Impact of Preoperative *Staphylococcal* Colonization on Patient-Reported Outcomes Following Primary Total Knee Arthroplasty: Propensity Matched Analysis

Muhammad Hamza Ilyas, MD[1]; Oh-Joon Kwon[1]; Zhijun Li, PhD[1]; Margaret Arthur[1]; Hahn Kang, BSc[1]; William Sampson, BA[1]; Carlo Mannina, BSc[1]; Oh-Jak Kwon[1]; Sina Afzal, MD[1]; Michelle Shimizu, MD[1]; Isaiah Freeman, BSc[1]; Pengwei Xiao, PhD[1]; Young-Min Kwon, MD, PhD[1]
[1]Bioengineering Laboratory, Massachusetts General Hospital/Harvard Medical School, Boston, MA
ymkwon@mgh.harvard.edu

Disclosures: Muhammad Hamza Ilyas (N), Oh-Joon Kwon (N), Zhijun Li (N), Margaret Arthur (N), Hahn Kang (N), William Sampson (N), Carlo Mannina (N), Oh-Jak Kwon (N), Sina Afzal (N), Michelle Shimizu (N), Isaiah Freeman (N), Pengwei Xiao (N), Young-Min Kwon (5- MicroPort; 5- Depuy; 5- Smith & Nephew; 5- Stryker; 5- Zimmer Biomet; 5- Medacta)

INTRODUCTION: Methicillin-sensitive Staphylococcus aureus (MSSA) and methicillin-resistant Staphylococcus aureus (MRSA) are common causes of surgical site infections after orthopaedic surgery. Nasal colonization screening for MSSA/MRSA and subsequent decolonization is widely adopted as part of routine pre-operative screening before primary total knee arthroplasty (TKA). While previous studies have investigated the association of positive MSSA/MRSA screening results with infection-related outcomes following total joint arthroplasty, limited studies to date have focused on its potential impact on patient-reported outcome measures (PROMs). This study aims to compare whether there were minimal clinically important differences (MCID) in PROMs in patients who underwent primary TKA based on their preoperative MSSA/MRSA screening results.

METHODS: This study received IRB approval. A total of 11,210 consecutive patients who underwent primary TKA at a single institution were reviewed. Patients who met the following inclusion criteria were analyzed: 1) a documented record of pre-operative MSSA/MRSA nares screening, 2) pre-operative and post-operative patient-reported outcome measure surveys: knee disability and osteoarthritis outcome score-physical function short form (KOOS-PS), physical function short form (SF-10a), and the physical and mental patient-reported outcomes measurement information system (PROMIS-Physical; PROMIS-Mental), and 3) had a finalized preoperative MSSA/MRSA screening test. Propensity-controlled matching was performed in a 1:3 (positive to negative nasal test) ratio based on age, body mass index, sex, diabetes status, chronic kidney disease, heart failure, osteoporosis, and American Society of Anesthesiologists score. The delta score for each PROM was calculated by subtracting the pre-operative score from the post-operative score. These scores were then used to establish the threshold for minimal clinically important difference improvement (MCID-I) and worsening (MCID-W) in PROM scores (0.5 times the standard deviation of the mean delta PROM scores). PROM scores and MCID thresholds for each cohort were compared using Wilcoxon rank-sum and Chi-square analysis. Postoperative complications were recorded for 90 days, one year, and two years.

RESULTS SECTION: After propensity-matching, 1,428 MSSA negative and 476 MSSA positive patients were available for analysis. No differences in covariate demographics were observed between groups ($p>0.05$). Ninety-day, one-year, and two-year complications rates were similar regardless of MSSA result prior to TKA ($p>0.05$). Absolute preoperative and postoperative scores were equal between groups in the SF10-a, PROMIS Mental, PROMIS Physical, and KOOS-PS ($p>0.05$). Delta scores were similar for MSSA negative and positive patients for all PROMs ($p>0.05$). Proportions of clinically significant improvement, no change, and worsening demonstrated no significant difference between MSSA negative and positive patients ($p>0.05$).

DISCUSSION: Preoperative MRSA/MSSA screening is the standard of care for patients undergoing primary TKA however, the potential impact of these test results on patients' perception of their health after TKA is poorly understood. To our knowledge, this is one of the first studies to investigate the association between a positive MSSA/MRSA test result and PROM survey scores following TKA. This study found that MSSA/MRSA colonization was not associated with clinically meaningful differences in patient-reported outcomes following primary TKA. These findings suggest that MSSA/MRSA colonization does not impact patient perception of physical or mental recovery after surgery, providing clinically useful information for patients who have either MSSA or MRSA positive results prior to undergoing primary TKA.

SIGNIFICANCE/CLINICAL RELEVANCE: Preoperative colonization with methicillin-sensitive or methicillin-resistant Staphylococcus aureus does not significantly impact patient-perceived outcomes following primary total knee arthroplasty.

Variable	Negative MRSA/MSSA (N = 1,428)	Positive MRSA/MSSA (N = 476)	P-value
Age (years)	66.7 ± 8.9	66.6 ± 8.7	0.607
Body mass index (kg/m^2)	31.1 ± 5.8	31.2 ± 5.9	0.970
Female	808 (56.6%)	266 (55.9%)	0.218
Diabetes	269 (18.8%)	89 (18.7%)	0.921
Chronic kidney disease	120 (8.4%)	44 (9.2%)	0.637
Heart failure	72 (5.0%)	21 (4.4%)	0.667
Osteoporosis	258 (18.1%)	88 (18.5%)	0.891
ASA score distribution			0.831

Table 1. Propensity-matched characteristics of MRSA/MSSA positive and negative patients undergoing primary total knee arthroplasty.

Patient-Reported Outcome Measure	Negative MRSA/MSSA	Positive MRSA/MSSA	P-value
SF10-a	N = 1,319	N = 444	
Postoperative score	42.88 ± 7.59	42.64 ± 7.49	0.6337
Delta score	5.81 ± 6.92	5.90 ± 6.91	0.9778
MCID-I	874 (66%)	290 (65%)	0.7592
PROMIS Mental	N – 1,345	N = 443	
Postoperative score	52.04 ± 8.77	52.02 ± 9.22	0.9169
Delta score	1.65 ± 6.84	1.51 ± 6.54	0.7048
MCID-I	622 (46%)	1215 (49%)	0.4343
PROMIS Physical	N = 1,346	N = 443	
Postoperative score	47.16 ± 8.36	46.76 ± 8.55	0.4033
Delta score	5.80 ± 7.32	5.47 ± 7.18	0.3211
MCID-I	863 (64%)	278 (63%)	0.6453
KOOS-PS	N = 1,098	N = 371	
Postoperative score	69.80 ± 15.19	70.48 ± 15.43	0.3939
Delta score	14.60 ± 16.21	15.38 ± 15.89	0.2451
MCID-I	745 (68%)	262 (71%)	0.3531

Table 2. Patient-Reported Outcome Measures for MRSA/MSSA positive and negative patients undergoing primary total knee arthroplasty.