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**“Does Race Improve the Accuracy of Models Predicting the Size of TKA Femoral Components?”**

The ability to accurately predict the size of implants prior to total knee arthroplasty (TKA) could reduce costs. Previous research examined the accuracy of a model using height, weight, and sex for predicting femoral component size.<sup>1</sup> When this model was applied to our dataset, its accuracy for predicting femoral implant size within 1 size of the final implant significantly differed between the vendors United and Zimmer/Biomet (76.3% vs. 87.1%,  $p=0.014$ ). This study evaluated whether vendor-specific linear predictive models that include race, sex, height, and weight improves predictive accuracy.

This retrospective chart review included 320 black and white patients who underwent primary TKA performed by one surgeon at a university-based hospital during 2015-2020. For each vendor, patients were randomly assigned to either a training or testing group. The training datasets were used to develop the models while the testing datasets were used to evaluate their accuracy.

The accuracy of the final models for predicting femoral implant size within 1 size of the final implant was 91.1% (95% confidence interval [CI] 84.4-97.9%,  $n=68$ ) for United and 94.8% (95% CI 89.1-100%,  $n=58$ ) for Zimmer/Biomet. We compared the accuracy of our final models with the Sershon model<sup>1</sup> using our testing dataset. Our model developed for United implants was significantly more accurate (91% vs. 72%,  $p=0.0008$ ) than the Sershon model. There was no statistically significant difference in accuracy between our Zimmer/Biomet model and the Sershon model (95% vs. 90%,  $p=0.257$ ) although our model was highly accurate.

This study shows that developing vendor-specific models that include race in addition to sex, weight, and height can improve predictive accuracy. Allowing surgeons to easily apply these vendor-specific models (e.g., using a mobile app) prior to TKA could save time and lower costs by reducing waste of unneeded implants and allowing for more streamlined product distribution.

**References:**

1. Sershon, Robert A, et al. “Can Demographic Variables Accurately Predict Component Sizing in Primary Total Knee Arthroplasty?” *The Journal of Arthroplasty*, U.S. National Library of Medicine, Oct. 2017, <https://www.ncbi.nlm.nih.gov/pubmed/28583760/>.

