care,

imaging studies, physician services, equipment, and laboratory studies compared with nonarthritic patients.[15] Furthermore, OA patients experience significantly higher rates of work disability compared with controls.[16]

An analysis of medical claims from a major third-party payer, which sought to determine the contribution of comorbidities to the cost of OA treatment, found that OA patients cost between 1.5 and 2.6 times more to treat than nonarthritic matched patients.[17] These results are supported by a survey of OA patients from 1999/2000 which observed a more than doubling in costs of treatment for patients with 3 comorbidities compared with those with no comorbidities.[12]

Direct Costs Analyses

Results from studies conducted to determine the direct costs of OA are somewhat heterogeneous, a result, in part, of different patient populations, different payers, different variables calculated, and different treatment locales. The Canadian study noted earlier found that direct costs for OA patients were US$3952 per person per year based on 1999 and 2000 data from a government health plan from the province of Ontario.[12] A study of claims filed with a US managed care plan between 1991 and 1993 compared the medical costs of OA patents with non-OA patients and subtracted the latter from the former to arrive at a figure of additional costs attributable to OA. This study also divided patients in 2 age groups: <65 years and ≥65 years. For the <65 years age group total annual costs were $5294, which was $2827 more than non-OA patients. OA patients 65 years or older had overall annual costs of $5704, which were $1963 higher.[18] Taken together, these data suggest OA costs are roughly double those of non-OA patients.

A study using data from a managed care organization over the course of 1 year starting in mid-1993 (but this time using Medicare reimbursement schedules to calculate costs) reckoned direct costs as a combination of medication use, ambulatory care, and hospital care. The annual figure for OA patients was just $543, nearly half (46%) of which was for hospital care and a third (32%) for medications.[19] Most of the hospitalization costs went to knee and hip replacements, and although they constituted a large proportion of total costs, they represented resources used by only 5% of the OA patients.[19] Medication costs, which amounted to $173 per person per year, were mainly split between nonsteroidal anti-inflammatory drugs (NSAIDs) and antiulcer drugs. OA patients used 3.3 office visits each year, 1.2 of which were for physical therapy. Interestingly, the same study found per patient costs for rheumatoid arthritis almost 5 times greater than per patient OA costs ($2612 vs $543), and yet total costs to the plan for OA patients were nearly 7 times as high due to the much higher prevalence of OA.[19]

The Medical Expenditure Panel Survey (MEPS) polled nearly 20,000 households (and more than 34,000 individuals) in 2003 about medical expenditures and wage losses among people with arthritic diseases and compared these data with similar polling they had conducted in 1997. The MEPS found that in adjusted 2003 dollars, the additional annual expenditure per patient with an arthritic disease remained almost unchanged from 1997 ($1762) to 2003 ($1752).[8] However, there was a shift in how these expenditures were distributed. Medication costs increased from $141 to $338 per person, and outpatient costs also increased, from $758 to $914. At the same time, inpatient costs decreased from $508 to $352 per person, as did residual costs (eg, home healthcare, medical devices, etc) from $223 to $146.[8]

Factors Influencing Costs

Disease Progression and Patient Status

To better understand how costs manifest in the OA population, it is useful to examine how factors such as disease severity and patient age impact expenditures. Gupta et al[20] looked at a Canadian cohort of 2411 patients aged 55 years or older with hip and knee OA and found that greater disability was associated with higher costs in a linear fashion, based on Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores.[21] Patients with WOMAC scores ≥55 had nearly 3.5 times the reported costs of those with a WOMAC score less than 15 (P <.0001). Losina et al recently reported data showing that annual direct costs for "end-stage" OA—that is, prior to hip or knee replacement—average $3800 per person but range considerably, from $2000 to $10,500.[22] These are nearly double the additional costs described in the studies previously discussed.

A 2009 Spanish study compared costs based on radiographic severity—using the Kellgren/Lawrence scale, which grades severity from 1 to 4—in 1071 OA patients and found that Grade 4 patients had direct annual costs that were approximately 45% higher than Grade 1 patients, although no difference was seen between Grades 1 through 3.[23] Total costs were 74% higher in Grade 4 compared with Grade 1 patients.

Impact of Medical Treatments

The above discussion of cost of treatment for OA has focused on average costs across patient populations. However, specific therapies (eg, NSAIDs, cyclooxygenase [COX]-2 inhibitors, opioid analgesics, topical agents, injectable products) differ in cost, although most studies addressing such expenditures deal with relative cost-effectiveness rather than the impact that individual agents have on total treatment costs.

Costs Associated With the Treatment of Pain. Data from a large claims database of a private insurer from 2003 to 2004 found that 15% of annual drug costs went to pain and pain-related medications.[13] Taking into account the fact that many of the 24,457 patients in the study took more than 1 medication, it is interesting to note that more than half (54%) took a COX-2 inhibitor, 46% used nonselective NSAIDs, 34% were prescribed antidepressants, while 9% took tramadol.[13] With regard to nonselective NSAID use, it is worth pointing out that 35% of the patient population was prescribed a proton pump inhibitor.

Costs Associated With Use of Viscosupplementation. Intraarticular hyaluronate (IAH) (also called viscosupplementation) for OA involves injections of hyaluronic acid into the affected joints. IAH, of which there are currently 5 available agents, is recommended in the clinical guidelines produced by the American College of Rheumatology (ACR) and Osteoarthritis Research Society International (OARSI).[24,25] The ACR recommends its use in patients who have failed nonpharmacologic therapy or "simple" analgesic therapy, and in patients for whom NSAIDs and COX-2 inhibitors are contraindicated. Little data are available regarding the effect of IAH on total OA costs, although the actual cost of IAH treatment for a period of 6 months has been estimated as varying from $852 to $1840 (in 2006 dollars, including injections, arthrocentesis, and office visits) depending on the specific regimen.[26] The remaining pharmacoeconomic data on IAH deal with its demonstrated efficacy in delaying joint replacement surgery.[27]

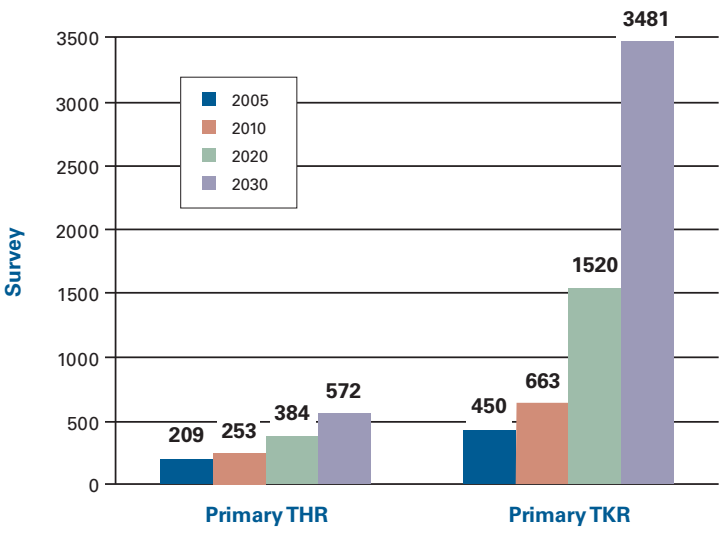
Epidemiology of Joint Replacement Surgery. The number of hip and knee replacement surgeries performed has been increasing and is projected to do so at a rapid rate. It has been estimated that hip arthroplasty will increase by 174% from 2005 to 2030, with 572,000 operations expected by the latter year.[28] Knee arthroplasty is expected to increase to an even greater extent, 673% by 2030, resulting in nearly 3.5 million such operations (**Figure 2**). The enormous growth in hip arthroplasty may be justified by the fact that, despite its high cost, total hip replacement (THR) is an extremely cost-effective treatment intervention.[29] Total knee replacement (TKR), although less well studied, appears to also represent a significantly cost-effective intervention.

The average age of a THR recipient in the United States is just under 68 years of age.[30] The likelihood of having the procedure increases with age up to the age range of 75 to 79 years.[31] At ages 75 to 79 years, 0.3% of US women have a THR compared with 0.25% of US men. In contrast, 0.64% of women have TKR between 75 and 79 years of age, whereas the peak age range for TKR in men is 80 to 84 years during which time 0.61% have the operation.

There is a paucity of US data that clarify the contribution of OA to the prevalence of TKR and THR. However, a recent Taiwanese study examined the diagnoses of recipients of THR and TKR from 1996 to 2004. The authors found that approximately 40% of all THRs occurred in patients with OA, while OA patients made up approximately 94% of all TKR subjects.[32]

Costs Associated With Use of Joint Replacement. The combined annual costs of knee and hip arthroplasty in 2007 are estimated to have been approximately $15.6 billion based on data compiled by the Healthcare Costs and Utilization Project (HCUP).[33,34] To better understand the cost of knee

■ **Figure 2.** Projected Number of Primary Hip and Knee Arthroplasties From 2005 to 2030 Based on Nationwide Inpatient Sample[28]



THR indicates total hip replacement; TKR, total knee replacement.

and hip arthroplasty, it should be noted that as more THRs and TKRs are undertaken, more revision procedures also take place. The cost of these secondary surgeries was examined in a study of Medicare expenditures from 1997 to 2003, which found that revision hip arthroplasty constituted 18.8% of all Medicare expenditures for hip replacement, while revision knee arthroplasty expenditures were 8.2% of all Medicare costs for knee replacement.[35] In 2007, Medicare paid for approximately 250,000 total and partial hip replacement surgeries, constituting nearly 62% of all such surgeries.[36] In the same year, Medicare paid for slightly less than 340,000 knee arthroplasties, which was 55% of the total nationwide.[37] The inpatient costs for primary THR are estimated to be between $30,000 and $38,000 for revision hip replacement.[29] Primary TKR costs have been estimated at approximately $21,000, while TKR revisions are nearer $25,000.[22]

Summary

The data described in this review define OA as a significant economic burden based on very substantial direct and indirect costs. Although not normally as clinically severe a disease as rheumatoid arthritis (to which it is often studied in parallel), because of its higher prevalence, OA greatly surpasses rheumatoid arthritis in overall economic impact. That said, this review underscores the many gaps in OA economic data. For example, data on OA costs need to be more consistently gathered both to understand patterns of expenditure and simply to have available up-to-date information. At the same time, such data must be more detailed to be fully useful. To be fully practical OA costs need to be stratified by demography (eg, age, sex, location), disease severity, as well as payer/benefit type. In addition, greater clarification of OA costs by treatment type—whether pharmacotherapy, TKR/THR, etc—is needed to get a fuller picture of OA costs. More rigorous data such as these would be of enormous benefit to managed care providers as well as clinicians themselves, allowing for a deeper understanding of the comparative effectiveness of OA treatments, which could then help to improve clinical, humanistic, and economic outcomes.

Author Affiliation: From Health Plan of Nevada, Inc, Las Vegas, NV.

Funding Source: Financial support for this work was provided by Endo Pharmaceuticals.

Author Disclosure: The author (RB) reports no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (RB); analysis and interpretation of data (RB); critical revision of the manuscript for important intellectual content (RB).

Address correspondence to: Ryan Bitton, PharmD, MBA, Health Plan of Nevada, Inc, 2716 N Tenaya Way, Las Vegas, NV 88011. E-mail: rkbitton@gmail.com.

REFERENCES

1. Martel-Pelletier J, Boileau C, Pelletier JP, Roughley PJ. Cartilage in normal and osteoarthritis conditions. *Best Pract Res Clin Rheumatol.* 2008;22(2):351-384.

2. Lawrence RC, Felson DT, Helmick CG, et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. *Arthritis Rheum.* 2008;58(1):26-35.

3. Helmick CG, Felson DT, Lawrence RC, et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part I. *Arthritis Rheum.* 2008;58(1):15-25.

4. Michaud CM, McKenna MT, Begg S, et al. The burden of disease and injury in the United States 1996. *Popul Health Metr.* 2006;4:11.

5. Yelin E, Callahan LF. The economic cost and social and psychological impact of musculoskeletal conditions. *Arthritis Rheum.* 1995;38(10):1351-1362.

6. Cooper C, Inskip H, Croft P, et al. Individual risk factors for hip osteoarthritis: obesity, hip injury, and physical activity. *Am J Epidemiol.* 1998;147(6):516-522.

7. Lawrence RC, Helmick CG, Arnett FC, et al. Estimates of the prevalence of arthritis and selected musculo-

skeletal disorders in the United States. *Arthritis Rheum.* 1998;41:778-799.

8. Yelin E. Medical care expenditures and earnings losses among persons with arthritis and other rheumatic conditions in 2003, and comparisons with 1997. *Arthritis Rheum.* 2007;56(5):1397-1407.

9. Hootman JM, Helmick CG. Projections of U.S. prevalence of arthritis and associated activity limitations. *Arthritis Rheum.* 2006;54:226-229.

10. March LM, Bachmeier CJ. Economics of osteoarthritis: a global perspective. *Baillieres Clin Rheumatol.* 1997;11(4):817-834.

11. Leigh JP, Seavey W, Leistikow B. Estimating the costs of job related arthritis. *J Rheumatol.* 2001;28(7): 1647-1654.

12. Maetzel A, Li LC, Pencharz J, et al. The economic burden associated with osteoarthritis, rheumatoid arthritis, and hypertension: a comparative study. *Ann Rheum Dis.* 2004;63(4):395-401.

13. White AG, Birnbaum HG, Janagap C, Buteau S, Schein J. Direct and indirect costs of pain therapy for osteoarthritis in an insured population in the United States. *J Occup Environ Med.* 2008;50(9):998-1005.

14. Gabriel SE, Crowson CS, Campion ME, O'Fallon WM. Indirect and nonmedical costs among people with rheumatoid arthritis and osteoarthritis compared with nonarthritic controls. *J Rheumatol.* 1997;24(1):43-48.

15. Gabriel SE, Crowson CS, Campion ME, O'Fallon WM. Direct medical costs unique to people with arthritis. *J Rheumatol.* 1997;24(4):719-725.

16. Gabriel SE, Crowson CS, O'Fallon WM. Costs of osteoarthritis: estimates from a geographically defined population. *J Rheumatol Suppl.* 1995;43:23-25.

17. Lee DW, Meyer J, Clouse J. The medical cost of osteoarthritis and rheumatoid arthritis: Methods and evidence. *Value Health.* 1999;2(3):142-143.

18. MacLean CH, Knight K, Paulus H, Brook RH, Shekelle PG. Costs attributable to osteoarthritis. *J Rheumatol.* 1998;25(11):2213-2218.

19. Lanes SF, Lanza LL, Radensky PW, et al. Resource utilization and cost of care for rheumatoid arthritis and osteoarthritis in a managed care setting: the importance of drug and surgery costs. *Arthritis Rheum.* 1997;40:1475-1481.

20. Gupta S, Hawker GA, Laporte A, et al. The economic burden of disabling hip and knee osteoarthritis (OA) from the perspective of individuals living with this condition. *Rheumatology (Oxford).* 2005;44(12):1531-1537.

21. Bellamy N. Pain assessment in osteoarthritis: experience with the WOMAC osteoarthritis index. *Semin Arthritis Rheum.* 1989;18(4 suppl 2):14-17.

22. Losina E, Walensky RP, Kessler CL, et al. Cost-effectiveness of total knee arthroplasty in the United States: patient risk and hospital volume. *Arch Intern Med.* 2009;169(12):1113-1121.

23. Loza E, Lopez-Gomez JM, Abasolo L, et al. Economic burden of knee and hip osteoarthritis in Spain. *Arthritis Rheum.* 2009;61(2):158-165.

24. Zhang W, Moskowitz RW, Nuki G, et al. OARSI recommendations for the management of hip and knee osteoarthritis, part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage.* 2008; 16(2):137-162.

25. American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. Recommendations for the medical management of osteoarthritis of the hip and knee: 2000 update. *Arthritis Rheum.* 2000;43(9):1905-1915.

26. Arnold W, Fullerton DS, Holder S, May CS. Viscosupplementation: managed care issues for osteoarthritis of the knee. *J Manag Care Pharm.* 2007; 13(4):3-19.

27. Waddell D, Rein A, Panarites C, Coleman PM, Weiss C. Cost implications of introducing an alternative treatment for patients with osteoarthritis of the knee in a managed care setting. *Am J Manag Care.* 2001;7(10): 981-991.

28. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Joint Surg Am.* 2007;89:780-785.

29. Katz JN. Total joint replacement in osteoarthritis. *Best Pract Res Clin Rheumatol.* 2006;20(1):145-153.

30. Antoniou J, Martineau PA, Filion KB, et al. In-hospital cost of total hip arthroplasty in Canada and the United States. *J Bone Joint Surg Am.* 2004;86-A(11): 2435-2439.

31. Mahomed NN, Barrett JA, Katz JN, et al. Rates and outcomes of primary and revision total hip replacement in the United States Medicare population. *J Bone Joint Surg Am.* 2003;85-A(1):27-32.

32. Tien WC, Kao HY, Tu YK, Chiu HC, Lee KT, Shi HY. A population-based study of prevalence and hospital charges in total hip and knee replacement. *Int Orthop.* 2009;33(4):949-954.

33. Healthcare Cost and Utilization Project. Nationwide Inpatient Sample. Outcomes by 153 hip replacement, total and partial. Agency for Healthcare Research and Quality Web site. http://hcupnet.ahrq.gov/HCUPnet.jsp. Accessed August 11, 2009.

34. Healthcare Cost and Utilization Project. Nationwide Inpatient Sample. Outcomes by 152 arthroplasty knee. Agency for Healthcare Research and Quality Web site. http://hcupnet.ahrq.gov/HCUPnet.jsp. Accessed August 11, 2009.

35. Ong KL, Mowat FS, Chan N, Lau E, Halpern MT, Kurtz SM. Economic burden of revision hip and knee arthroplasty in Medicare enrollees. *Clin Orthop Relat Res.* 2006;446:22-28.

36. Healthcare Cost and Utilization Project. Nationwide Inpatient Sample. Patient and hospital characteristics for CCS all-listed procedure category: 153 hip replacement, total and partial. Agency for Healthcare Research and Quality Web site. http://hcupnet.ahrq.gov/HCUPnet.jsp. Accessed August 11, 2009.

37. Healthcare Cost and Utilization Project. Nationwide Inpatient Sample. Patient and hospital characteristics for CCS all-listed procedure category: 152 arthroplasty knee. Agency for Healthcare Research and Quality Web site. http://hcupnet.ahrq.gov/HCUPnet.jsp. Accessed August 11, 2009.