

Propensity Score Matching Can Be Used Effectively to Evaluate the Improvement of KOOS-JR in TKA Designs: A MARCQI Study

David C Markel, Huiyong Zheng, Eric R Cornish, Richard E Hughes, Brian Richard Hallstrom

INTRODUCTION:

Introduction Patient reported outcome measures (PROMs) are used to evaluate total knee arthroplasty (TKA) outcomes, but it is not clear how scores compare between different implant designs.

Propensity Score Matching (PSM) allows statistical comparison of groups in non-randomized studies. PSM matches co-variables so that treatment assignment is independent of potential outcomes. Accuracy depends on assuring no unobserved co-variables.

This project's aims were: 1) demonstrate the use of propensity score matching in analyzing PROMs data between two implants; 2) apply and compare four case matching methods to highlight the application of PSM.

METHODS:

Materials and Methods TKA implant designs "A" and "B", performed between 1/2/2017 and 9/10/21 from the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI), were reviewed. Implant selection was based on differences in raw KOOS-JR and implant volume. Four propensity score methods were evaluated: 1) Greedy Nearest Neighbor Matching; 2) Optimal Matching; 3) Optimal Matching with patellar resurfacing as a restricted variable and 4) Optimal Matching with patellar resurfacing as the restricted variable with Bootstrapping.

RESULTS:

Results There were 2193 matched pairs. KOOS JR delta was comparable using methods 1 and 2. Method 3 had better balancing of matching co-variables. Method 3, with the inclusion of patellar resurfacing as a restricted variable, showed device "A" had a lower KOOS JR delta mean (20.23, 95%CI 19.48, 20.98) than device B (24.45, 95%CI 24.10, 25.60). While Device "A" had a small number of cases with patellar resurfacing, after bootstrapping 500 times, the statistically significant difference in KOOS JR delta scores remained.

DISCUSSION AND CONCLUSION:

Discussion A statistically significant difference in KOOS JR delta between the two TKA implants after patient matching suggests better outcomes with Device "B" vs device "A". Propensity score matching can be used to compare PROMs scores between implants. Algorithms likely need to include surgical and design differences as co-variables.