Use of Technology Improves Short-Term Clinical Outcomes in Total Knee Arthroplasty

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INTRODUCTION:
Technology has been increasingly employed in total knee arthroplasty (TKA), with robotic-assisted (RA-TKA) and computer-assisted surgery (CAS) being notable examples. However, the impact of these advancements on short-term outcomes and resource utilization in TKA remains uncertain. This study aimed to investigate the effects of different surgical techniques on postoperative outcomes following TKA.
METHODS:
A total of 15,530 patients who underwent primary TKA from January 2016 – December 2022 were retrospectively reviewed. Cases were categorized into three groups based on type of technology: 1,936 cases (12.5%) in the RA-TKA group, 3,048 (19.6%) in the CAS group, and 10,546 (67.9%) in the manual group. Demographic data and short-term outcome measures, including the Activity Measure for Post-Acute Care (AM-PAC) scores, a validated tool used to quantify postoperative recovery, were collected and compared using ANOVA and multivariate logistic regression.
RESULTS:
The RA-TKA group exhibited the shortest mean length of stay (38.79 hours), followed by the CAS group (47.30 hours) and manual group (56.69 hours) ($p<0.001$). Furthermore, the RA-TKA, and CAS cohorts had significantly higher rates of discharge to home compared to the manual group (95.1 vs. 94.4 vs. 79.2%, respectively; $p<0.001$). Although there were no significant differences in 30-day readmissions, the 90-day readmission rate was lowest in the RA-TKA cohort (2.4 vs. 3.0 vs. 3.5%; $p=0.04$). In addition, perfect AM-PAC scores on postoperative day 0 (POD0) were more often observed in the RA-TKA cohort relative to the CAS and manual groups (31.1 vs. 21.8 vs. 8.3%, respectively; $p<0.001$). Multivariate analysis demonstrated that use of RA-TKA was independently associated with reduced odds of 90-day readmission ($p=0.031$), after adjusting for implant type and baseline demographics.
DISCUSSION AND CONCLUSION:
We observed favorable short-term outcomes associated with the integration of RA-TKA, including shorter hospital stays, increased likelihood of discharge to home, lower 90-day readmission rates, and faster postoperative recovery.

Table. Multivariable Analysis for Perfect AM-PAC Score Achievement on POD0 Odds Ratio

	Perfect Score POD0 Odds Ratio (95% CI)	P-Value
Surgical Technique		
Conventional		
Robot-Assist	5.16 (4.25-6.26)	**<0.001***
Navigation	3.11 (2.61-3.71)	**<0.001***
Fluoroscopy	1.72 (0.47-6.25)	0.413
Days to Last Ortho F/U	1.00 (0.97-1.00)	0.597
Date of Surgery	1.00 (0.99-1.00)	0.362

Table. TKA Outcomes stratified by Conventional vs. Robotic vs. Navigation use

	Conventional (n=10546)	Robotic (n=1936)	Navigation (n=3048)	P-Value
LOS (hours)	59.69	38.79	47.30	**<0.001***
Discharge Disposition – no. (%)				**<0.001***
Home	27951 (79.2)	3183 (95.1)	2476 (94.4)	
Skilled Nursing Facility	4974 (14.1)	111 (3.3)	112 (4.3)	
Acute Rehab Facility	2255 (6.4)	43 (1.3)	24 (0.9)	
Other	133 (0.4)	11 (0.3)	10 (0.4)	
30-Day Readmissions – no. (%)	173 (1.6)	25 (1.3)	35 (1.1)	0.104
90-Day Readmissions – no. (%)	367 (3.5)	47 (2.4)	92 (3.0)	**0.040***
Days to Readmission	40.84	33.09	43.92	0.107
Reason for Readmission				0.808
Pain	12	1	2	
Dislocation/Instability	4	0	3	
Infection	86	13	21	
Fracture	13	3	2	
Wound Complication	30	3	6	
Other	222	27	58	
Perfect Score Achieved POD0 – no. (%)	285 (8.3)	255 (31.1)	304 (21.8)	**<0.001***