

Osteoarthritis and Cartilage



Patterns and predictors of persistent opioid use following hip or knee arthroplasty



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SUMMARY

Objective: The relationship between arthroplasty and long-term opioid use in patients with knee or hip osteoarthritis is not well studied. We examined the prevalence, patterns and predictors of persistent opioid use after hip or knee arthroplasty.

Method: Using claims data (2004–2013) from a US commercial health plan, we identified adults who underwent hip or knee arthroplasty and filled ≥ 1 opioid prescription within 30 days after the surgery. We defined persistent opioid users as patients who filled ≥ 1 opioid prescription every month during the 1-year postoperative period based on group-based trajectory models. Multivariable logistic regression was used to determine preoperative predictors of persistent opioid use after surgery.

Results: We identified 57,545 patients who underwent hip or knee arthroplasty. The mean \pm SD age was 61.5 ± 7.8 years and 87.1% had any opioid use preoperatively. Overall, 7.6% persistently used opioids after the surgery. Among patients who used opioids in 80% of the time for ≥ 4 months preoperatively ($n = 3023$), 72.1% became persistent users. In multivariable analysis, knee arthroplasty vs hip, a longer hospitalization stay, discharge to a rehabilitation facility, preoperative opioid use (e.g., a longer duration and greater dosage and frequency), a higher comorbidity score, back pain, rheumatoid arthritis, fibromyalgia, migraine and smoking, and benzodiazepine use at baseline were strong predictors for persistent opioid use (C-statistic = 0.917).

Conclusion: Over 7% of patients persistently used opioids in the year after hip or knee arthroplasty. Given the adverse health effects of persistent opioid use, strategies need to be developed to prevent persistent opioid use after this common surgery.

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Introduction

Osteoarthritis (OA) is a highly prevalent, chronic condition, affecting nearly one-third of adults aged 65 years and older in the US¹ and its prevalence continues to rise. Hip and knee OA is the most common type of OA, generally treated with a combination of non-pharmacologic interventions such as exercise, patient education and physical therapy, and medications including acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), and intra-articular glucocorticoids². For patients with moderate to severe symptomatic OA resistant to the aforementioned drugs or those

who cannot tolerate NSAIDs, opioid analgesics can be prescribed with caution. For patients with severe OA unrelieved by medical treatment, total joint replacement (TJR) is often considered², as TJR is an effective surgical intervention leading to significant improvement in quality of life, pain and function in most patients with severe hip or knee OA^{3,4}. Between 2010 and 2011, there were an estimated 1.3–1.4 million inpatient joint replacement procedures including total knee or hip replacement or arthroplasty in the US⁵.

Over the past two decades, overuse of prescription opioid medications in the US has become a serious public health concern⁶. Compared to the years between 1988 and 1994, when 3.4% of US adults had any use of opioid analgesics, the use of these agents has more than doubled^{6,7}. In older patients such as those with OA, due to the known cardiovascular risks of NSAIDs, the threshold for using opioids has decreased; opioids have been used more frequently

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in the elderly or those with cardiovascular risk factors⁸. A recent study using the Medicare Current Beneficiary Survey showed that 40% of a cohort of elderly patients with mean age of 77 received an opioid prescription in 2009⁹. However, in a Cochrane systematic review of 22 randomized controlled trials, opioids were noted to have only a small clinical benefit but a high risk of side effects, including opioid dependency and withdrawal in patients with hip and knee OA¹⁰. Furthermore, preoperative use of opioids may lead to persistent opioid use and poor clinical outcomes including pain, stiffness, and requirement of additional surgery following TJR^{11–14}. The objective of this study was to examine the prevalence, patterns and predictors of persistent opioid use after hip or knee arthroplasty in a population-based cohort of patients who underwent hip or knee arthroplasty.

Methods

Data source

We used claims data from a large US commercial health insurance, United HealthCare/Optum Clinformatics[®] Data Mart Database, from January 1, 2004 to December 31, 2013. This database has been described in detail elsewhere¹⁵. Briefly, it includes, at any particular time point, more than 13 million fully-insured subscribers with medical and pharmacy coverage from across the United States and provides patients' demographic information as well as longitudinal data on inpatient and outpatient medical claims, procedure claims, and pharmacy claims. The quality of these data in accurately capturing inpatient diagnoses, procedures, health care utilization and drug dispensing as well as some outpatient diagnoses is known to be high¹⁶. A prior validation study reported that there was 96% agreement between medical diagnoses defined using claims data and the medical records or the patient surveys¹⁷. The use of this de-identified database was approved by the Institutional Review Board of the Brigham and Women's Hospital and informed consent was not required.

Study population

We selected adults aged ≥ 50 years who were hospitalized for a total hip or knee arthroplasty (i.e., index admission). The *index date* was defined as the fourteenth day following the hospital discharge date from the index admission. Patients were required to have a 1-year continuous enrollment period prior to the index admission date and a 1-year continuous enrollment period after the index date (Fig. 1). Patients were excluded if they had a diagnosis of any malignancy or underwent a surgery for fracture, hip or knee arthroplasty in the year prior to the index date.

Outcome definition

The primary outcome of interest was persistent use of opioids (i.e., hydrocodone, codeine, oxycodone, meperidine, hydromorphone, morphine, fentanyl, methadone, and oxymorphone) in the year following the index date. Persistent use was defined as having any use of opioid prescriptions in each of the 12 months continuously based on a group-based trajectory modeling (GBTM) and identified as Trajectory 6 in Fig. 2. We utilized this GBTM method to identify clinically distinct, dynamic patterns of opioid use over the 12-month time period. GBTM has been used to describe longitudinal trajectories and summarize long-term medication adherence^{18–21}.

Covariate assessment

During the baseline 365-day period prior to the index date, we assessed a number of pre-defined variables potentially related to persistent use of opioids. These variables were demographic factors (i.e., age, sex), type and characteristics of joint arthroplasty (i.e., surgical site, year of surgery, length of in-hospital stay, bilateral/unilateral, discharge type), preoperative opioid use characteristics [i.e., any use, duration of opioid use, single or multiple opioid agents, cumulative dose, number of months with a proportion of days

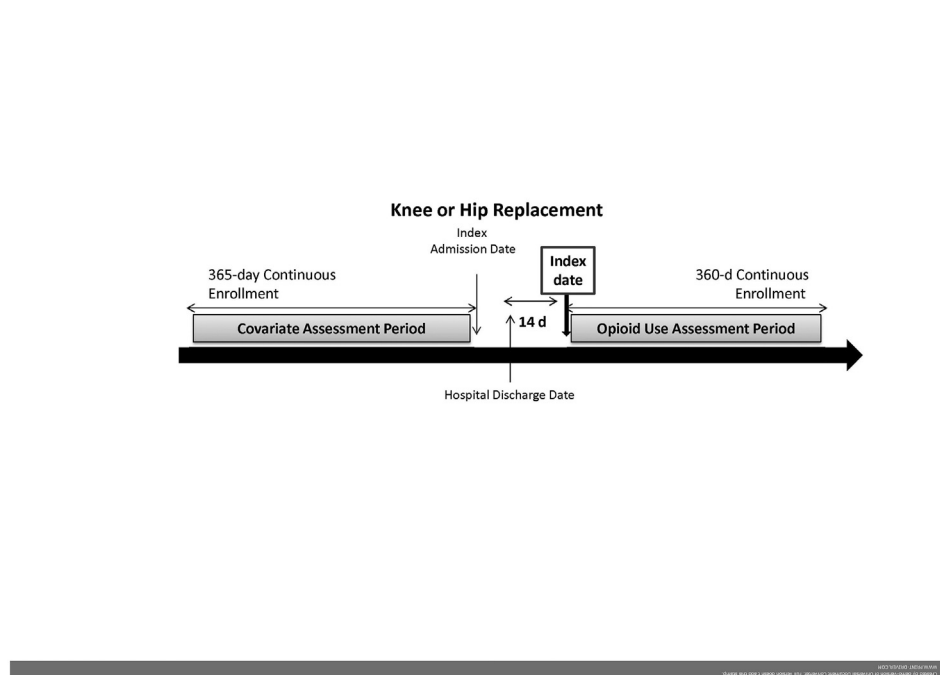


Fig. 1. Overview of study design. The index date was defined as the fourteenth day following the hospital discharge date from the index admission. Patients were required to have a 1-year continuous enrollment period prior to the index admission date and a 360-day continuous enrollment period after the index date.

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