# Predicting Forgotten Joint Score and KOOS, JR After Total Knee Arthroplasty Using Machine Learning: A Retrospective Cohort Study

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DISCLOSURES: Maggie Head (N), Maunil Mullick (N), Langan S Smith (N), Luke Byerly (N), Arinan Dourado (N), Arthur L Malkani (1, 2, 3B, 5 - Stryker; 4 - Parvizi Surgical Innovation)

INTRODUCTION: As total knee arthroplasty (TKA) becomes increasingly common, especially among younger individuals, there is a growing need to predict how patients will feel and function after surgery. Traditional metrics often focus on complications or length of stay, but these fail to capture the patient's lived experience of recovery. Patient-reported outcome measures (PROMs), such as the Forgotten Joint Score (FJS) and the Knee injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR), provide valuable insight into postoperative satisfaction and functional improvement. FJS reflects joint awareness during daily activities, while KOOS, JR assesses short-term pain and functional ability: both critical components of meaningful recovery. Despite their clinical relevance, these PROMs are rarely incorporated into predictive models used in preoperative planning. Our objective is to develop a machine learning model that uses routine preoperative data (including age, sex, race, body mass index (BMI), comorbidities, and operative approach) to predict both FJS and KOOS, JR scores following TKA. This model aims to enhance individualized counseling, set realistic expectations, and support shared decision-making for patients undergoing knee replacement.

METHODS: We conducted a retrospective cohort study using a database of ~1,700 patients who underwent primary TKA at a single institution between 2022 and 2024. Of these, 185 patients met initial inclusion criteria: age 22–90, availability of preoperative data (age, sex, BMI, race, comorbidities, operative approach), and postoperative KOOS, JR and FJS outcomes recorded within 1–2 years. De-identified data were analyzed using supervised machine learning. A random forest classification model was developed to predict KOOS, JR. and FJS outcome categories (0–25, 26–50, 51–75, 76–100) based on preoperative variables. Random forest is an ensemble method that constructs multiple decision trees during training and outputs the mode of the predicted classes. This approach is robust to overfitting and handles nonlinear relationships common in clinical datasets.

RESULTS: Our preliminary results show that the trained machine learning model can predict FJS and KOOS, JR outcomes based on preoperative data with 71% accuracy for FJS and 74% accuracy for KOOS Jr. Specifically, the model correctly predicted the outcome scores within the appropriate categorical ranges of 0–25, 26–50, 51–75, and 76–100 with this level of accuracy. We anticipate that incorporating additional data and further applying expert model refinement will further improve predictive accuracy, potentially reaching the 90% range.

DISCUSSION: Our findings support the hypothesis that preoperative clinical data can moderately predict postoperative FJS and KOOS, JR scores using machine learning, offering a novel approach to personalize patient counseling and manage realistic expectations after primary TKA. Limitations include a small, single-center retrospective cohort and potential selection bias. While current accuracy (71% and 74%) is promising, further refinement with larger datasets is needed to improve prediction and clinical applicability. These preliminary results suggest machine learning models may enhance shared decision-making by incorporating patient-reported outcomes into preoperative planning.

SIGNIFICANCE/CLINICAL RELEVANCE: This study addresses the critical need for personalized prediction of patient-reported outcomes following total knee arthroplasty, enabling more accurate preoperative counseling and expectation management. By leveraging routine clinical data with machine learning, it offers a scalable tool to improve patient satisfaction and optimize shared decision-making in knee replacement care.