Cost-effectiveness of Outpatient Total Knee Arthroplasty compared to Inpatient Total Knee Arthroplasty

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INTRODUCTION:
Knee osteoarthritis (OA) is a leading cause of disability and reduced quality of life, presenting a substantial, growing burden to patients and the healthcare system. Total knee arthroplasty (TKA) is an effective intervention for advanced OA. The prevalence of knee OA is rapidly increasing, resulting in a rising demand for care and significant impact on healthcare budgets. Standard TKA procedure includes an overnight hospital stay. Eliminating overnight stays following TKA may reduce the financial burden to hospitals, however, all associated costs post-discharge must be evaluated. The purpose of this study is to estimate the cost-effectiveness of outpatient TKA compared to the standard of care inpatient TKA from the Canadian healthcare payer and societal perspectives.
METHODS:
We combined data collected from a randomized controlled trial (RCT) (n=25) and a prospective cohort study (n=61), for 86 participants, outpatient (n=43) and inpatient (n=43). We recorded all costs associated with each discharge model for each participant including equipment, operating room costs, length of stay in hospital, and laboratory or other medical tests. At 2 weeks, 6 weeks, 3, 6, 9, and 12 months postoperative, participants reported any healthcare resource use including hospitalizations, procedures, doctor's visits, and personal expenses related to the surgery. At baseline, 6 weeks, 3 months, and 12 months postoperative, participants completed the EQ-5D-5L, and at baseline, 3 months and 12 months postoperative, completed the Western Ontario McMaster University Osteoarthritis Index (WOMAC).

We conducted a cost-effectiveness analysis from a Canadian public health care payer (HCP) and a societal perspective. The HCP perspective includes any direct health costs covered by the publicly funded system. In addition to the health care system costs, the societal perspective also includes any out of pocket costs to the patient (e.g. physiotherapy, medication, or assistive devices), as well as any indirect costs such as time off paid employment for patients or caregivers.

We calculated the incremental cost-utility ratio (ICUR) using quality adjusted life years (QALYs) derived from EQ-5D utility scores as the measure of effect. We also estimated cost-effectiveness using the net benefit regression (NBR) framework, at willingness to pay values ranging from $0 to $10,000. We included age, sex, BMI, Charlson comorbidity index, and baseline EQ-5D scores as covariates in our regression models.
RESULTS:
There were no significant differences at baseline in age, sex, height, weight, BMI, utility scores, and WOMAC scores between inpatient and outpatient groups. The surgical procedure and in-hospital stay costs were statistically significant lower in the outpatient group. There were no statistically significant differences in costs between the two groups in any other cost category (Table 1). There were no significant differences between total costs from the healthcare payer or societal perspective, QALYs, or WOMAC scores (Table 2). The outpatient pathway was cost-effective from the healthcare payer perspective regardless of willingness to pay values. The outpatient group had greater overall total cost over the 12-month study period from the societal perspective, although this difference was not statistically significant.
DISCUSSION AND CONCLUSION:
This study found that outpatient TKA resulted in both lower costs and no statistically significant difference in quality adjusted life years, suggesting outpatient TKA is cost-effective compared to inpatient TKA from a healthcare payer perspective. From the societal perspective, a greater amount of time off work among outpatient participants may offset the lower in-hospital stay costs however; these findings may be subject to selection bias because of the cohort study design. Further research with larger sample sizes and detailed employment data are needed to clarify the societal cost implications of outpatient TKA.

Table 1: Total mean cost by healthcare resource use category

	Inpatient TKA	Outpatient TKA	Mean Difference	p-Value
	Mean (SD)		(95% CI)	
Surgical Costs	8571 (1308)	7738 (834)	833 (366, 1299)	<0.01
Postoperative Costs				
Emergency Visits and Hospitalizations	251 (742)	132 (342)	119 (-126, 364)	0.34
Physician Visits	147 (118)	208 (202)	-61 (-132, 10)	0.09
Other Healthcare-HCP	375 (250)	344 (187)	31 (-63, 125)	0.51
Other Healthcare-SOC	592 (463)	731 (657)	-139 (-381, 104)	0.26
Tests	86 (35)	61 (38)	6 (-10, 21)	0.48
Medication-HCP	59 (129)	585 (3384)	-526 (-1552, 500)	0.31
Medication-SOC	313 (520)	965 (3711)	-651 (-1787, 484)	0.26
Other Expenses	344 (662)	212 (367)	131 (-36, 359)	0.26
Time Costs				
Time Off Work	3490 (6266)	6049 (15267)	-2558 (-7551, 2434)	0.31
Homemaking, Volunteering, Caregiving	3880 (4429)	3698 (6252)	182 (-2131, 2495)	0.88
Unpaid Assistance	1710 (1764)	2272 (2633)	-563 (-1523, 396)	0.25

Abbreviations. SD = standard deviation, CI = confidence interval, HCP = healthcare payer, SOC = societal.

Table 2: Total mean cost and quality of life comparison between groups

	Inpatient TKA	Outpatient TKA	Mean Difference	p-Value
	Mean (SD)		(95% CI)	
HCP Perspective				
	9490 (1768)	9088 (3473)	402 (-777, 1580)	0.50
SOC Perspective				
	19384 (10237)	22086 (23595)	-2701 (-10481, 5078)	0.49
QALY				
Utility at baseline	0.592 (0.213)	0.593 (0.212)	-0.001 (-0.005, 0.003)	0.98
Total QALY at 1 year	0.804 (0.077)	0.808 (0.080)	-0.005 (-0.005, -0.004)	0.79
WOMAC				
At baseline	49.186 (16.708)	48.349 (17.972)	0.837 (-26.695, 28.369)	0.82
At 1 year	78.812 (13.940)	78.104 (13.098)	0.708 (-15.996, 17.412)	0.81

Abbreviations. SD = standard deviation, CI = confidence interval, HCP = healthcare payer, SOC = societal, WOMAC = Western Ontario and McMaster Universities Arthritis Index, QALY = quality-adjusted life year.