The Use of Accelerometers to Predict Functional Outcome After Total Knee Arthroplasty

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**Background:** Total knee arthroplasty (TKA) effectively relieves arthritis pain in 98% of patients but improvement in physical function varies after TKA. Research has identified demographic and clinical predictors of high and low function after TKA. Variation in patients’ physical activity levels prior to TKA may contribute to variable functional gains but this has never been quantified.

**Objectives:** The purpose of this study was to determine if pre-operative physical activity measurement improves the ability to predict post-operative functional outcome.

**Methods:** Seventy-nine (79) primary, unilateral TKA patients enrolled in a prospective study between 2006 and 2007 had complete data. The mean age was 68 years, and 71% of the patients were female. All patients who were scheduled for a TKA by one of three high-volume arthroplasty surgeons at a single total joint replacement center were invited to participate in this study. Exclusion criteria included surgery that would interfere with physical activity improvement during the 6-month post-operative period (i.e., TKA of the contralateral knee). Descriptive and multivariate statistics (mixture models) evaluated associations between pre-operative home physical activity level and 6-month post-operative function. Pre-operative physical activity was measured using a step activity monitor, an accelerometer that measures the frequency, intensity and duration of steps. Average steps per day (general activity), average maximum steps in a 5-minute period (a measure of intensity) and average maximum steps in a 30-minute period (a measure of endurance) were calculated. Global post-operative function was assessed using the Short-Form 12 (SF-12) Physical Component Score (PCS) and knee function using the Western Ontario and McMaster University Osteoarthritis Index (WOMAC).

**Results:** After adjusting for age, gender, BMI, and emotional health (SF12/MCS), pre-operative average steps per day was significantly correlated with post-operative WOMAC score ($p = 0.003$). The greater the average steps per day, the better the post operative knee function (WOMAC). However, no significant relationship was detected with global physical function (SF12/PCS). There were no statistically significant associations observed between the 5 and 30 minute rates and the post-operative knee or global function.
Conclusion: These data suggest that pre-operative average steps per day measurement is predictive of knee function after TKA. Pedometer measures may be adequate in clinical use as step rates data did not add significantly to these analyses. Future accelerometer studies should test maximal rates in a controlled condition and in larger patient samples before its value in pre-operative assessment can be determined.