

Trends in Utilization and Billing Practices of Primary Total Hip and Knee Arthroplasty During the COVID-19 Era: A Medicare Data Analysis of 2.1 Million Claims

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INTRODUCTION: Primary hip and knee total joint arthroplasties (TJAs) comprise around 2.4 million surgeries annually in the United States, with an estimated growth rate of 159% by 2040. The cancellation of elective surgeries in response to the COVID-19 pandemic resulted in long-term disruptions in surgical volume as a substantial population of patients had their care delayed. One study estimated that it would take approximately 16 months after resuming the pre-pandemic level of elective arthroplasty procedures to reach 90% of the anticipated surgical volume forecasted before the pandemic. However, there is limited literature on the long-term financial impact of the considerable backlog in procedures on billing practices for physicians and patients. Therefore, this study aimed to investigate the billing practices of primary TJA in Medicare patients surrounding the pandemic era by analyzing changes in service charges, reimbursements, and markup ratio (MR) between 2017 and 2021.

METHODS: We analyzed Medicare Part B claims data using the Centers for Medicare and Medicaid Services Physician/Supplier Procedure Summary Database. Current Procedural Terminology (CPT) codes for primary TJA (Total Hip Arthroplasty: 27130, Total Knee Arthroplasty: 27447) were used to query the database for procedures in years before and during the COVID-19 pandemic (2017 to 2021). Yearly service counts, service charges, allowed reimbursement from Medicare, and markup ratio (MR=charge/reimbursement) were analyzed. Monetary values were adjusted to the 2021 US Dollar.

RESULTS: The total study cohort comprised 2,097,682 patients with Medicare undergoing primary TJA between 2017 and 2021. Weighted mean service charges had the greatest increase from pre-pandemic values, with a change of 32.0% from 2017 to 2021 (\$6629.5 to \$8751.3; R² = 0.68). The difference is particularly significant in 2020 and 2021, with an increase of 15.1% and 18.5% from the previous year. Reimbursement increased to a lesser extent than charge, with a rise of 19.3% over the study period (\$1449.3 to \$1728.9; R²=0.73). Therefore, the markup ratio was found to increase by 10.6% (4.57 to 5.06; R²=0.47) (**Table 1; Fig. 1**). The number of procedures stayed relatively consistent with a change of -0.1% (R²=0.12), with a notable drop in 2020 by -18.1%. Trends in utilization and billing varied across different procedural types, service settings, and states.

DISCUSSION: From 2017 to 2021, service charges increased at a greater rate than Medicare reimbursements, leading to an increase in the markup ratio (MR). The rise in service charges and MR observed in 2019 and 2020 could be attributed to the healthcare system’s attempts to counteract the continuously declining value of physician reimbursement in elective primary TJA and to offset the substantial financial strain caused by delays and cancellations. The continued upward trajectory observed in 2021 could reflect the sustained economic impact of the pandemic on healthcare institutions. High MR poses a financial burden for vulnerable patients who are uninsured, underinsured, or privately insured, as the increased charge forms the basis of the negotiated rate.

SIGNIFICANCE/CLINICAL RELEVANCE: During the COVID-19 era, service charges increased at a greater rate than Medicare reimbursements, suggesting the rise in charges and MR observed in 2019 and 2020 could be attributed to the healthcare system’s attempts to offset the substantial financial strain caused by delays and cancellations.

Table 1. Trends in Total Services, Charge, Reimbursement, and Markup Ratio of Primary TJA from 2017 to 2021.

		2017	2018	2019	2020	2021	% Change	R ²
Primary THA (CPT 27130)	Service Count	138086	145028	153122	130055	153674	11.29	0.06
	Service Charge (\$)	7070.6	6956.6	6752.7	6560.2	8734.0	23.53	0.28
	Reimbursement (\$)	1455.6	1423.7	1418.0	1422.9	1640.5	12.71	0.38
	Markup	4.86	4.89	4.76	4.61	5.32	9.60	0.15
Primary TKA (CPT 27447)	Service Count	286954	287983	295067	236830	270882	-5.60	0.32
	Service Charge (\$)	6417.2	6357.351	6233.0	7834.5	8761.1	36.52	0.75
	Reimbursement (\$)	1446.2	1821.6	1419.9	1712.8	1779.0	23.01	0.22
	Markup	4.44	4.71	4.39	4.57	4.92	10.98	0.38
Total	Total Services	425040	433011	448189	366885	424556	-0.11	0.12
	Service Charge (\$)	6629.5	6558.1	6410.6	7382.8	8751.3	32.00	0.68
	Reimbursement (\$)	1449.3	1425.5	1419.2	1610.1	1728.9	19.29	0.73
	Markup	4.57	4.60	4.52	4.59	5.06	10.65	0.47

Figure 1. Trends in charge, reimbursement, and markup ratio of primary total knee (left) and hip (right) joint arthroplasty from 2017 to 2021, adjusted to the 2021 US dollar (blue=charge; orange=reimbursement; red=markup).

