Bias in Large Database Studies on Technology in TKA: Considering Potential Confounding

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INTRODUCTION:

Administrative and registry data is increasingly being used to study the impact of technology on the outcomes of total knee arthroplasty (TKA). The validity of using observational data to study this topic is unclear. We aimed to uncover potential confounding variables for patients receiving technology during TKA at our institution that may not be captured in large observational datasets.

METHODS:

This retrospective chart review included 1,001 consecutive patients aged 18 to 89 who underwent primary TKA from 2021-2023 at an academic medical center. All four surgeons at our institution selectively used technology (computer navigation, robotics, or augmented reality). Patient charts were reviewed for demographic data and medical history. Univariate analysis was performed with chi-squared tests, T-tests, and ANOVA tests. Binary logistic regression analysis was used to determine the relationship between statistically significant variables from univariate analysis (P < 0.1) and technology use during surgery.

RESULTS:

For univariate analysis, age, range of motion, preoperative KOOS Jr score, surgeon, payor, diabetes, liver disease, limb alignment, peripheral vascular disease (PVD), retained hardware, excessive bone loss, and obesity were significant variables associated with technology use (P < 0.05). For multivariate analysis, surgeon, excessive bone loss, retained hardware, and PVD remained significant (P < 0.05). Surgeon was the greatest predictor for whether technology was used (P < 0.001). Over half of the variation explained by the model was related to which surgeon performed the operation [R^2 (adj) = 51.5%, ROC AUC = 0.9216].

DISCUSSION AND CONCLUSION:

The surgeon performing the operation appears to be a strong confounding variable when studying technology use during TKA. Administrative and registry data studies that do not control for the surgeon are potentially confounded and may lead to erroneous conclusions. There are a number of additional variables that may also be relevant when looking at observational data on this topic.