



## Direct Cost and Complications Associated With Total Joint Arthroplasty in Patients With Preoperative Anxiety and Depression



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### ABSTRACT

**Introduction:** The outcome of total joint arthroplasty (TJA) may be affected by numerous factors including the mental health status of patients and the presence of psychological disorders. Therefore, the present study was designed and conducted to determine the impact of concomitant psychiatric disorders on the hospitalization charges and complications in patients with preoperative depression or anxiety undergoing TJA.

**Materials and Methods:** International Classification of Diseases, Ninth Revision, codes were used to identify perioperative complications in patients with and without concomitant diagnosis of depression or anxiety who underwent TJA at our institution during 2009. Hospitalization charges and complications were compared for patients with and without depression or anxiety undergoing TJA.

**Results:** Respectively, 12.7% and 6.4% of knee and the hip arthroplasty patients had concomitant depression or anxiety. In the knee but not the hip group, the charge was \$3420 higher in patients with depression/anxiety ( $P < .001$ ). Anxiety and depression and higher American Society of Anesthesiologists score were independent predictors of complications.

**Discussion:** Depression or anxiety was a predictor of increased complications after TJA. Therefore, patients with depression or anxiety undergoing TJA need to be counselled appropriately, and all efforts need to be invested to minimize complications and the added cost in these patients.

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Both total knee arthroplasty (TKA) and total hip arthroplasty (THA) are safe and cost-effective operations for the treatment of advanced degenerative joint disease [1,2]. However, the outcome of total joint arthroplasty (TJA) may be affected by numerous factors including the mental health status of patients and the presence of psychological disorders [3,4]. Given the increasing prevalence of major depression [5,6] and anxiety disorders in the general population [7], investigation of impact of preoperative depression and anxiety on the outcome of TJA merits special attention.

Along with studies in other fields of medicine [8–11], there is growing evidence in the orthopedic literature suggesting that concomitant psychiatric and affective disorders may increase the cost of hospitalization and negatively impact the outcome of different orthopedic procedures [12–15]. However, studies about the impact of psychological disorders on the outcome of TJA have yielded conflicting results [3,4,16–20]. Most of these studies have focused on the functional outcome and pain relief after TJA with no data regarding the complication rate and the cost of care in patients with preoperative diagnosis of

depression or anxiety undergoing TJA. Therefore, the present study was designed and conducted to determine the impact of concomitant psychiatric disorders on the hospitalization charges and complications in patients with preoperative depression or anxiety undergoing TJA.

### Materials and Methods

After approval of our institutional review board, we reviewed our TJA databases to identify patients who underwent THA or TKA between January 1, 2009, and December 31, 2009. The clinical records of patients were reviewed to identify those with preoperative diagnosis of depression or anxiety disorders. Diagnosis of these disorders was further confirmed by reviewing patients' clinical records, including the medication list. Patients who underwent revision TJA, received general anesthesia, and underwent bilateral TJA under the same anesthesia and those with the diagnosis of other psychiatric disorders were excluded.

The clinical records of the patients were reviewed to extract data on the demographics, hospital charges, and the length of hospital stay. Comorbidities were analyzed using the American Society of Anesthesiologists (ASA) scores. Complications were obtained using an electronic query based on the *International Classification of Diseases, Ninth Revision*, codes. The following complications and codes were considered: device-related (996), central nervous system (997.0), cardiac (997.1), peripheral vascular (997.2), respiratory (997.3), gastrointestinal (997.4), genitourinary (997.5), other

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organ specific (997.6–997.9), postoperative shock (998.0), hematoma or seroma (998.1), accidental puncture or laceration (998.2), disruption of the operative wound (998.3), postoperative infection (998.5), other complications of the procedure (998.6–998.9), complications of medical care (999), acute posthemorrhagic anemia (285.1), pulmonary embolism (415.1), pulmonary insufficiency after trauma and surgery or adult respiratory distress syndrome (518.5), and venous thrombotic events (451.1, 451.2, 451.8, 451.9, 453.2, 453.8, 453.9).

To compare the characteristics of the 2 groups,  $\chi^2$  (Fisher exact test where appropriate) and independent-samples *t* tests were used. Hospitalization charges and the length of stay were compared using a Mann-Whitney *U* test. Multiple regression analysis was performed to identify factors influencing the hospitalization charges and the length of hospital stay. Finally, all complications were pooled, and a logistic regression analysis was performed to investigate if the presence of preoperative anxiety disorder or depression was an independent predictor of postoperative complications after adjusting for confounders that included age, sex, ASA score, and the type of anesthesia.  $P < .05$  was considered to be statistically significant in all analyses.

## Results

Of 1005 cases of primary TKA, 128 patients (12.7%) had a preoperative diagnosis of anxiety disorder or depression, and there were 62 patients with preoperative diagnosis of depression or anxiety among 964 cases of primary THA (6.4%) (Table).

In the TKA group, hospitalization charges were significantly higher ( $P < .001$ ) in patients with preoperative diagnosis of anxiety or depression (median, \$55,670; interquartile range [IQR], \$50,630–\$67,970) compared with patients without these disorders (median, \$52,270; IQR, \$48,600–\$56,640). However, in the THA group, there was no statistically significant difference ( $P = .96$ ) between the hospitalization charges in patients with preoperative anxiety or depression (median, \$49,800; IQR, \$45,900–\$56,490) compared with those without (median, \$49,610; IQR, \$45,490–\$55,830). Median length of hospital stay was 3.4 days (IQR, 3.2–4.1 days) in patients without preoperative anxiety or depression and 3.5 days (IQR, 3.3–4.4 days) in patients with these disorders who underwent TKA, which was statistically significant ( $P < .001$ ). However, there was no statistically significant difference ( $P = .51$ ) in the length of hospital stay in patients with and without preoperative anxiety and depression who underwent THA. Median length of hospital stay was 2.6 days (IQR, 2.3–3.4 days) in patients with these disorders vs a median of 2.5 days (IQR, 2.3–3.4 days) in those without.

The rate of complications was higher in patients with preoperative anxiety or depression at 29%, compared with controls at 15.5% ( $P < .001$ ). Figure A and B demonstrate the rates of complications in patients with preoperative anxiety or depression vs those without in THA and TKA separately. Using logistic regression analysis, the presence of anxiety and depression (odds ratio [OR], 2.25; 95% confidence interval [CI],

1.56–3.23;  $P < .001$ ), male sex (OR, 1.29; 95% CI, 1.0–1.67;  $P = .04$ ), and higher ASA score (OR, 1.59; 95% CI, 1.22–2.07;  $P < .001$ ) were independent predictors of complications. Age had marginal effect on the rate of complications (OR, 1.01; 95% CI, 1.0–1.03;  $P = .04$ ).

## Discussion

It is well known that psychiatric disorders including depression and anxiety disorder are important comorbidities that may negatively impact the outcome of surgical procedures [21]. In addition, it is recognized that the presence of these psychiatric conditions may result in exacerbation of symptoms of other systemic diseases [11]. For example, patients with chronic obstructive pulmonary disease and coexistent depression or anxiety were found to experience greater disease severity and a higher use of healthcare resources [8]. Similarly, the relationship between depression and anxiety and cardiac disorders has been well established [9,10,22,23]. Along with these reports, previous studies have suggested that unstable emotional health, preexistent depression, and anxiety are important predictors of poor functional outcome after TJA [3,16,18,24–27]. However, there are few to no published studies investigating the incidence of postoperative complications and the hospitalization charges in patients with preexistent depression or anxiety undergoing TJA.

The present study indicated that the presence of preoperative depression or anxiety disorders in patients undergoing TJA was associated with a significantly higher rate of complications, higher length of hospital stay, and an increase in hospitalization charges. Our findings are consistent with the study performed by Walid and Robinson [14] that indicated concomitant psychiatric and affective disorders increase the hospitalization cost of patients undergoing spine surgery. In contrast, in a study by Brull et al [28] on a small cohort of 38 patients undergoing THA or TKA, no associations were found between the length of hospital stay and the diagnosis of preoperative anxiety or depression. The higher hospitalization charges in patients undergoing TKA can be explained partly by the significantly longer hospital stay. The need for psychiatric medications and consultations in addition to poor patient compliance with rehabilitation exercises may also contribute to the higher hospital charges in these patients. The higher rate of complications in patients with preoperative anxiety and depressive disorders may also explain the longer hospital stay in these patients. A higher rate of complications in patients with depressive and anxiety disorder was confirmed in a multivariate analysis that controlled for confounders, mainly other comorbidities. Association between a higher rate of morbidity and complications including periprosthetic joint infection and preexisting depression have been described in TJA patients using large national databases [19,20]. However, the reason for the higher rate of complication in these patients is not clear.

In our cohort, 12.7% and 6.4% of patients undergoing TKA and THA had a preoperative diagnosis of depression and anxiety, respectively. This incidence is less than the national estimate of lifetime prevalence of major depressive disorder [29]. In a face-to-face household survey

**Table**  
Comparison of Characteristics of Patients.

	Primary TKA		<i>P</i>	Primary THA		<i>P</i>
	Anxiety and Depression (+)	Anxiety and Depression (–)		Anxiety and Depression (+)	Anxiety and Depression (–)	
Mean age (SD)	65.05 (10.36)	63.51 (8.07)	.01	60.48 (11)	62.2 (12.29)	.28
Sex (female)	65.6%	57.9%	.11	74.2%	46.2%	<.001
ASA score						
1	–	1.1%	.07	–	51.4%	.07
2	31.2%	38.3%		41.7%	46.8%	
3	67.2%	60.3%		58.3%	47.5%	
4	1.6%	0.3%		–	0.3%	
Mean BMI (SD), kg/m <sup>2</sup>	32.23 (5.87)	31.75 (7.99)	.51	29.15 (5.42)	29.47 (5.49)	.65
Anesthesia						
Spinal	61.6%	52.5%	.19	92.7%	93.9%	.66
Epidural	1.0%	0.6%		–	0.4%	
Combined spinal and epidural	37.4%	46.9%		7.3%	5.7%	

Abbreviation: BMI, body mass index.

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