

Do Outcomes following Total Joint Arthroplasty Differ by Objectively Measured Activity Performance?

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INTRODUCTION:

The desire for feedback regarding recovery progress, particularly in comparison to peers, has often been asserted. This study aimed to determine whether differences in clinically relevant outcomes were apparent by comparison of a patient's performance to peers based on walking metrics collected by wearable technology.

METHODS:

Mobility data was passively collected using a smartphone-based care management platform with smartwatch in patients undergoing joint replacement procedures. Subjects (n=3,103) were divided into cohorts based on age, gender, BMI, and procedure. Patients were divided within these cohorts according to either step counts or walking sessions into performance groups compared to peers: low (<15th percentile); on-track (15th-85th percentile); high (>85th percentile). Outcomes including active flexion range of motion (ROM), KSS Satisfaction, NRS pain scores, and time to reach preoperative gait speed were compared between predicted performance groups by Kolmogorov-Smirnov two-sample tests. Principal component analysis (PCA) was applied to combine flexion, satisfaction, and pain outcomes to determine whether differences exist between predicted performance cohorts at 1 month.

RESULTS:

Differences in ROM were apparent at 1 month only in the low versus high-performance groups when cohorts were separated into performance groups by either step counts or walking sessions with medians of distribution different by approximately 5° (p<0.001). Differences in ROM at 3 months were only observed between low- and high-performance groups based on walking sessions (p=0.005), but not step count predicted groups. Satisfaction at 3 months was significantly lower in the low step count performance group than on-track and high groups, while differences were significant only comparing on-track vs. high-performance groups separated by walking sessions. Pain at 1 month was higher in the low-performance group compared to both on-track and high performers separated by either step count or walking sessions, while no differences were observed between any cohorts at 3 months postoperative. High performers, separated by either step count or walking sessions, returned to preoperative gait speeds earlier than both on-track and low performance groups. PCA demonstrated difference in outcome between high vs. on-track and high vs. low, but not on-track vs. low performance groups.

DISCUSSION AND CONCLUSION:

Patients can be meaningfully segmented into high, medium, and low progress compared to their peers using mobility data collected by wearables and smartphones. Differences in clinically important outcomes including ROM, satisfaction, pain, and gait recovery metrics were apparent between the highest and lowest performing groups based on these objective mobility metrics.