

Complications and costs in simultaneous versus staged bilateral total knee arthroplasty within a 90-day period

Abstract

Introduction:

Patients seeking bilateral total knee arthroplasty (TKA) in a short timeframe might consider surgery simultaneously (sim bTKA) or in a staged, compressed fashion (sc bTKA) with <90 days between procedures. This study compares complications, readmissions, and facility costs between these two approaches.

Methods:

Retrospective cohort analysis the PINC AI Healthcare Database (2016–2022) compared two cohorts undergoing elective, primary, bilateral TKA: (1) sim bTKA and (2) sc bTKA. Outcomes included CMS-defined complication rates and facility costs from the index hospitalization(s) for sim bTKA or the combined hospitalizations for sc bTKA. Multivariable logistic regression analysis was used to determine the association between timing of bilateral surgery and complications and costs while controlling for age, payer, sex, race/ethnicity, and Elixhauser comorbidity index.

Results:

We included 29,274 patients: 19,503 patients undergoing sim bTKA and 9,771 undergoing sc TKA. Sim bTKA had higher unadjusted rates of pulmonary embolism (1% vs. 0.4% combined, $p<0.001$) and pneumonia (1% vs. 0.7%, $p=0.005$). Staged bTKA had a higher rate of combined overall CMS-complications (0.04 vs 0.03, $p<0.001$). Additionally, sim bTKA was associated with a longer mean initial hospital length of stay compared to each staged procedure (2.88 vs. 1.82 and 1.75 days, respectively, $p<0.001$), and a substantially higher rate of non-home discharge (43% vs 10% respectively, $p<0.001$). Regression analysis revealed no difference in complication risk ($p=0.055$) but did reveal that sim bTKA was associated with decreased index facility costs compared to the staged approach (-\$4,871, 95% CI: -\$5,113 to -\$4,629, $p<0.001$).

Conclusion:

Compared to staged bTKA, simultaneous bTKA was not associated with complication risk in adjusted analysis but did show index facility cost savings. Patient selection remains paramount.

Table-1: Baseline demographics, clinical characteristics, hospital characteristics, complications, and outcomes after primary bilateral total knee arthroplasty by simultaneous and staged cohorts in the PINC AI Healthcare Database (2016-2022, N=29,274)

Variable	Simultaneous Bilateral TKA (N=19,503)	Staged TKA – Primary (N=9,771)	Staged TKA – Secondary (N=9,771)	p-value
Age in years (Mean ± SE)	64 (0.06)	64 (0.09)	-	0.432
Sex				<0.001
Male	9,329 (47.8)	4,431 (0.45)	-	
Female	10,174 (52.2)	5,340 (0.55)	-	
Payer status				<0.001
Medicaid	624 (0.03)	410 (0.04)	-	
Medicare	8,128 (0.42)	4,134 (0.42)	-	
Other	650 (0.03)	320 (0.03)	-	
Private	9,966 (0.51)	4,875 (0.50)	-	
Uninsured	135 (0.01)	32 (0.003)	-	
Race				<0.001
Asian	401 (0.02)	168 (0.02)	-	
Black	1,361 (0.07)	595 (0.06)	-	
Other	684 (0.04)	363 (0.04)	-	
White	17,057 (0.88)	8,645 (0.89)	-	
Ethnicity				<0.001
Hispanic	625 (0.03)	277 (0.03)	-	
Non-Hispanic	18,878 (0.97)	9,494 (0.97)	-	
Elixhauser Comorbidity Index (Mean ± SE)	1.92 (0.01)	2.72 (0.02)	-	<0.001
Length of Stay (Mean ± SE)	2.88 (0.01)	1.82 (0.01)	1.75 (0.01)	<0.001
Non-Home Discharge	8,465 (0.43)	926 (0.10)	924 (0.10)	<0.001
Index Cost	23,491 (70.5)	14,457 (49.8)	14,414.9 (50.0)	<0.001
90 Day Readmissions	421 (0.02)	-	152 (0.02)	<0.001
Complications	634 (0.03)	114 (0.01)	312 (0.03)	<0.001
Acute Myocardial Infarction	32 (0.002)	8 (0.001)	24 (0.002)	0.015
Pneumonia	101 (0.01)	34 (0.003)	56 (0.01)	0.005
Sepsis or Shock	89 (0.01)	8 (0.001)	49 (0.01)	0.151
Surgical Site Bleed	21 (0.001)	24 (0.002)	35 (0.004)	<0.001
Pulmonary Embolism	167 (0.01)	9 (0.001)	31 (0.003)	<0.001
Mechanical	68 (0.003)	8 (0.001)	60 (0.01)	0.002
Joint or Wound Infection	204 (0.01)	32 (0.003)	106 (0.01)	0.047
-Column data reported as number of patients (% proportion) or mean ± standard error (SE)				
-Immutable characteristics, such as Elixhauser Comorbidity or Age were only reported once for patients undergoing staged TKA				

-90 Day readmission was not reported for primary TKA in staged procedure due to expected readmission within 90 days for secondary procedure

*90 Day Episodic cost for Staged Primary excludes the cost of the secondary procedure

Table-2: Multivariable logistic regression for patient demographics and clinical characteristics on index hospital costs in patients simultaneous versus staged primary bilateral total knee arthroplasty in the PINC AI Healthcare Database (2016-2022, N=29,274)

Variable	Coef	95% Confidence Interval	p-value
Simultaneous TKA	-4,871	-5,113 - -4,629	<0.001
Age in years (Unit of Change 10)	-79	-253 – 96	0.38
Sex			
Male	Ref		
Female	-185	-409 – 39	0.10
Payer status			
Medicaid	1,970	1,358 – 2,583	<0.001
Medicare	-16	-320 – 289	0.92
Private	Ref		
Other	241	-387 – 869	0.45
Uninsured	-599	-2,069 – 870	0.42
Race			
Asian	3,380	2,577 – 4,184	<0.001
Black	2,324	1,877 – 2,771	<0.001
Other	1,357	731 – 1,983	<0.001
White	Ref		
Ethnicity			
Hispanic	2,318	1,647 – 2,990	<0.001
Non-Hispanic	Ref		
Elixhauser Comorbidity Index (Mean ± standard error)	533	460 – 605	<0.001