



Outcomes Following Primary Total Hip or Knee Arthroplasty in Substance Misusers



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ABSTRACT

The influence of drug misuse on outcomes following primary total hip (THA) or knee (TKA) arthroplasty is poorly understood. The National Hospital Discharge Survey was used to identify patients who underwent primary THA or TKA between 1990 and 2007. Patients were divided into two groups: 1) those with a diagnosis of drug misuse (cannabis, opioids, cocaine, amphetamines, sedatives, inhalants or mixed combinations) ($n = 13,163$) and 2) those with no diagnosis of misuse ($n = 8,366,327$). Patients with a diagnosis of drug misuse had longer hospital stays ($P < 0.001$), nearly eight times the odds of leaving against medical advice ($P < 0.001$) and five times the mortality rate ($P < 0.001$). Drug misuse was associated with higher odds ($P < 0.001$) of complications including postoperative infection, anemia, convulsions, osteomyelitis, and blood transfusion.

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Drug misuse, including substance abuse and dependence [1], is a maladaptive pattern of substance use with considerable societal, economic and personal cost [2–5]. The lifetime prevalence of drug abuse and dependence among U.S. adults is estimated at 7.7% and 2.6%, respectively [6]. The risk of secondary osteoarthritis among drug users is thought to be higher than the general population due to increased rates of osteonecrosis of the femoral head and inflammatory arthropathies due to repetitive bacteremia [7,8]. Additionally, when joint arthroplasty is considered, the risk of a septic complication is of concern as injection or inhalation of drugs is felt to increase the risk of infection [9,10]. Despite the rates of drug abuse and dependence in the U.S., few studies have evaluated their influence on outcomes following primary total hip (THA) or knee (TKA) arthroplasty [7,11,12].

Previous groups have found decreased implant survival rates [7], increased rates of infection [12], and high rates of postoperative substance withdrawal delirium [11] in substance abusers who underwent total joint arthroplasty, but these studies were limited by small sample size. The purpose of the present study was to measure the influence of drug misuse on inpatient perioperative outcomes following primary

THA or TKA using a large national database. The specific aims of the study were to evaluate the relationship between substance abuse and length of hospital stay, discharge disposition, mortality and perioperative complications in patients undergoing primary THA or TKA. The identification of modifiable risk factors associated with complications following total joint arthroplasty may allow surgeons to intervene preoperatively, potentially decreasing complications and improving outcomes.

Materials and Methods

Data Source

The National Hospital Discharge Survey (NHDS) [13], developed by the National Center for Healthcare Statistics Division of the Centers for Disease Control and Prevention (CDC), was used in this study. The NHDS is considered the most comprehensive of all inpatient surgical databases in use today and is the principal database used by the U.S. government for monitoring hospital use [14]. Publicly available, the NHDS provides demographic and medical data for inpatients discharged from non-federal, short stay hospitals [14]. The survey uses International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) [15] codes to classify up to seven discharge diagnoses and up to four procedures that are present at the time of discharge. In addition to medical information, the NHDS collects demographic information (age, gender), expected source of payment (insurance status), length of hospital stay, hospital size, U.S. region, and inpatient outcomes including discharge destination [16]. The NHDS ensures an unbiased national sampling by using a complex three-stage probability design

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including: inflation by reciprocals of the probabilities of sample selection, adjustment for no response and population weighting ratio adjustments [14]. This study did not require approval by the institutional review board because the NHDS is a publically available database with no patient identifying information.

Patient Selection

All patients admitted to hospitals in the U.S. who underwent primary THA or TKA between 1990 and 2007 were identified using ICD-9-CM codes. Using previously described techniques, discharges with a procedure code (ICD-9-CM) of primary THA (81.51) or TKA (81.54) were identified [17]. Due to National Center for Health Statistics budgetary limitations starting in 2008, the number of hospital surveys was halved, decreasing the precision of the survey data and nearly doubling the relative standard error [18]. Consequently, we chose 2007 as the endpoint of our study. Patients were divided into two groups: 1) those with a diagnosis of drug misuse (ICD-9-CM: 304.00–304.93, 305.20–305.93) and 2) those who did not have a diagnosis of drug misuse. The drug misuse group includes subjects with diagnoses for either substance abuse or substance dependence. Substance abuse is defined as a maladaptive pattern of substance use leading to clinically significant impairment or distress as manifested by one or more of the following, occurring within a 12-month period: 1) recurrent substance use resulting in a failure to fulfill major role obligations at work, school, or home (e.g. repeated absences or poor work performance related to substance use; substance-related absences, suspensions, or expulsions from school; neglect of children or household), 2) recurrent substance use in situations in which it is physically hazardous (e.g. driving an automobile or operating a machine when impaired) 3) recurrent substance-related legal problems (e.g. arrests for substance-related disorderly conduct) 4) continued substance use despite persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance (e.g. arguments with spouse about consequences of intoxication, physical fights) 5) the symptoms for substance abuse have never met the criteria for substance dependence [1]. In contrast, substance dependence is defined as a maladaptive pattern of substance use leading to clinically significant impairment or distress as manifested by three or more of the following, occurring at any time in the same 12-month period: 1) tolerance, as defined by either of the following: a) a need for markedly increased amounts of the substance to achieve intoxication or desired effect b) markedly diminished effect with continued use of the same amount of the substance, 2) withdrawal, as manifested by either of the following: a) the characteristic withdrawal syndrome for the substance, b) taking the same (or a closely related) substance to relieve or avoid withdrawal symptoms, 3) taking the substance often in larger amounts or over a longer period than was intended, 4) having a persistent desire or unsuccessful efforts to cut down or control substance use [1].

Demographic variables were collected including age, sex and prevalence of comorbidities. The length of hospital stay and discharge destination were determined. The incidence of complications was determined using the complication screening package [19]. The variable “perioperative complication” was created based upon the following (ICD-9-CM): acute postoperative bleeding (998.1), acute postoperative infection (998.5), other operative complication (998.89), acute postoperative anemia (285.1), thrombocytopenia (287.4, 287.5), peripheral vascular complication (997.2), urinary tract infection (599.0), other urinary complication (997.5), acute renal failure (584), acute myocardial infarction (410), pulmonary embolism (415.1), pulmonary insufficiency (518.5), acute deep venous thrombosis (453.4), osteomyelitis (730.0–730.2), cellulitis/abscess formation (682), convulsion (780.39), transfusion of blood (99.0), mechanical complication of internal orthopedic device (996.4, 996.79), infection of internal joint prosthesis (996.77), and other complication of internal joint prosthesis (996.77).

Statistical Analysis

Differences between continuous variables were compared using the independent-samples t-test, while the Pearson chi square test was used to compare differences between categorical variables. To determine whether drug abuse was an independent predictor of a negative in-hospital outcome, variables present in at least 2% of the population [20] were included in a multivariable binary logistic regression model. The dichotomous variables were 1) presence of any complication, 2) prolonged hospital stay (greater than the 75th percentile of the mean), 3) leaving against medical advice, and 4) in-hospital mortality. Potential confounders were controlled for using a multivariable regression model, to isolate the effect of drug abuse on inpatient outcomes. Covariates accounted for in the regression model included: gender, age, length of stay, hospital bed size, primary source of payment, presence of a complication, and preexisting comorbidities (i.e., diabetes mellitus, hypertension, congestive heart failure, coronary artery disease, atrial fibrillation, previous myocardial infarction, osteoporosis, and rheumatoid arthritis). Odds ratios and confidence intervals were calculated to assess the association between drug abuse and inpatient perioperative complications. Correcting for multiple comparisons, a *P*-value < 0.001 was used to define statistical significance, as previously described [21]. All data were analyzed using the software-statistical package for social sciences [SPSS] version 20 (Chicago, IL, USA).

Source of Funding

No external funding source was used for the conduct of this study.

Results

A cohort representative of 8,379,490 patients who underwent primary THA or TKA between 1990 and 2007 was identified (Table 1). Of the total cohort, 13,163 patients had a diagnosis of drug misuse, while 8,366,327 patients had no diagnosis of drug misuse. The drug misuse group was younger (51.6 ± 12.9 years compared to 67.3 ± 11.7 years; $P < 0.001$), had longer hospital stays (5.3 ± 4.0 days compared to 5.1 ± 4.2 days; $P < 0.001$), and had a higher rate of patients who left against medical advice (0.4% compared to 0.1%, $P < 0.001$) when compared with non-drug misusers. The drug misuse group also had higher rates of non-routine discharge

Table 1
Demographics for Patients Undergoing Primary Total Hip or Total Knee Arthroplasty With Bivariate Analysis Comparing Those Who Misuse Drugs to Those Who Do Not Misuse Drugs. (SD, Standard Deviation).

Parameter	Drug Misuse	No Drug Misuse	<i>P</i> Value
Number of patients, N	13,163	8,366,327	
Gender (%)			
Male	45.2	38.5	<0.001
Female	54.8	61.5	
Discharge disposition (%)			
Routine/home	48.7	51.8	<0.001
Left AMA	0.4	0.1	
Non-routine	38.8	30.0	
Mortality	1.4	0.3	
Age, years, mean (SD)	51.6 (12.9)	67.3 (11.7)	<0.001
Days of care, mean (SD)	5.3 (4.0)	5.1 (4.2)	<0.001
Bed size			
< 100	23.3	20.8	<0.001
100–199	18.1	26.2	
200–299	16.6	21.3	
300–499	28.2	22.1	
500 +	13.9	9.6	
Primary source of payment			
Private insurance	31.4	31.9	0.217
Medicare	35.3	59.6	
Medicaid	18.9	2.9	
Workmen's	6	1.0	
Other	8.4	4.6	

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