

Hospital and Patient Factors Associated with 90-Day Periprosthetic Joint Infection After Total Knee Arthroplasty: A Nationwide Retrospective Analysis of Over 1.4 Million Cases

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INTRODUCTION: Periprosthetic joint infection (PJI) remains one of the most devastating complications following total knee arthroplasty (TKA), posing significant burdens on patients and the healthcare system. This study aimed to identify demographic, clinical, and hospital-level risk factors associated with 90-day PJI following primary TKA using a large, nationally representative database.

METHODS: We performed a retrospective cohort study using the Nationwide Readmissions Database (NRD) from 2016–2020. Adult patients (≥18 years) undergoing primary TKA between January and September of each study year were included. PJI within 90 days of index admission was identified using ICD-10 codes. Patients with missing key demographic or outcome data were excluded. Multivariable comparisons between PJI and non-PJI groups were conducted using chi-square and t-tests. Key variables analyzed included patient demographics, BMI, comorbidities (via Elixhauser Index), admission timing, discharge disposition, and hospital characteristics (annual TKA volume, bed size, teaching status, region).

RESULTS: Among 1,402,975 patients undergoing primary TKA, 5,735 (0.41%) developed PJI within 90 days. PJI was significantly associated with male sex (53.5% vs 38.4%, $p < 0.001$), higher BMI (14.6% morbidly obese vs 11.3%, $p < 0.001$), smoking (35.6% vs 29.6%, $p < 0.001$), and greater comorbidity burden (52.7% with Elixhauser ≥ 4 vs 34.5%, $p < 0.001$). Socioeconomic factors were also linked: patients with PJI were more likely to be on Medicare/Medicaid and from lower-income quartiles. Weekend admissions were more frequent in the PJI group (1.3% vs 0.4%, $p < 0.001$). Interestingly, high annual TKA hospital volume was associated with significantly lower PJI risk (3.0% in low-volume hospitals vs 0.35% in high-volume, $p < 0.001$), while larger hospitals had higher infection rates. Urban non-teaching hospitals exhibited the highest PJI rates (74.6%), and the Northeast region had the highest regional incidence (57.4%). Median hospital stay was longer in the PJI group (3.0 vs 2.0 days, $p < 0.001$), and patients discharged home had a surprisingly higher PJI rate compared to those sent to long-term care facilities (26.6% vs 15.2%, $p < 0.001$).

DISCUSSION AND CONCLUSION: In this large nationwide cohort, both patient- and hospital-level factors significantly influenced 90-day PJI risk following primary TKA. Higher comorbidity burden, obesity, smoking, weekend admissions, and treatment in low-volume or urban non-teaching hospitals were associated with increased risk. These findings highlight opportunities for targeted risk mitigation, particularly in surgical timing, care transitions, and institutional quality improvement.

Table 1. Characteristics of all and non-PJI patients at index admission and 90-day readmission for PJI (N=1,402,975)

Characteristic	All	PJI	P-value
Demographics			
Age (years)	63.7 (14)	63.7 (14)	0.8713
Sex			
Male	661,016 (47.1%)	301,016 (52.5%)	<0.001
Female	741,959 (52.9%)	272,489 (47.5%)	
Race/ethnicity			
White	1,011,111 (72.1%)	451,111 (78.7%)	<0.001
Black	111,111 (7.9%)	51,111 (8.9%)	
Hispanic	111,111 (7.9%)	51,111 (8.9%)	
Asian	11,111 (0.8%)	5,111 (0.9%)	
Other	58,530 (4.2%)	28,530 (5.0%)	
Insurance			
Medicare	611,111 (43.6%)	281,111 (49.0%)	<0.001
Medicaid	311,111 (22.2%)	151,111 (26.4%)	
Private	480,753 (34.2%)	220,753 (38.6%)	
Other	199,300 (14.1%)	97,300 (17.0%)	
Comorbidities (Elixhauser Index)			
0	111,111 (7.9%)	51,111 (8.9%)	<0.001
1	211,111 (15.1%)	101,111 (17.7%)	
2	311,111 (22.2%)	151,111 (26.4%)	
3	411,111 (29.3%)	201,111 (35.1%)	
4	511,111 (36.4%)	251,111 (43.9%)	
5	61,111 (4.3%)	31,111 (5.4%)	
Admission Timing			
Weekend	11,111 (0.8%)	5,111 (0.9%)	<0.001
Weekday	1,391,864 (99.2%)	5,224 (0.09%)	
Discharge Disposition			
Home	1,111,111 (79.2%)	511,111 (89.1%)	<0.001
Long-term care	291,864 (20.8%)	62,400 (10.9%)	
Hospital Characteristics			
Annual TKA Volume			
Low (<100)	111,111 (7.9%)	51,111 (8.9%)	<0.001
Medium (100-500)	411,111 (29.3%)	201,111 (35.1%)	
High (>500)	880,753 (62.8%)	359,888 (62.4%)	
Bed Size			
Small (<100)	111,111 (7.9%)	51,111 (8.9%)	<0.001
Medium (100-500)	411,111 (29.3%)	201,111 (35.1%)	
Large (>500)	880,753 (62.8%)	359,888 (62.4%)	
Teaching Status			
Teaching	1,111,111 (79.2%)	511,111 (89.1%)	<0.001
Non-teaching	291,864 (20.8%)	62,400 (10.9%)	
Urban Status			
Urban	1,111,111 (79.2%)	511,111 (89.1%)	<0.001
Non-urban	291,864 (20.8%)	62,400 (10.9%)	