

Trends in the Cost of Total Knee Arthroplasty — a US Hospital Database Analysis, 2000 – 2021

Yifan Zhang, MPH, PhD, Jill W. Ruppenkamp, MSc, Anshu Gupta, PhD, Chantal E. Holy, MSc, PhD

Epidemiology and Real-World Data Sciences, Johnson & Johnson MedTech, New Brunswick, NJ, USA

OBJECTIVE

This study aimed to evaluate healthcare costs of total knee arthroplasty (TKA) in the US from 2000 to 2021 from the hospital perspective and examine factors contributing to it.

METHODS

Study Design: Cross-sectional observational study

Data Source: Premier Healthcare Database

Study population: Patients that underwent primary TKA (N = 1,841,541) in both inpatient and outpatient settings from 2000-2021

Outcomes: Hospital costs (expense incurred to deliver health care services to patients at the time of TKA) including total costs and department costs, inflation-adjusted to 2021

Statistical Analysis: Generalized linear models with log link function were used to examine the associations between cost and various factors including patient demographics, marital status, insurance type, preoperative characteristics, technology use (robotic and computer assisted surgery), provider characteristics and admission year.

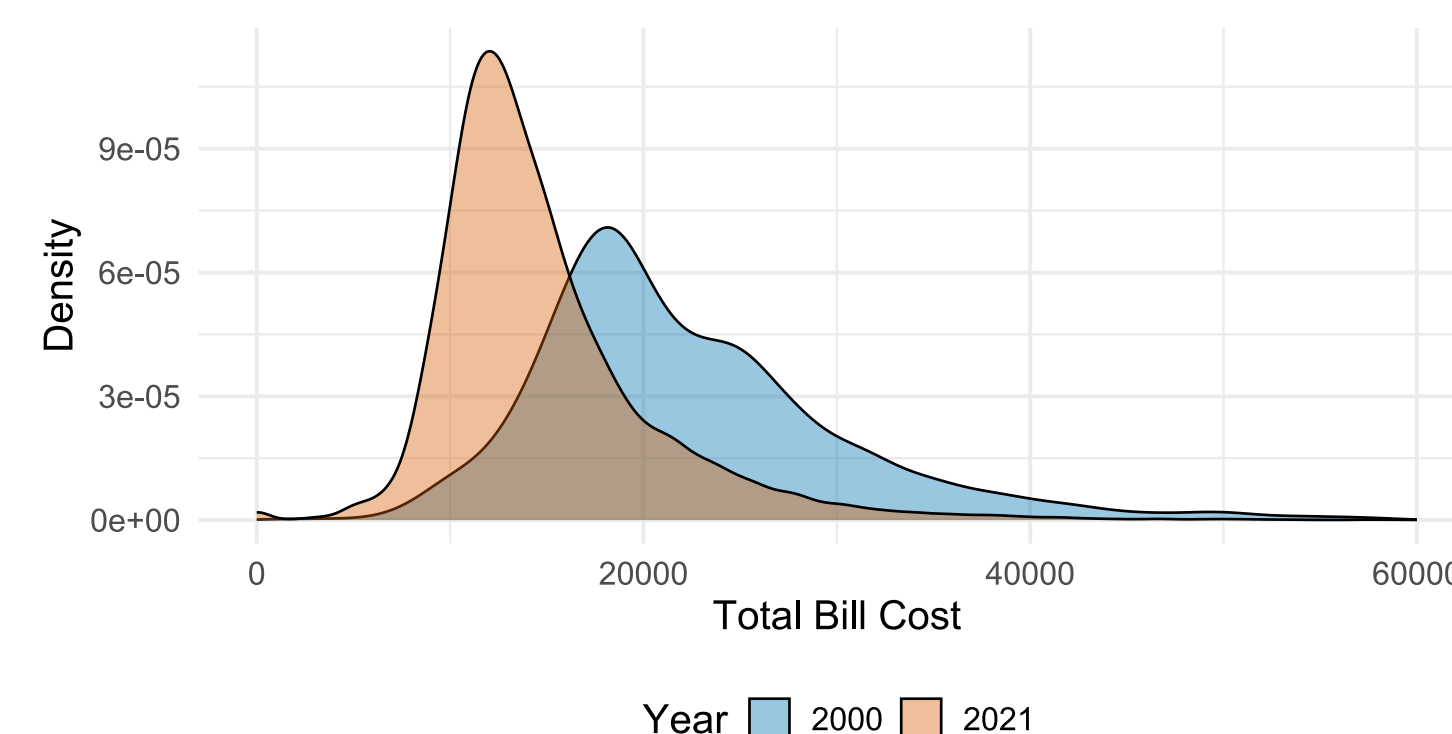
References:

1. Bieganowski, et al. (2022) J Arthroplasty, 37(11), 2122-2127.E1.
2. Hsiue et al. (2020) Arthroplast Today, 6(1), 112-117.E1
3. Molloy et al. (2017) J Bone Joint Surg Am. 99(5), 402-407
4. Christensen, et al. (2022) J Arthroplasty, 38(2), 203-208

RESULTS

- In 2000, the mean total cost for one TKA episode was \$22,551 (standard deviation (SD) = \$9,571)).
- By 2021, the total cost decreased to \$14,965 (SD = \$7,722).
- From 2000 to 2021, the biggest decreases were lab cost (81%) and room and board cost (76%).
- Meanwhile, the percentage of inpatient TKAs among all TKAs decreased from 97% (n=14,510) to 34% (n=19,864).
- Mean cost related to TKA decreased from \$22,616 to \$17,060 (25%) for inpatient and from \$20,671 to \$13,884 (33%) for outpatient.

Figure 1. Density distribution for total cost of TKA, 2000 and 2021.



- Supply cost and operating room cost were consistently the top two cost categories (46% and 25% of mean total cost in all the years).

Table 1. Changes in absolute cost and percentage between 2000 and 2021 for inpatient and outpatient TKA.

Cost Type	Inpatient	Outpatient
Total cost	-\$5,555.58(-25%)	-\$6787.39(-33%)
Lab cost	-\$515.51(-71%)	-\$651.28(-87%)
Operation room cost	\$1,415.12(35%)	\$1104.56(26%)
Pharmacy cost	-\$298.52(-27%)	-\$192.83(-21%)
Room and board cost	-\$992.43(-28%)	-\$3975.97(-100%)
Supply cost	-\$3,994.48(-37%)	-\$2711.37(-30%)
Therapy cost	-\$339.17(-35%)	-\$763.48(-67%)

Figure 2. Number of inpatient admission and percentage of inpatient admission among all admission type from 2000 to 2021.

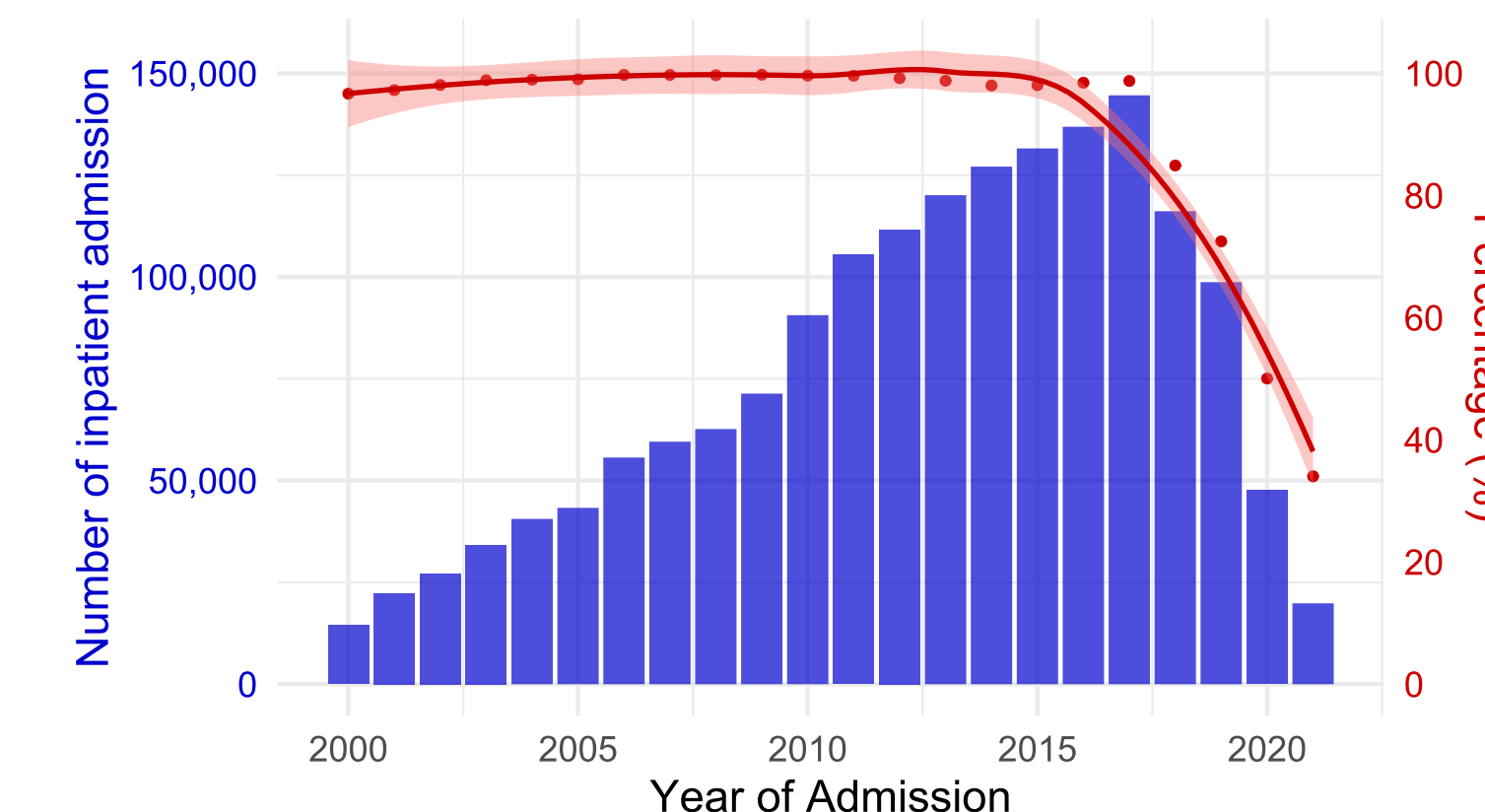


Figure 3. Total cost per episode for patient with TKA, stratified by admission type from 2000 to 2021.

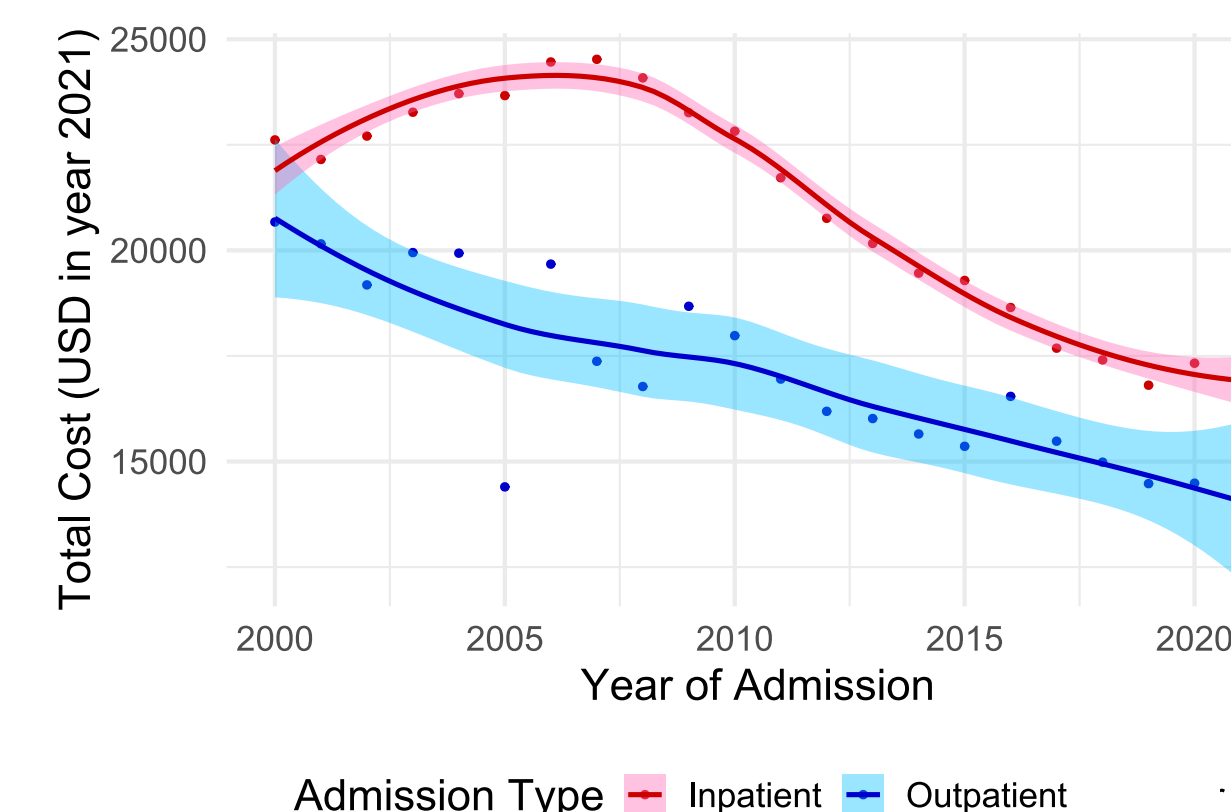


Table 2. Cost ratios for selected variables associated with total cost of TKA.

Variable	Cost Ratio (95% Confidence Interval)
Age Group (vs. 61-70)	
18-30	1.16 (1.113, 1.199)
31-45	1.01 (1.006, 1.019)
Male (vs. Female)	1.02 (1.019, 1.023)
Black (vs. White)	1.05 (1.049, 1.055)
Single (vs. Married)	1.02 (1.020, 1.024)
Medicaid (vs. Commercial)	1.02 (1.011, 1.020)
ECI (one unit increase)	1.03 (1.025, 1.026)
Inpatient (vs. Outpatient)	1.18 (1.177, 1.187)
LOS	1.01 (1.009, 1.009)
Rural (vs. Urban)	1.02 (1.019, 1.025)
CAS	1.03 (1.029, 1.036)
Robotic Surgery	0.99 (0.979, 0.993)
Year (one unit increase)	0.98 (0.980, 0.981)
Region (vs. Midwest)	
Northeast	1.16 (1.159, 1.165)
West	1.13 (1.127, 1.133)
South	1.03 (1.027, 1.031)

Note: the cost ratios may fall out of the range of 95% confidence interval due to rounding. ECI – Elixhauser Comorbidity Index; LOS – Length of Stay; CAS – Computer-assisted Surgery

CONCLUSIONS

- Hospital costs of primary TKA have decreased over the years with largest relative decreases in lab cost and room and board cost.
- This decrease in cost was coupled with the shift from inpatient TKA to outpatient TKA.