

## **Impact of Robotic Assistance on Hospital Stay Direct Costs of Total Knee Arthroplasty**

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**INTRODUCTION:** Technology continues to proliferate in total knee arthroplasty (TKA). This includes increasing rates of robotic assistance when performing this procedure. The goal is to improve outcomes, and to ultimately reduce costs through this improvement, but these systems are associated with increased upfront costs. The impact of robotics on direct hospital costs is less well known. The purpose of this study is to compare the total direct costs of TKA when robotic assistance is used compared with conventional TKA.

### **METHODS:**

This is a retrospective analysis of patients who underwent an elective TKA at a single center between December 2020 and February 2023. Direct costs, including both fixed and variable costs associated with each operation, were obtained. Cases which used robotic assistance were compared to conventional TKA cases. The two cohorts were propensity matched by age, sex, and date of surgery. Independent t-test, Mann Whitney U test, or Chi2 were used to compare date between cases with and without robotic assistance. Association between cost data and in-hospital metrics were assessed using Pearson correlations. Incremental costs of using robotic assistance while controlling for patient demographic, OR time, and LOS were performed using a multilinear mix model.

### **RESULTS:**

Overall, 2,132 primary TKAs were performed over the studied period, including 333 with robotic assistance. After propensity matching, 308 patients were retained in each cohort. There were no observed significant differences in preoperative KOOS, PCS, or MCS scores. OR time was found to be significantly longer for robotic cases ( $p < 0.001$ ) both in the "cut-to-close" time (median of 127 minutes with robot, 111 without) and the "room-in to room-out" time (median of 201 minutes with robot, 185 without). However, there was no significant difference in length of hospital stay, with most patients staying one (40.7%) or two (27.9%) days. Robotic cases had a significantly higher direct cost than their traditional counterparts ( $p < 0.001$ ). Compared to traditional TKA, the median of robotic-assisted case overall direct cost was 7.1% higher, driven primarily by the direct variable cost, which was 9.7% higher for robotic cases. After adjusting for age, OR Time, and total length of stay, using robotic assistance increased the cost by 4.8% compared to the median variable direct cost of conventional TKA ( $p = 0.013$ ). Multivariate analysis controlling for age, LOS, and OR time showed that use of robotics is not an independent predictor of total direct cost or fixed direct cost ( $p > 0.05$ ), but the median direct variable cost was 4.8% higher compared to conventional TKA ( $p = 0.013$ ).

**DISCUSSION AND CONCLUSION:** Robotic TKA has higher hospital direct costs, both fixed and variable. Robotic TKAs were longer with respect to both cut-to-close time and time in the room. When controlling for surgery time, use of robotic assistance during total knee arthroplasty was not an independent driver of overall direct costs, however it was shown to increase variable costs compared to conventional TKA.