Immediate post-operative qualified step counts associated with 90-day readmission after primary TKA

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INTRODUCTION:
The risk of readmission following primary total knee arthroplasty (TKA) continues to be a burden to the healthcare system. Evaluation of patients at risk for readmission could be possible with analysis of objective activity metrics during the immediate post-operative period. The purpose of this study was to evaluate differences in qualified step counts in primary TKA patients who did and did not experience a readmission between 15- and 90-days post-operative using data from a smart implantable device (SID).
METHODS:
A retrospective case-control study of real-world data from patients who received an SID during primary TKA was performed. Data were obtained from a de-identified longitudinal commercial claims aggregator. We evaluated 6,394 patients who received a SID between October 2021 and January 2025. Of these, a total of 810 patients had a complete claims data set between days 15 and 90 available for analysis. Readmission for any reason was identified using current procedural terminology codes. Based on procedure codes, 261 patients experienced a readmission between days 15 and 90. Patients with a readmission were significantly older (68±9 vs. 65±9 years, $p<0.0001$). BMI did not differ between the groups ($p=0.744$). The proportion of male patients was higher among patients readmitted (55% vs 42%, $p=0.0019$). The SID contains an embedded inertial measurement unit (IMU). The IMU sensor collected qualified step counts (step counts), defined using a proprietary algorithm to indicate purposeful walking. The average daily step counts collected from day 0 to day 14 post-operative were compared between patients who did or did not experience a readmission. Of the 810 patients eligible for analysis, 806 contributed gait data. The association between step counts and readmission was assessed using a generalized linear mixed model, adjusted for age, sex, and BMI. Significance was assessed as $p<0.05$. Data are reported as adjusted mean ± standard error.
RESULTS:
The mean time from TKA to readmission was 41.8±21.5 days. SID data revealed patients who were readmitted had a significantly lower average daily maximum qualified step count during the first 14 post-operative days (256±23 steps) compared to those who were not readmitted (417±31 steps; $p < 0.0001$).
DISCUSSION AND CONCLUSION:
SID-recorded qualified step counts were significantly lower in patients who subsequently experienced a readmission. These findings suggest that objective activity monitoring with a SID can potentially identify risk for 90-day readmission. Further prospective studies are warranted to validate these findings by defining cutoffs and determining if data-driven interventions reduce readmission rates.