

Influence of Extended Antibiotic Use on Patient-Reported Outcomes Following Total Knee Arthroplasty

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INTRODUCTION: The American Academy of Orthopaedic Surgeons recommends that prophylactic antibiotics be administered within one hour before surgical incision and discontinued within 24 hours after surgery as a core quality measure in primary total knee arthroplasty (TKA). However, high-risk patient factors, such as obesity, diabetes, and immunosuppression, are associated with increased surgical site infection (SSI) and periprosthetic joint infection (PJI), prompting the use of extended antibiotics. While previous retrospective studies suggest a reduced incidence of PJI in particular high-risk cohorts, limited studies to date have investigated the potential impact of extended antibiotic regimens patient-reported outcome measures (PROMs) in TKA patient populations. Therefore, this study aims to assess whether extended antibiotic use after primary TKA affects PROMs with a propensity-matched analysis.

METHODS: From an institutional database, we performed a retrospective cohort study of 11,210 primary TKA patients following IRB approval. Inclusion criteria were the following: age ≥ 18 years, minimum follow-up of 2 years, and completed pre-operative and postoperative PROMs. Extended antibiotic use was documented in 222 patients. Standard prophylaxis was reported in 2,255 non-users. We applied 1:3 nearest-neighbor propensity matching on 11 covariates: age, BMI, sex, diabetes, heart failure, chronic kidney disease, osteoporosis, osteopenia, stroke, alcohol use, and cigarette use. We compared complication rates at 90 days, 1 year, and 2 years, including SSI, PJI, pulmonary embolism (PE), deep vein thrombosis (DVT), sepsis, acute kidney injury (AKI), reoperation, and revision TKA. PROMs included Patient-reported Measurement Information Systems (PROMIS) Global Physical and Mental Survey, Physical Function Short Form Survey (SF-10a), and the Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS). For each PROM, we analyzed the mean preoperative and mean postoperative scores, change (delta score), and rates of achieving a minimal clinically important difference in improvement (MCID-I) or worsening (MCID-W).

RESULTS: A total of 222 extended antibiotic users and 666 non-users were included in the 1:3 propensity matching analysis. Matched cohorts showed no significant demographic differences. For 90-day complications, extended users had similar SSIs (0.5% vs. 0.9%; $P = 0.604$). Rates of PJI, PE, DVT, sepsis, and AKI did not differ. Reoperation and revision TKA were similar. For 1-year and 2-year complications, there were no significant differences in the rates of PJI, instability, periprosthetic fracture, loosening, reoperation, or revision. Patient-reported outcomes were similar in both cohorts. Preoperative PROMIS Global Physical scores were 40.7 ± 7.4 versus 40.6 ± 8.0 in extended users and non-users, respectively, rising to 46.4 ± 8.7 versus 46.0 ± 8.9 post-operatively. The mean change in Global Physical (5.64 \pm 7.20 vs. 5.41 \pm 6.98), Global Mental (1.35 \pm 6.50 vs. 2.46 \pm 6.52), SF-10a (5.97 \pm 6.95 vs. 5.46 \pm 6.58), and KOOS PS (15.59 \pm 16.83 vs. 13.60 \pm 14.79) did not differ significantly between groups, and similar proportions of patients in each cohort achieved minimal clinically important differences.

DISCUSSION: Extended antibiotic prophylaxis after primary total knee arthroplasty was not associated with a significant reduction in 90-day surgical site infections. PROMs improved equally in both cohorts, with similar proportions achieving clinically meaningful improvement. These findings indicate that patients experienced similar clinically meaningful improvements in PROMs regardless of the use of extended antibiotic prophylaxis after primary total knee arthroplasty. Prospective randomized trials are needed to identify which patient subgroups derive the most significant benefit and to determine the optimal duration of extended prophylaxis while avoiding unnecessary antibiotic use.

SIGNIFICANCE/CLINICAL RELEVANCE: Patients experience similar clinically meaningful improvements in PROMs regardless of the use of extended antibiotic prophylaxis after primary total knee arthroplasty.

Variable	Unmatched Cohorts			Matched Cohorts		
	New Antibiotic Users (N = 222)	Antibiotic Users (N = 212)	P Value	New Antibiotic Users (N = 666)	Antibiotic Users (N = 333)	P Value
Age	67.6 \pm 8.1	66.3 \pm 9.0	0.843	66.4 \pm 8.8	66.1 \pm 9.0	0.778
BMI	30.4 \pm 5.8	32.4 \pm 6.7	<0.001	32.2 \pm 6.1	32.4 \pm 6.7	0.737
Gender			0.451			1
Male	960 (42.6%)	104 (46.8%)		310 (46.7%)	104 (46.8%)	
Female	1294 (57.4%)	138 (63.2%)		356 (53.3%)	138 (63.2%)	
Other	1 (0.0%)	0 (0.0%)				
Race			0.7			0.817
White	2022 (89.7%)	201 (93.5%)		589 (88.4%)	201 (93.5%)	
Black	74 (3.3%)	8 (4.1%)		33 (5.2%)	8 (4.1%)	
Asian	49 (2.2%)	2 (0.9%)		16 (2.5%)	2 (0.9%)	
American Indian or Alaska Native	2 (0.1%)	0 (0.0%)				
Other	108 (4.8%)	10 (4.7%)		34 (5.1%)	10 (4.7%)	
Diabetes			0.004			0.894
Diabetes - No	1848 (82.0%)	164 (77.9%)		497 (74.6%)	164 (77.9%)	
Diabetes - Yes	407 (18.0%)	58 (28.1%)		169 (25.4%)	58 (28.1%)	
Heart Failure			0.153			0.943
Heart Failure - No	2139 (94.9%)	205 (92.3%)		612 (91.9%)	205 (92.3%)	
Heart Failure - Yes	116 (5.1%)	17 (7.7%)		54 (8.1%)	17 (7.7%)	
Chronic Kidney Disease			0.016			1
Chronic Kidney Disease - No	2089 (92.6%)	195 (91.5%)		586 (88.0%)	195 (91.5%)	
Chronic Kidney Disease - Yes	166 (7.4%)	27 (12.5%)		80 (12.0%)	27 (12.5%)	
Osteoporosis			0.267			1
Osteoporosis - No	1896 (81.4%)	188 (88.7%)		560 (84.7%)	188 (88.7%)	
Osteoporosis - Yes	439 (19.6%)	24 (11.3%)		102 (15.3%)	24 (11.3%)	
Osteopenia			0.622			1
Osteopenia - No	2163 (95.9%)	213 (99.8%)		661 (99.8%)	213 (99.8%)	
Osteopenia - Yes	92 (4.1%)	7 (3.2%)		21 (3.2%)	7 (3.2%)	
Stroke			0.982			0.944
Stroke - No	2084 (92.4%)	204 (95.9%)		609 (91.4%)	204 (95.9%)	
Stroke - Yes	171 (7.6%)	18 (8.1%)		57 (8.6%)	18 (8.1%)	
Alcohol Use			0.057			0.927
Alcohol Use - No	766 (34.0%)	82 (38.4%)		283 (42.5%)	82 (38.4%)	
Alcohol Use - Yes	1461 (64.8%)	129 (61.1%)		379 (57.5%)	129 (61.1%)	
Alcohol Use - Unknown	28 (1.2%)	1 (0.5%)		4 (0.6%)	1 (0.5%)	
Cigarette Use			0.56			0.71
Cigarette Use - No	2155 (95.6%)	215 (99.8%)		646 (96.4%)	215 (99.8%)	
Cigarette Use - Yes	74 (3.3%)	6 (2.7%)		17 (2.6%)	6 (2.7%)	
Cigarette Use - Unknown	26 (1.2%)	1 (0.5%)		7 (1.1%)	1 (0.5%)	

Table 1 (left): Demographics of non-users and extended-spectrum antibiotic users before and after propensity matching. Bold indicates $P < 0.05$.

Characteristic	No Antibiotic Use	Antibiotic Use	P Value
PROMIS Global Physical	N = 624	N = 209	
Preop Score	40.73 \pm 7.43	40.55 \pm 8.04	0.5376
Postop Score	46.37 \pm 8.71	45.97 \pm 8.92	0.4876
Delta Score	5.64 \pm 7.20	5.41 \pm 6.98	0.6387
MCID-I	408 (65%)	132 (63%)	0.6172
No Change	132 (21%)	46 (22%)	0.8699
MCID-W	84 (13%)	31 (15%)	0.7029
PROMIS Global Mental	N = 623	N = 209	
Preop Score	49.83 \pm 8.60	49.76 \pm 10.18	0.954
Postop Score	51.18 \pm 8.74	52.21 \pm 9.84	0.2206
Delta Score	1.35 \pm 6.50	2.46 \pm 6.52	0.094
MCID-I	296 (48%)	105 (50%)	0.5466
No Change	147 (24%)	52 (25%)	0.7771
MCID-W	180 (29%)	52 (25%)	0.303
SF10-a	N = 611	N = 208	
Preop Score	36.52 \pm 5.14	36.44 \pm 6.26	0.4799
Postop Score	42.49 \pm 8.00	41.90 \pm 7.94	0.2355
Delta Score	5.97 \pm 6.95	5.46 \pm 6.58	0.5162
MCID-I	400 (65%)	138 (66%)	0.8837
No Change	132 (22%)	49 (24%)	0.6243
MCID-W	79 (13%)	21 (10%)	0.3393
KOOS-PS	N = 500	N = 154	
Preop Score	53.57 \pm 14.74	54.09 \pm 15.75	0.596
Postop Score	69.16 \pm 16.11	67.69 \pm 16.88	0.4774
Delta Score	15.59 \pm 16.83	13.60 \pm 14.79	0.3614
MCID-I	327 (65%)	108 (70%)	0.3223
No Change	135 (27%)	35 (23%)	0.3411
MCID-W	38 (8%)	11 (7%)	0.9893

Table 2 (right): PROMs of extended-spectrum antibiotic users and non-users following primary total knee arthroplasty.