## Comparing A.I enabled Personalized Decision Support versus Educational Material on Decision Quality, Shared Decision-Making, Patient Experience, and Levels of Capability in Adults with Knee Osteoarthritis considering Joint Replacement Surgery: A Randomized Clinical Trial

Prakash Jayakumar, Ariel Hortert, George Sayegh<sup>1</sup>, Lauren Uhler<sup>2</sup>, Karl Marc Koenig, Paul Rathouz<sup>3</sup>, Kevin John Bozic<sup>4</sup> <sup>1</sup>University of Texas Medical School - SA, <sup>2</sup>University of Texas At Austin, <sup>3</sup>The University of Texas at Austin, Dell Medical School, <sup>4</sup>Dell Med Sch, Univ of Texas At Austin

## INTRODUCTION:

Patient decision aids aim to inform the selection of treatments that are both appropriate and aligned with a person's preferences, values, and needs through shared decision making (SDM). This approach is especially important in orthopaedic surgery where there are a range of common, preference sensitive conditions, such as knee osteoarthritis (OA), managed with discretionary procedures, including total knee replacement (TKR). However, few decision aids combine patient education, preference assessment, and artificial intelligence (AI) using clinical and patient-reported outcome measurement (PROM) data from large datasets to generate a machine learning model (known as the "digital twin concept) that offers personalized estimations of surgical outcomes to augment SDM. Our objective was to assess the impact of an AI-enabled patient decision aid compared to education only on decision quality, capability (valued life activities), level of collaborative SDM, decision conflict, patient experience, and consult time among people with advanced knee OA considering TKR.

## METHODS:

This randomized clinical trial at a single US academic orthopedic practice included 201 new adult patients presenting for OA-related knee pain from December 2021 to October 2023. Patients were randomized into a group that received a decision aid including patient education, preference assessment, and personalized outcome estimations (intervention group) or a group receiving educational material only (control group). Both groups received usual musculoskeletal care at our center which includes a comprehensive range of non-operative strategies alongside TKR performed in ambulatory or hospital inpatient settings. The primary outcome was decision quality, measured using the Knee OA Decision Quality Instrument (K-DQI). Secondary outcomes were collaborative decision-making (CollaboRATE survey), patient satisfaction with consultation (using a numerical rating scale), Knee Injury and Osteoarthritis Outcome Score Joint Replacement (KOOS JR) score, and consultation time. Trial Registration - ClinicalTrials.gov Identifier: <u>NCT03956004</u> RESULTS:

A total of 101 patients in the intervention group (54 [54%] women; 69 [68%] non-white) and 100 patients in the control group (60 [60%] women; 63 [63%] non-white) were included in the analysis. The intervention group showed better decisional quality (K-DQI, 63 [62.4%] versus 39 [39%] patients with a score of 100; p = .0005), improved capability at 6 months (mean [SE] KOOS JR, 69.5 [SD 17.3] versus 47 [SD 18.4], p < .0001), and less decision conflict (mean [SE] DCS, 1.0 [3.1] versus 3.3 [5.8], p=0.0007) compared to the control group. The intervention group also demonstrated greater levels of collaborative decision making (CollaboRATE, 69 [68.3%] vs 59 [59%] patients with a maximum score of 27; p=0.1886) and greater satisfaction (numerical rating scale, mean (SD) 9.7 (1.2) versus 9.5 (1.1), p = 0.201), but these were not statistically significant differences. The intervention did not significantly affect consultation time (mean [SE] difference, 24 [10.7] versus 22.5 [10.6] minutes; p= 0.3582).

## DISCUSSION AND CONCLUSION:

In this randomized clinical trial, an AI-enabled decision aid significantly improved decision quality, greater levels mediumterm capability, and less decision conflict compared to education only in patients with advanced knee OA considering surgery. A.I (Machine Learning) applied to clinical and patient generated health data can generate 'digital twins' that offer a more personalized data-driven approach to decision support in real-time at the point-of-care. This technology-enabled approach provides an effective strategy for improving appropriateness in orthopaedic treatment selection and shifting toward a data-driven, evidence-based, and "fly-by-wire" approach to augmenting decision making in orthopaedic surgery.