Low Volume Total Knee Arthroplasty Surgeons & Infection Rates: Is it the Surgeon or the Center?

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INTRODUCTION: Total knee arthroplasty (TKA) is one of the most commonly performed elective procedures in the United States, with more than 600,000 cases annually. As utilization increases, concerns regarding surgical complications—particularly periprosthetic joint infection (PJI) and surgical site infection (SSI)—have led to greater focus on modifiable risk factors. Previous studies have demonstrated that high surgeon and hospital procedural volumes are associated with improved outcomes, including lower infection rates. However, the close relationship between high-volume surgeons and high-volume centers makes it difficult to isolate the impact of surgeon experience from institutional factors. This study investigates whether surgeon volume independently affects infection outcomes in a high-volume academic orthopedic center where consistent perioperative protocols and institutional infrastructure may mitigate individual variation.

METHODS: A retrospective review was conducted using prospectively collected data at a high-volume academic orthopedic specialty hospital. All primary TKA procedures performed between January 1, 2018, and December 30, 2024, were included. Surgeons were stratified by annual TKA case volume into three categories: low (<50 cases/year), high (50–250 cases/year), and ultra-high (>250 cases/year). Infection outcomes, including superficial SSI (SSSI) and PJI, were monitored for 90 days postoperatively using a dedicated surveillance program in accordance with National Healthcare Safety Network (NHSN) criteria. Statistical analyses were performed using chi-square or Fisher's exact tests for categorical variables, ANOVA for continuous variables, and logistic regression to control for known confounders.

RESULTS: A total of 33,747 primary TKA procedures performed by 52 surgeons were analyzed. The low-volume group (1,979 cases) had an average operative time of 112.2 minutes, a PJI rate of 0.3%, and an SSSI rate of 0.2%. The high-volume group (21,594 cases) had an average operative time of 96.5 minutes, a PJI rate of 0.3%, and an SSSI rate of 0.1%. The ultra-high-volume group (10,174 cases) had and average operative time of 90.5 minutes, a PJI rate of 0.2%, and SSSI rate of 0.1%. Despite the differences in operative duration, there were no statistically significant differences in infection rates across surgeon volume groups (PJI p = 0.46; SSSI p = 0.63).

DISCUSSION AND CONCLUSION: Within a high-volume academic orthopedic center, infection rates following primary TKA remained uniformly low regardless of individual surgeon volume. These findings suggest that institutional specialization—including standardized infection prevention protocols, specialized operating room teams, and robust surveillance systems—can offset the potential risks associated with lower individual procedural volumes. Rather than limiting low-volume surgeons' access to TKA based solely on volume thresholds, healthcare systems should prioritize strengthening institutional infrastructure and quality improvement programs. This approach may support safe and effective patient care, even among surgeons early in their careers or with lower annual caseloads, and has important implications for surgical training, referral patterns, and policy development in arthroplasty care.

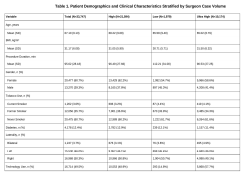

Table 1. Patient Demographics and Clinical Characteristics Stratified by Surgeon Case Volume

Variable	Total (N=33,747)	High (N=21,594)	Low (N=1,979)	Ultra High (N=10,174)
Age, years				
Mean (SD)	67 (10.0)	66.6 (10.0)	69 (9.5)	66.9 (9.9)
BMI, kg/m²				
Mean (SD)	31.2 (6.6)	31.0 (6.5)	31.7 (6.7)	31.0 (6.5)
Procedure Duration, min				
Mean (SD)	95.6 (24.4)	96.45 (23.7)	112.21 (24.5)	90.55 (17.7)
Gender, n (%)				
Female	19,477 (57.7%)	12,435 (57.6%)	1,062 (53.7%)	5,980 (58.8%)
Male	14,270 (42.3%)	9,159 (57.7%)	917 (46.3%)	4,193 (41.2%)
Tobacco Use, n (%)				
Current Smoker	1,402 (4.2%)	908 (4.2%)	97 (4.9%)	397 (3.9%)
Former Smoker	10,996 (32.7%)	7,401 (34.4%)	673 (34.4%)	3,495 (34.5%)
Never Smoker	21,475 (63.7%)	13,985 (65.2%)	1,210 (61.7%)	5,974 (58.9%)
Diabetes, n (%)	5,178 (15.4%)	3,742 (17.4%)	330 (16.8%)	1,106 (10.9%)
Comorbidity, n (%)				
Bilateral	1,437 (4.7%)	979 (4.6%)	70 (3.9%)	388 (4.0%)
Left	15,545 (50.6%)	9,963 (46.5%)	899 (46.4%)	4,683 (48.0%)
Right	15,688 (51.0%)	10,482 (48.9%)	1,009 (52.1%)	4,197 (43.0%)
Technology Use, n (%)	25,713 (83.9%)	16,818 (83.9%)	1,455 (81.9%)	7,440 (77.7%)

logistic regression: PJI

	Odds ratio	2.50%	97.50%	P value
Low Volume	0.8227	0.3153	1.7726	0.6522
Ultra-high Volume	0.7632	0.4564	1.2300	0.2829
Gender	2.1587	1.4176	3.3220	< 0.001
Age	1.0002	0.9767	1.0247	0.9888
Former Smoker	2.0110	0.6030	12.4818	0.3409
Never Smoker	1.9416	0.5994	11.9088	0.3591
BMI	1.0013	0.9650	1.0376	0.9436
Diabetes	0.9400	0.4692	1.7062	0.8495
Procedure Duration	1.0100	1.0040	1.0154	< 0.001

logistic regression: SSSI

	Odds ratio	2.50%	97.50%	P value
Low Volume	1.2179	0.2869	3.5355	0.7500
Ultra-high Volume	1.2489	0.6352	2.3761	0.5056
Gender	0.4308	0.1994	0.8516	0.0215
Age	0.9837	0.9519	1.0178	0.3383
Former Smoker	0.3792	0.1168	1.6963	0.1411
Never Smoker	0.4909	0.1702	2.0776	0.2483
BMI	0.9886	0.9398	1.0374	0.6473
Diabetes	0.5787	0.1390	1.6132	0.3648
Procedure Duration	1.0036	0.9928	1.0130	0.4808

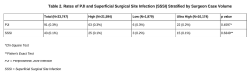

Table 2. Rates of PJI and Superficial Surgical Site Infection (SSSI) Stratified by Surgeon Case Volume

	Total (N=33,747)	High (N=21,594)	Low (N=1,979)	Ultra High (N=10,174)	p-value
PJI	91 (0.3%)	62 (0.3%)	5 (0.3%)	23 (0.2%)	0.6917 *
SSSI	24 (0.1%)	19 (0.1%)	2 (0.1%)	3 (0.0%)	0.4364**

*Chi-Square Test

**Fisher's Exact Test

PJI = Periprosthetic Joint Infection

SSSI = Superficial Surgical Site Infection