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The Price-Quality Mismatch: Are Negotiated Prices for Total Joint Arthroplasty Associated With Hospital Quality in a Large California Health System?

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Abstract

Background Price variations in healthcare can be caused by quality or factors other than quality such as market share, negotiating power with insurers, or hospital ownership model. Efforts to improve care value (defined as the ratio between health outcomes and price) by making healthcare prices readily accessible to patients are driven by the assumption this can help patients more easily identify high-quality, low-price clinicians and health systems, thus reducing price variations. However, if price variations are driven by factors other than quality, then strategies that involve payments for higher-quality care are unlikely to reduce price variation and improve value. It is unknown whether prices for total joint arthroplasty (TJA) are correlated with the quality of care or whether factors other than quality are responsible for price variation.

Questions/purposes (1) How do prices insurers negotiate for TJA paid to a single, large health system vary across payer types? (2) Are the mean prices insurers negotiate for TJA associated with hospital quality?

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Methods We analyzed publicly available data from 22 hospitals in a single, large regional health system, four of which were excluded owing to incomplete quality information. We chose to use data from this single health system to minimize the confounding effects of between-hospital reputation or branding and geographic differences in the cost of providing care. This health system consists of large and small hospitals serving urban and rural populations, providing care for more than 3 million individuals. For each hospital, negotiated prices for TJA were classified into five payer types: commercial in-network, commercial out-of-network, Medicare Advantage (plans to which private insurers contract to provide Medicare benefits), Medicaid, and discounted cash pay. Traditional Medicare plans were not included because the prices are set statutorily, not negotiated. We obtained hospital quality measures from the Centers for Medicare and Medicaid Services. Centers for Medicare and Medicaid Services quality measures included TJA-specific complication and readmission rates in addition to hospital-wide patient survey star rating (measure of patient care experience) and total performance scores (aggregate measure of clinical outcomes, safety, patient experience, process of care, and efficiency). We evaluated the association between the mean negotiated hospital prices and Centers for Medicare and Medicaid Services quality measures using Pearson correlation coefficients and Spearman rho across all payer types. Statistical significance was defined as $p < 0.0025$.

Results The mean ± SD overall negotiated price for TJA was USD 54,500 ± 23,200. In the descriptive analysis, the lowest negotiated prices were associated with Medicare Advantage (USD 20,400 ± 1800) and Medicaid (USD 20,300 ± 8600) insurance plans, and the highest prices were associated with out-of-network care covered by commercial insurance plans (USD 78,800 ± 9200). There was no correlation between the mean negotiated price and TJA complication rate (discounted cash price: $r = 0.27$, $p = 0.29$; commercial out-of-network: $r = 0.28$, $p = 0.26$; commercial in-network: $r = -0.07$, $p = 0.79$; Medicare Advantage: $r = 0.11$, $p = 0.65$; Medicaid: $r = 0.03$, $p = 0.92$), readmission rate (discounted cash price: $r = 0.19$, $p = 0.46$; commercial out-of-network: $r = 0.24$, $p = 0.33$; commercial in-network: $r = -0.13$, $p = 0.61$; Medicare Advantage: $r = -0.06$, $p = 0.81$; Medicaid: $r = 0.09$, $p = 0.74$), patient survey star rating (discounted cash price: $r = -0.55$, $p = 0.02$; commercial out-of-network: $r = -0.53$, $p = 0.02$; commercial in-network: $r = -0.37$, $p = 0.13$; Medicare Advantage: $r = -0.08$, $p = 0.75$; Medicaid: $r = -0.02$, $p = 0.95$), or total hospital performance score (discounted cash price: $r = -0.35$, $p = 0.15$; commercial out-of-network: $r = -0.55$, $p = 0.02$; commercial in-network: $r = -0.53$, $p = 0.02$; Medicare Advantage: $r = -0.28$, $p = 0.25$; Medicaid: $r = 0.11$, $p = 0.69$) for any of the payer types evaluated.

Conclusion There is substantial price variation for TJA that is not accounted for by the quality of care, suggesting that a mismatch between price and quality exists. Efforts to improve care value in TJA are needed to directly link prices with the quality of care delivered, such as through matched quality and price reporting mechanisms. Future studies might investigate whether making price and quality data accessible to patients, such as through value dashboards that report easy-to-interpret quality data alongside price information, moves patients toward higher-value care decisions.

Clinical Relevance Efforts to better match the quality of care with negotiated prices such as matched quality and price reporting mechanisms, which have been shown to increase the likelihood of choosing higher-value care in TJA, could improve the value of care.

Introduction

Total joint arthroplasty (TJA) is the most common inpatient procedure in patients older than 65 years in the United States, with more than 400,000 TJAs performed in 2019 [9]. Procedure volume is projected to continue to increase in the United States, contributing to rising healthcare expenditures [25, 27]. Owing to the high volume and costs associated with TJA, reducing unwarranted price variation could result in substantial cost savings. Variations in TJA pricing may be explained by multiple factors, such as geographic variations in the costs of providing care, amount of competition between providers, provider or insurer market power, and differences in quality of care [1]. Elucidation of the key drivers of TJA price variation is necessary to inform initiatives for improving care value. For example, some hospitals and physician practices owned by a single entity have been associated with higher hospital prices [3]. If similar factors are key drivers of TJA price variation as opposed to quality of care, then efforts to make TJA prices widely accessible to patients, which is intended to create greater competition between hospitals [19, 20], may fail to reduce costs or improve value if there is insufficient competition [38]. Even if larger price differences are justified by a higher quality of delivered care, making hospital quality metrics readily accessible alongside pricing information is necessary for effective price shopping. A prior study showed that geographic variation did not account for the high degree of price variation in cataract surgery, suggesting quality may be a key driver of price variation in ophthalmology [4]. In contrast, another recent study revealed that hospital charges were not associated with complication or readmission rates after TJA [15].

The Affordable Care Act mandated that hospitals publish charges for their services, which was implemented by the Centers for Medicare and Medicaid Services (CMS) in 2019 [10]. In response, hospitals released machine-readable chargemasters that were widely criticized

because of a lack of usability and wide discrepancies between hospital charges and the negotiated prices that insurers actually pay [2, 20]. In 2021, the Hospital Price Transparency Rule went into effect, which aimed to make hospitals' negotiated prices for common healthcare services (including TJA) that reflect insurer reimbursements to hospitals publicly available [1]. Hospitals were required to disclose insurer- and plan-specific prices. Subsequent analyses of negotiated price data have revealed large price variations for the covered procedures (including TJA) across hospitals [30]. However, whether these variations in TJA pricing can be accounted for by differences in the quality of care is unknown.

In this study, we asked: (1) How do prices insurers negotiate for TJA paid to a single, large health system vary across payer types? (2) Are the mean prices insurers negotiate for TJA associated with hospital quality?

Materials and Methods

Study Design and Setting

This was a comparative study of publicly available insurer-negotiated price data for TJA across 22 hospitals in a single, large California health system. We chose to use data from a single, large regional health system to reduce variation attributable to reputation, branding, and other market factors such as market share and geographic differences in the costs of providing care. This large health system consists of large and small hospitals serving urban and rural communities, providing care for more than 3 million individuals.

Data Source

Using publicly available price data published by a single, large California health system, we collected payer-specific negotiated prices from March 2021 for TJA, defined as diagnosis-related group 470, across 22 hospitals [39]. Payer-specific prices corresponding to commercial out-of-network, Medicare Advantage (plans to which private insurers contract to provide Medicare benefits), and Medicaid were identified. Each hospital also had a single discounted cash price. All other payer-specific prices were classified as commercial in-network. Traditional Medicare plans were not included because the prices are set statutorily, not negotiated. These prices represent only the facility component of TJA costs and do not include physician or other professional fees. Hospital price data were then linked with hospital quality measures from 2021, obtained using the CMS Hospital Compare tool [11]. CMS quality measures included TJA-specific complication and readmission rates as well as hospital-wide patient survey star ratings and total performance scores for hospitals in the hospital value-based purchasing program. Patient survey star ratings are an aggregate measure of patient experience, derived from a postdischarge patient survey that measures communication with physicians and nurses, staff responsiveness, hospital cleanliness and quietness, communications about medicines, discharge information, care transitions, willingness to recommend the hospital, and overall patient rating of the hospital. The total performance score is a risk-adjusted measure that consists of clinical care, patient- and caregiver-centered experience of care or care coordination, safety, and efficiency or cost reduction domains. TJA-specific complication rates were available for 19 of the 22 hospitals, and readmission rates were available for 20 of the 22 hospitals. Some data were missing because several facilities had inadequate volume for CMS reporting. Total hospital performance scores were available for 20 of the 22 hospitals. No data were missing for patient survey star ratings. We only included hospitals with complete quality data (n = 18). We identified 266 commercial in-network, 108 commercial out-of-network, 126 Medicare Advantage, 52 Medicaid, and 18 discounted cash prices for facility fees for TJA hospitalizations.

Primary and Secondary Study Outcomes

Our primary study goal was to characterize the prices for TJA in the single, large health system by insurer and plan type. To achieve this, we calculated the mean and standard deviation of TJA prices by insurer and plan type, consisting of discounted cash price and commercial out-of-network, commercial in-network, Medicare Advantage, and Medicaid plans.

Our secondary study goal was to evaluate whether these insurer-negotiated TJA prices were associated with hospital quality. To achieve this, we correlated TJA prices by insurer and plan type with hospital quality measures, consisting of TJA-specific complication and readmission rates as well as hospital-wide patient survey star ratings and total performance scores for hospitals in the hospital value-based purchasing program.

Ethical Approval

Ethical approval for this study was not required because patient data were not used.

Statistical Analysis

The mean and SD of negotiated prices for TJA were characterized by payer type in a descriptive analysis. We also

calculated charge-to-price ratios, defined as the gross charge divided by the negotiated price, by payer type. We then calculated the mean negotiated price by payer type for each hospital and performed pairwise comparisons between the mean negotiated price and each CMS quality measure. Pairwise comparisons among negotiated price and complication rate, readmission rate, and hospital total performance score were evaluated using the Pearson correlation coefficient. Pairwise comparisons between negotiated price and patient survey star rating were evaluated using Spearman rho. Because some hospitals might report payer-specific prices from contracts that cover only a small proportion of their patients, we performed a sensitivity analysis that included only commercial in-network prices from three of the largest insurers in California [8]. There was no correlation between negotiated price and any of the quality measures studied in our sensitivity analysis, which is consistent with our main results (Supplemental Fig. 1; http://links.lww.com/CORR/A984). Because 20 pairwise comparisons were made, we applied the Bonferroni correction to define statistical significance at $p < 0.0025$. A sample size estimation showed that 16 observations were required to detect a Pearson correlation coefficient of 0.65 with 80% power (alpha = 0.05).

Results

Negotiated Prices for TJA Vary Across Payer Types

Across the 18 hospitals in the study sample in 2021, the mean ± SD overall negotiated price for TJA was USD 54,500 ± 23,200 (Table 1). In the descriptive analysis, the lowest negotiated prices were associated with Medicare Advantage (USD 20,400 ± 1800) and Medicaid (USD 20,300 ± 8600) insurance plans, and the highest prices were associated with commercial out-of-network insurance plans (USD 78,800 ± 9200) (Fig. 1). The overall mean charge-to-price ratio was 2.2 ± 1.8, with ratios varying from 1.1 ± 0.1 for commercial out-of-network plans to 5.8 ± 5.3 for Medicaid plans (Table 1). Higher charge-to-price ratios represented larger discounts from the charged amount. Hospital performance on the CMS quality measures ranged from 1.5% to 5.5% for complication rates, 3.2% to 4.6% for readmission rates, 23.0 to 49.7 for hospital performance scores, and 2 to 4 stars for the patient survey star rating (Fig. 2).

Negotiated Prices for TJA Are Not Associated With Hospital Quality

We found no correlation between the mean negotiated price and TJA complication rate (discounted cash price: $r = 0.27$, $p = 0.29$; commercial out-of-network: $r = 0.28$, $p = 0.26$; commercial in-network: $r = -0.07$, $p = 0.79$; Medicare Advantage: $r = 0.11$, $p = 0.65$; Medicaid: $r = 0.03$, $p = 0.92$), readmission rate (discounted cash price: $r = 0.19$, $p = 0.46$; commercial out-of-network: $r = 0.24$, $p = 0.33$; commercial in-network: $r = -0.13$, $p = 0.61$; Medicare Advantage: $r = -0.06$, $p = 0.81$; Medicaid: $r = 0.09$, $p = 0.74$), patient survey star rating (discounted cash price: $r = -0.55$, $p = 0.02$; commercial out-of-network: $r = -0.53$, $p = 0.02$; commercial in-network: $r = -0.37$, $p = 0.13$; Medicare Advantage: $r = -0.08$, $p = 0.75$; Medicaid: $r = -0.02$, $p = 0.95$), or total hospital performance score (discounted cash price: $r = -0.35$, $p = 0.15$; commercial out-of-network: $r = -0.55$, $p = 0.02$; commercial in-network: $r = -0.53$, $p = 0.02$; Medicare Advantage: $r = -0.28$, $p = 0.25$; Medicaid: $r = 0.11$, $p = 0.69$) for any of the payer types evaluated (Supplemental Fig. 2; http://links.lww.com/CORR/A985). When all payer types were aggregated into a single mean negotiated price by hospital, there was no correlation between negotiated price and any of the quality measures studied. Finally, there was no correlation between negotiated price and any of the quality measures studied in our sensitivity analysis that included only commercial in-network prices from the largest insurers (Supplemental Fig. 3; http://links.lww.com/CORR/A984).

Discussion

As value-based healthcare such as pay-for-performance reimbursement models becomes increasingly emphasized,

Table 1. Negotiated prices by payer type

Payer type	Price in USD	Charge-to-price ratio
Commercial in-network	63,900 ± 8700	1.4 ± 0.2
Commercial out-of-network	78,800 ± 9200	1.1 ± 0.1
Medicare Advantage	20,400 ± 1800	4.2 ± 0.5
Medicaid managed care	20,300 ± 8600	5.8 ± 5.3
Discounted cash	52,200 ± 5200	1.6 ± 0.1

Data are presented as the mean ± SD. Prices are rounded to the nearest hundred, and charge-to-price ratios are rounded to one decimal place.

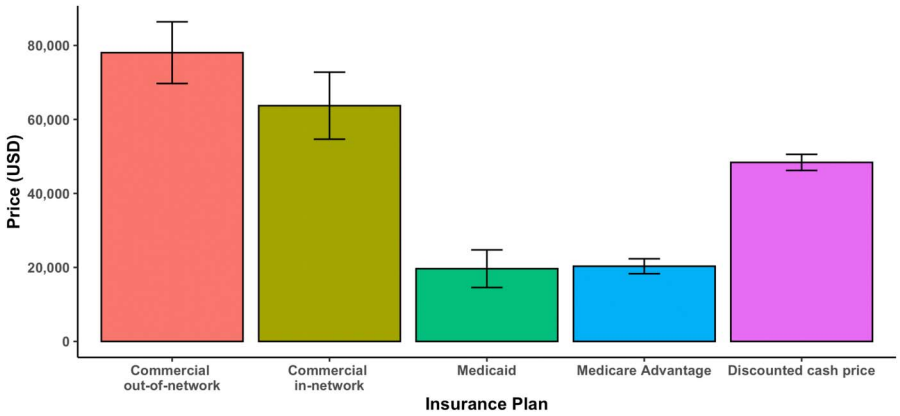

Fig. 1 The mean and standard deviation of negotiated prices are shown by payer type.

it is important that prices are directly correlated with the quality of care delivered so higher-value care can be achieved. In TJA, there are large variations in pricing between hospitals [30], with limited evidence on the drivers of this variation. Specifically, it was unknown whether price was correlated with the quality of care delivered. Our study showed that there was no correlation between the TJA prices negotiated by insurers and TJA-specific complication or readmission rates, or with hospital-wide quality measures. This suggests efforts to better match the quality of care with TJA prices, such as matched quality and price reporting mechanisms that have been shown to increase the likelihood of patients choosing higher-value care [22], could improve the value of care in TJA.

Limitations

First, our sample was from a single, large health system in California, which may limit generalizability to other settings. This health system is one of a minority in the nation that provided timely, accessible, and reliable pricing data in

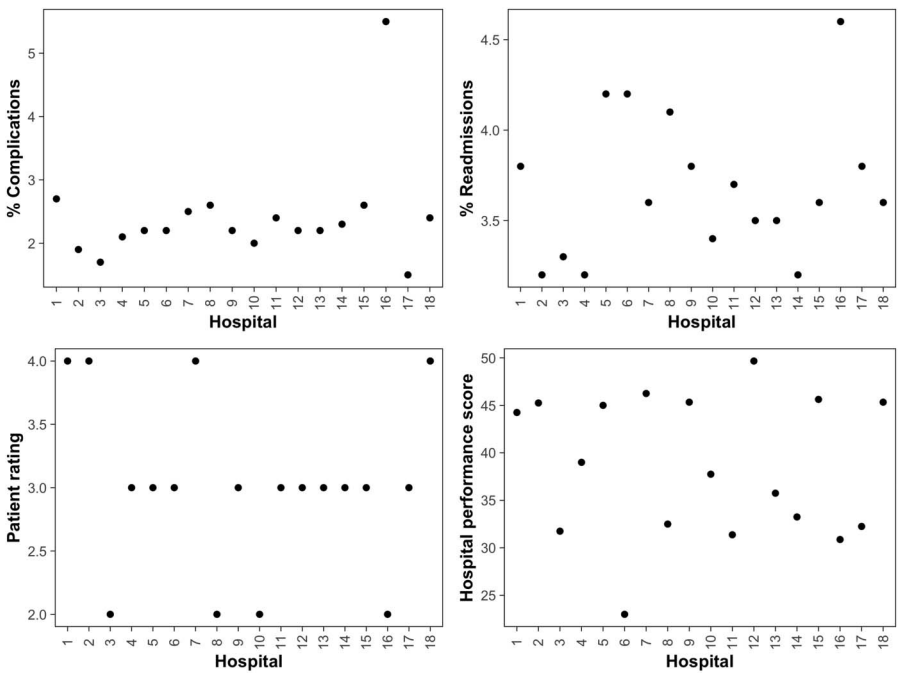

Fig. 2 Performance on CMS quality measures is shown by hospital. Lower complication or readmission rates correspond to better quality whereas higher patient star rating and hospital performance score correspond to better quality.

response to the law. This methodologic choice was made to minimize interhealth system variability (such as branding and reputation), geography-based variation (factors such as market share or hospital or physician practice ownership model), and missing data because of hospital nonadherence to the Hospital Price Transparency Rule [4, 13, 21]. Nevertheless, in a given region and plan, hospital volume and costs are key determinants in the price negotiation between payers and hospitals [41]. Therefore, our results likely generalize to other large nonprofit health systems. In contrast, our results may not be generalizable to health systems with for-profit models, in which improvements in some quality measures have been achieved at a lower cost [7, 34]. Furthermore, our study included price representation from more than 550 insurance plans, including large national commercial insurers and local health plans, in addition to the cash pay price. However, hospital pricing in this health system could have been correlated (for example, if quality at one hospital affected prices at another), resulting in an attenuated association between quality and price. Prices were evaluated for major THA and TKA in aggregate. Although the results may differ slightly if these procedures were evaluated individually, substantial differences are not expected because the CMS quality measures for these procedures were also pooled. Only a limited set of hospital quality measures were evaluated in this study. Therefore, negotiated prices may correlate with other quality measures that were not included in this study. We used CMS quality measures as surrogates for hospital quality because these measures are published and publicly available. However, commercially insured patients may experience a different quality of care (for example, in terms of complication or readmission rates) or have different patient satisfaction ratings from the Medicare population. Nevertheless, a prior study found similar short-term outcomes after TJA between patients with Medicare Advantage (plans managed by a commercial insurer) and those with traditional Medicare, suggesting similar care quality [43].

Negotiated Prices for TJA Vary Across Payer Types

We found that the differences in negotiated prices across the five surveyed payer types for the same TJA procedures varied by nearly USD 60,000. This is consistent with a prior study showing wide between-state variations in commercial healthcare prices for inpatient and outpatient services [12]. Value in orthopaedic surgery is often defined as the ratio between measures of health outcomes and measures of price [33]. In this framework, higher value is achieved by maximizing these ratios, by producing any given level of quality at the lowest price possible or, conversely, achieving the highest level of quality for a given price level. Given the lack of wide variation in TJA quality across the hospitals studied, wide variation in TJA prices implies wide variation in value, driven by factors other than quality such as market share, regional health system ownership, and negotiating power. Therefore, the linking of quality of care and reimbursement could help improve the value of care. For example, recent strategies for improving value in orthopaedic surgery such as pay-for-performance or episode-based payment models provide a mechanism by which to link quality and payment [6, 28]. In pay-for-performance models, hospitals receive additional payments from the CMS for performance on process quality measures, whereas in episode-based payment models, the CMS reimburses physicians and hospitals a single amount for an entire episode of care [28]. However, data on the effectiveness of these payment models for improving value have been mixed. For example, the quality scores used in pay-for-performance models in TJA, which are determined by adherence to process quality measures, do not correlate with clinical outcomes such as complication rates [5]. Evaluation of the CMS's bundled payment programs for TJA showed reductions in cost but quality performance was mixed, with some studies showing decreased length of stay and readmission rates, whereas others showed no difference in readmission or mortality rates [17, 18, 23, 32]. Therefore, additional research is needed on strategies for reducing price variation in TJA while improving care quality.

Negotiated Prices for TJA Are Not Associated With Hospital Quality

We found no association between the mean negotiated price and TJA complication or readmission rates, patient survey star rating, or total hospital performance score for any of the payer types evaluated. Our results are consistent with prior studies that examined the association between healthcare costs and quality in TJA. A recent study found that inpatient charges were not associated with TJA complication rates, although a subgroup analysis by payer type was not performed [14]. Another study of 18 hospitals showed that higher hospital charges were not associated with lower 90-day complication or readmission rates after TJA [15]. Similarly, higher facility costs for TJA were not associated with lower readmission rates in a New York State database [16]. In a study of more than 46,000 patients undergoing bariatric surgery in New York, higher hospital charges were not associated with major complication or mortality rates [40]. These results also align with the beliefs of patients, most of whom do not believe that price and quality are associated with each other [36]. However, our results contradict those of another study showing that higher hospital charges were associated with higher quality for medical and surgical services in a random sample of United States hospitals [35]. That study used charge data, which normally do not reflect actual amounts paid by insurers. Initiatives to make healthcare prices

readily accessible to patients have been shown to decrease insurer-negotiated prices, and price-aware consumers tend to use lower-cost services [44]. However, linking price and quality relies on patient access to and use of price and quality data. In one study in which participants were presented with cost and easy-to-interpret quality information, they were likely to choose higher-value care [22]. Nevertheless, other studies have revealed low overall patient use of price tools [31], and quality information is rarely presented with pricing information in practice [26], highlighting the need for wider dissemination of reliable, standardized price data matched with quality information. Surgeons could play a central role in developing and disseminating patient-centered quality measures on which performance can be assessed, using modified Delphi processes, for example [24]. This quality information could then be combined with price information and presented in decision aids for patients. Other strategies for reporting care quality and price include surgeon scorecards and institutional value dashboards, which have been piloted in orthopaedic surgery with promising results [29, 37, 42]. Such risk-adjusted quality indicators should be made publicly available along with price information to steer patients toward high-value surgeons and health systems.

Conclusion

We showed substantial variation in negotiated prices for TJA across payer types in a single, large health system. We found that negotiated prices for TJA were not associated with complication or readmission rates, patient survey star rating, or hospital total performance score. Rather, other market factors may be more important determinants of prices and quality. Efforts to improve care value at the patient level should focus on making matched, easy-to-understand price and quality information available to patients so they can choose higher-value care. At the system level, surgeons could take an active role in developing quality measures that can be explicitly considered during price negotiations in value-based reimbursement models, tying price to quality. Future studies are needed to characterize the price-quality relationship for orthopaedic services across diverse practice settings and to uncover novel strategies for reducing price variation while increasing the quality of care in TJA.

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