

Healthcare utilization and costs of CT-based robotic-arm assisted versus manual total knee arthroplasty cohorts: real-world evidence from the Premier Healthcare Database

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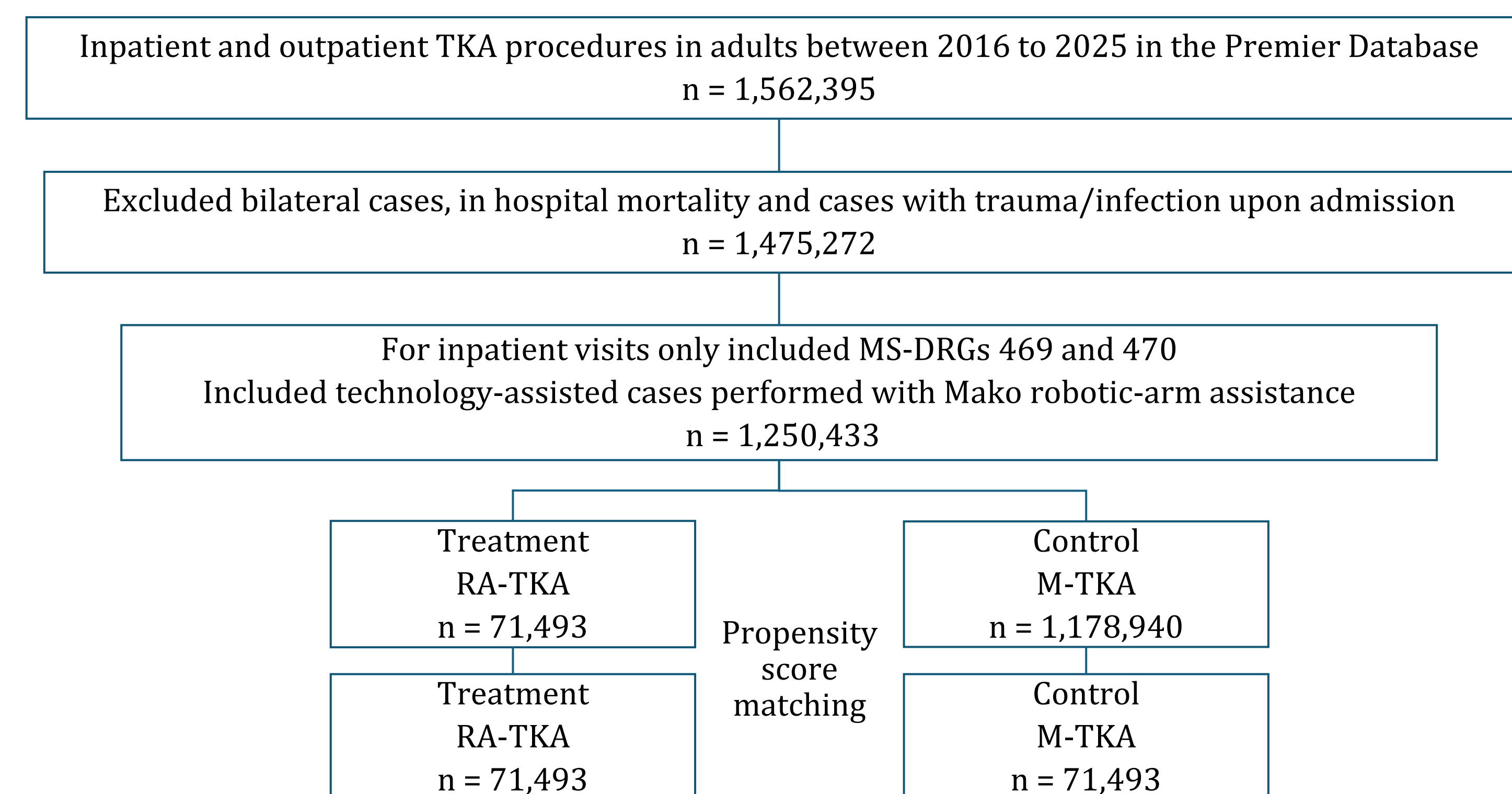
Background and Objective

- Total knee arthroplasty (TKA) is one of the most frequently performed orthopaedic procedures in the United States, with volumes projected to rise substantially in coming decades.¹
- Robotic-arm assisted TKA (RA-TKA) has demonstrated improved surgical precision and patient outcomes compared to manual TKA (M-TKA).²
- However, real-world evidence on healthcare resource utilization from all-payer administrative databases remains limited.
- This study evaluated real-world outcomes between CT-based RA-TKA and M-TKA using the Premier Healthcare Database.

Methods

- The Premier Healthcare database was used to identify adults who underwent elective TKA between June 2016 and March 2025.
- Patients who underwent RA-TKA and M-TKA were identified using the ICD-10 codes, CPT codes, and the Premier Chargemaster.

Figure 1. Attrition Diagram



- 1:1 nearest-neighbor PSM without replacement was performed to account for baseline differences in demographic and hospital characteristics.
- Regression models were used to examine the effect of RA-TKA on length of stay, discharge status, index costs, and index to 90-day complications.
- Odds ratio was reported for discharge status and estimated marginal means for lengths of stay and index costs.

Results

Table 1. All patient characteristics

	M-TKA n=71,493	RA-TKA n=71,493	Total n=142,986
Age in years			
Mean (SD)	67.7 (8.97)	67.6 (9.10)	67.7 (9.04)
Sex			
Women	60.3%	60.3%	60.3%
Race			
White	83.6%	82.2%	82.9%
Black	8.8%	9.1%	9.0%
Asian	0.9%	1.1%	1.0%
Other	4.3%	4.9%	4.6%
Unknown	2.5%	2.7%	2.6%
Primary payer			
Medicare	63.5%	62.6%	63.0%
Managed care	21.3%	20.9%	21.1%
Commercial	8.5%	9.7%	9.1%
Medicaid	2.8%	3.0%	2.9%
Other	3.8%	3.8%	3.8%
Elixhauser index			
Mean (SD)	1.86 (1.45)	1.91 (1.49)	1.89 (1.47)
Index visit type			
Inpatient	31.3% (22,363)	31.3% (22,363)	31.3% (44,726)

Table 2. Inpatient outcomes

	M-TKA n= 22,363	RA-TKA n=22,363	Odds ratio/ Mean difference	P-value
Lengths of stay	2.13	1.78	0.35	< 0.001*
Discharge to home	82.9%	87.7%	1.48	< 0.001*
Index hospital cost	\$16,697	\$17,042	\$345	< 0.001*

Results

Table 3: Odds Ratios of index to 90-day complications when comparing M-TKA to RA-TKA visits

Orthopaedic-related complications	M-TKA n=71,493	RA-TKA n=71,493	Odds ratio	P-value
Bleeding	0.05%	0.05%	1.00	1.000
Seroma	0%	0%	-	-
Malalignment	0.04%	0.01%	5.99	< 0.001*
Peri-prosthetic fracture	0.01%	0.01%	1.25	0.638
Osteolysis	0%	0%	-	-
Bearing surface wear	0%	0%	-	-
Wound complication	0.24%	0.20%	1.24	0.056
Infection	0.04%	0.01%	3.45	< 0.001*
Implant loosening	0.08%	0.01%	6.58	< 0.001*
Implant fracture or tibial insert dissociation	0.01%	0.01%	1.00	1.000
Disruption/Wound dehiscence	0.03%	0.02%	1.62	0.174
Embolism	0%	0%	-	-
Stiffness	0.29%	0.43%	0.662	< 0.001*
Vascular injury	0.02%	0.01%	2.60	0.069
Neural deficit	0%	0%	-	-
Medial collateral ligament injury	0%	0%	-	-
Extensor mechanism disruption	0%	0%	-	-
Revision	0.34%	0.15%	2.35	< 0.001*

- Inpatient RA-TKA was associated with shorter LOS, higher home discharge rates, and \$345 index cost difference compared with M-TKA (Table 2).
- RA-TKA patients experienced fewer malalignment, infection, implant loosening, and revision through 90 days post-discharge, with higher stiffness rates observed (Table 3).

Conclusions

- RA-TKA was associated with differences in clinical and utilization outcomes compared with M-TKA. Index costs may be offset by improved post-discharge utilization.
- As RA-TKA adoption increases, real-world evidence is essential to inform clinical decision-making and value-based care.

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