

# Body Mass Index Greater than 42 was Associated with Higher Rates of 2-Year Periprosthetic Joint Infection following Total Knee Arthroplasty: A Stratum Specific Likelihood Ratio Analysis of 43,742 Patients

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## INTRODUCTION:

Obesity is associated with increased risk of medical and infectious complications following total knee arthroplasty (TKA). Pre-established body mass index (BMI) thresholds have been used to guide surgical decision making when it comes to TKA. However, as there have been advances in patient care, it is important to not only reassess these thresholds but also contextualize them to TKA. Therefore, the purpose of this study was to identify data-driven BMI thresholds that predict the incidence of 90-day major complications and 2-year periprosthetic joint infection (PJI) following TKA.

## METHODS:

Patients who underwent a TKA between 2013 and 2022 were identified using a national database. Patients were included if they had a recorded BMI within one-month before TKA. Stratum specific likelihood ratio (SSLR) analysis was conducted to determine data-driven BMI thresholds that predict 2-year PJI and 90-day major complications (death, sepsis, acute kidney injury, myocardial infarction, stroke, and pulmonary embolism) following TKA. Univariate analysis was conducted using Chi-square analysis to show the association among SSLR-identified BMI strata for 2-year PJI and 90-day major complications. To account for potential confounders, patients in each data-driven stratum were matched by age, sex, hypertension, heart failure, diabetes, and chronic obstructive pulmonary disease to the lowest BMI strata, and the risk of 2-year PJI and 90-day major complications were subsequently compared among matched cohorts.

## RESULTS:

A total of 43,752 patients with a mean BMI  $32.2 \pm 6.3$  were identified. SSLR identified two BMI strata that predict both 2-year PJI and 90-day major complications: 19-42 and 43+. Prior to matching, patients with a BMI of 43+ had significantly higher rates of 2-year PJI (1.46% versus 2.82;  $P < 0.001$ ) and 90-day major complications (4.22% versus 5.48;  $P = 0.003$ ) when compared to those with a BMI of 19-42. and pulmonary embolism (0.86% versus 1.72%;  $P < 0.001$ ) (Table 3). After matching, patients with a BMI of 43+ had a higher risk of 2-year PJI (Risk Ratio [RR]:1.92; 95% CI [Confidence Interval]: 1.28-2.86;  $P < 0.001$ ) but not 90-day major complications (RR:1.16; 95% CI: 0.92-1.49;  $p=0.216$ ) when compared to those with a BMI of 19-42.

## DISCUSSION AND CONCLUSION:

This study identified two data-driven strata associated with significant risk of 2-year PJI. Prior studies have advocated for a BMI cut-off of 40 based on pre-established thresholds, with this study showing this cut-off should be reassessed permitting access to TKA to more patients. Surgeons can incorporate these data-driven strata into their decision making when

risk-stratifying

patients

to

undergo

TKA.

|                            | 19-42 | 43+  |
|----------------------------|-------|------|
| 90 DAY MAJOR COMPLICATIONS | 4.22  | 5.48 |
| 2-YEAR PJI                 | 1.46  | 2.82 |
| DEATH                      | 1.00  | 1.00 |
| SEPSIS                     | 1.00  | 1.00 |
| ACUTE KIDNEY INJURY        | 1.00  | 1.00 |
| MYOCARDIAL INFARCTION      | 1.00  | 1.00 |
| STROKE                     | 1.00  | 1.00 |
| PULMONARY EMBOLISM         | 0.86  | 1.72 |

|                   | NUMBER       | PERCENT |
|-------------------|--------------|---------|
| TOTAL             | 43,752       | -       |
| AVERAGE AGE       | 64.18 (s.d.) | -       |
| AVERAGE BMI       | 32.2 (s.d.)  | -       |
| SEX               |              |         |
| MALE              | 17,373       | 39.48   |
| FEMALE            | 26,479       | 60.52   |
| HYPER TENSION     | 30,851       | 70.53   |
| HEART FAILURE     | 2,706        | 6.21    |
| DIABETES MELLITUS | 16,891       | 38.60   |
| COPD              | 18,528       | 42.35   |

|                            | %    | P VALUE | %    | P VALUE |
|----------------------------|------|---------|------|---------|
| 2-YEAR PJI                 | 1.46 | <0.001  | 2.82 | <0.001  |
| 90 DAY MAJOR COMPLICATIONS | 4.22 | <0.001  | 5.48 | <0.001  |
| DEATH                      | 0.68 | <0.001  | 0.72 | <0.001  |
| SEPSIS                     | 0.77 | <0.001  | 0.77 | <0.001  |
| ACUTE KIDNEY INJURY        | 0.78 | <0.001  | 0.86 | <0.001  |
| MYOCARDIAL INFARCTION      | 0.63 | <0.001  | 0.63 | <0.001  |
| STROKE                     | 0.63 | <0.001  | 0.63 | <0.001  |
| PULMONARY EMBOLISM         | 0.86 | <0.001  | 1.72 | <0.001  |

|                            | RR (95% CI)      | P VALUE | RR (95% CI)      | P VALUE |
|----------------------------|------------------|---------|------------------|---------|
| 2-YEAR PJI                 | 1.92 (1.28-2.86) | <0.001  | 1.16 (0.92-1.49) | 0.216   |
| 90 DAY MAJOR COMPLICATIONS | 1.16 (0.92-1.49) | 0.216   | 1.16 (0.92-1.49) | 0.216   |
| DEATH                      | 1.16 (0.92-1.49) | 0.216   | 1.16 (0.92-1.49) | 0.216   |
| SEPSIS                     | 1.16 (0.92-1.49) | 0.216   | 1.16 (0.92-1.49) | 0.216   |
| ACUTE KIDNEY INJURY        | 1.16 (0.92-1.49) | 0.216   | 1.16 (0.92-1.49) | 0.216   |
| MYOCARDIAL INFARCTION      | 1.16 (0.92-1.49) | 0.216   | 1.16 (0.92-1.49) | 0.216   |
| STROKE                     | 1.16 (0.92-1.49) | 0.216   | 1.16 (0.92-1.49) | 0.216   |
| PULMONARY EMBOLISM         | 1.16 (0.92-1.49) | 0.216   | 1.16 (0.92-1.49) | 0.216   |

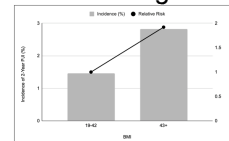


Figure 1. Incidence and relative risk of 2-year PJI between 19-42 and 43+ BMI values