

# Hospital Charges for Urologic Surgery Episodes of Care Are Rising Despite Declining Costs



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## Abstract

**Objective:** To investigate the temporal relationship of hospital charges relative to recorded costs for surgical episodes of care.

**Patients and Methods:** This retrospective cohort study selected individuals who underwent any of 8 index urologic surgical procedures at 392 unique institutions from January 1, 2005, through December 31, 2015. For each surgical encounter, cost and charge data reported by hospitals were extracted and adjusted to 2016 US dollars. Trend analysis and multivariable logistic regression modeling were used to assess outcomes. The primary outcome was trend in median charge and cost. Secondary outcomes consisted of hospital characteristics associated with membership in the highest quartile of institutional charge-to-cost ratio.

**Results:** Cohort-level median cost per encounter trended down from \$6824 in 2005 to \$5586 in 2015 ( $P$  for trend  $< .001$ ), and charges increased from \$20,210 to \$25,773 during the same period ( $P$  for trend  $< .001$ ). Hospitals in the highest quartile of institutional charge-to-cost ratio were more likely to be safety net, nonteaching, urban, lower surgical volume, smaller, and located outside the Midwest ( $P < .001$  for each characteristic).

**Conclusion:** The pricing trends shown herein could indicate some success in cost-containment for surgical episodes of care, although higher hospital charges may be increasingly used to bolster reimbursement from third-party payers and to compensate for escalating costs in other areas.

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Pricing of services in the US health care system is a practice that has become economically unsound and highly opaque.<sup>1,2</sup> Each hospital or health care provider creates an institution-specific chargemaster that is composed of thousands of billable items and their corresponding charges. These charges, however, merely signify asking, or “sticker,” prices, and the true rate of reimbursement is often significantly lower and tied to either fixed or negotiated sums from government or private payers, respectively.<sup>3</sup> Indeed, in 2013, the American Hospital Association estimated that US hospitals were paid only 39% of the total amount billed to patients or their insurers.<sup>4</sup>

The current state of cost and charge practices in the American health care industry leads to a variety of inefficiencies, propagating the current cost crisis and hindering efforts to introduce value-driven reform.<sup>5,6</sup> Although most patients are shielded from inflated charges via third-party payers reimbursing at a steeply discounted rate, there remains a subset of patients billed at or near the full chargemaster amount, including middle class uninsured individuals who do not meet the criteria for financial assistance, those with high deductibles, and individuals receiving care that is either out of network or uncovered by their policy.<sup>1</sup> With the lack of transparency that exists regarding health care costs, such patients are forced to function as uninformed



**For editorial comment, see page 946**

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consumers, oftentimes only becoming aware of institutional pricing after services have already been rendered. Although the associated increases in case-specific cost related to this practice are more typically borne by the government or private payer than by the individual, the overall effect still remains increased systemic costs.<sup>5,7</sup> As such, effective health care reform necessitates accurate cost accounting and transparent pricing.<sup>6,8</sup>

A useful step in moving toward more rational pricing of medical care is better understanding of current practices—both the degree to which a charge is inflated relative to cost and influences of variation. Nationwide Medicare data suggest that charges are, on average, 3.5 times higher than cost and 2.5 times higher than payment.<sup>3,9</sup> Regarding surgical episodes of care in particular, we recently reported that there is a high degree of variability in charge-to-cost ratios (CCRs) across procedures in the specialty of urology.<sup>10</sup> To date, however, no studies have evaluated how the relationship between cost and charge for surgical episodes of care has evolved over the preceding decade. With urology representing a surgical field with a broad array of open, minimally invasive, and endoscopic procedures, we again use it here as a model for exploring CCR trends in surgical episodes of care over time in a large, population-based database.

## PATIENTS AND METHODS

### Data Source

A retrospective cohort study was designed using the Premier Healthcare Database (Premier Inc), an all-payer database designed to measure health care quality and resource utilization. Encompassing more than 700 acute care hospitals and approximately 20% of annual discharges in the United States, this represents the largest available inpatient resource utilization database. Financial data are directly reported by hospitals, then verified and validated by Premier. Specifically, to ensure accuracy of resource utilization data, audits are performed on a periodic basis; if there are inconsistencies between reported costs and the hospital's financial statement,

Premier works with the respective institution to rectify the discrepancy.<sup>11</sup> In addition to complete billing and coding information, this database also includes such clinical information as procedures, administered pharmaceuticals, and laboratory or diagnostic tests.

We used *International Classification of Diseases, Ninth Revision, Clinical Modification* procedure codes to identify patients who had undergone radical prostatectomy, radical nephrectomy, radical cystectomy, partial nephrectomy, extracorporeal shock wave lithotripsy, percutaneous nephrolithotomy, ureteroscopy with lithotripsy, and transurethral resection of the prostate from January 1, 2005, through December 31, 2015. A similar method has been used in previous studies.<sup>12-15</sup> Because we used publicly available data, this analysis was exempt from review by the Partners HealthCare institutional review board.

### Outcome Measures and Covariates

Institutional characteristics included hospital size (<400 vs  $\geq$ 400 beds), teaching status, location (urban or rural), and region (Northeast, Midwest, West, or South). Safety net hospitals were defined as the top quartile of hospitals in which the patients were covered by self-pay or Medicaid, consistent with methods used in similar previous studies.<sup>16-18</sup> High-volume hospitals were defined as those in the highest quartile of surgical volume for the group of procedures in this study.

In the Premier Healthcare Database, hospitals with cost accounting systems assign relative value units to procedures to determine cost ("reported costs"). Those without accounting systems provide "estimated costs" based on Medicare cost-to-charge ratios.<sup>15</sup> For the present study, data from institutions without internal accounting systems were excluded such that only recorded cost data were included in the analyses. In other words, the cost data were not derived from Medicare or institutional charge center cost-to-charge ratios. The charge and cost data used herein should represent the values used by the institutions themselves on their own financial and billing statements.

Direct hospital costs and charges associated with the index encounter were extracted

for each surgery of interest. Total costs for each encounter encompassed the summation of individual line item values for all billed items during the inpatient surgical episode. Charge data were extracted for all procedures and categorized in the same manner. All costs and charges were adjusted to 2016 US dollars using the Consumer Price Index.

**Statistical Analyses**

Descriptive analyses were used to illustrate hospital characteristics. Furthermore, multivariate logistic regression modeling was used to evaluate the impact of hospital characteristics on institutional CCR. Of note, multi-level modeling was used to account for hospital-level clustering. We calculated the predicted probability of being among the top 25% of CCR facilities, accounting for the impact of each covariate. Trend analysis of median costs and charges was conducted across the study years. All statistical analyses were performed using Stata SE software, Version 13 (StataCorp LLC); tests were 2-sided, and  $P < .05$  was considered statistically significant.

**RESULTS**

There were 392 unique institutions identified in this analysis. Characteristics of institutions in this study population are detailed in Table. Institutional characteristics associated with the top quartile of CCR included safety net status, urban location, geography, teaching status, surgical volume, and hospital size (Figure 1). In particular, safety net hospitals possessed a 2.80% higher predicted probability of being in the top CCR quartile (27.41% vs 24.62%;  $P < .001$ ). Urban location was associated with a 25.93% predicted probability of membership in the top CCR quartile ( $P < .001$  compared with rural [17.58%]). With respect to geography, Midwestern institutions were significantly less likely to be in the top CCR quartile, with predicted probability of 16.78% compared with a combined likelihood of 27.35% in non-Midwestern hospitals ( $P < .001$ ). Nonteaching hospitals were more likely to be in the top CCR quartile (26.62% vs 22.38%;  $P < .001$ ), as were lower-volume hospitals (28.64% vs 22.76%;  $P < .001$ ) and

**TABLE. Characteristics of 392 Unique Hospitals Performing Urologic Surgery in the Premier Healthcare Database, 2005-2015**

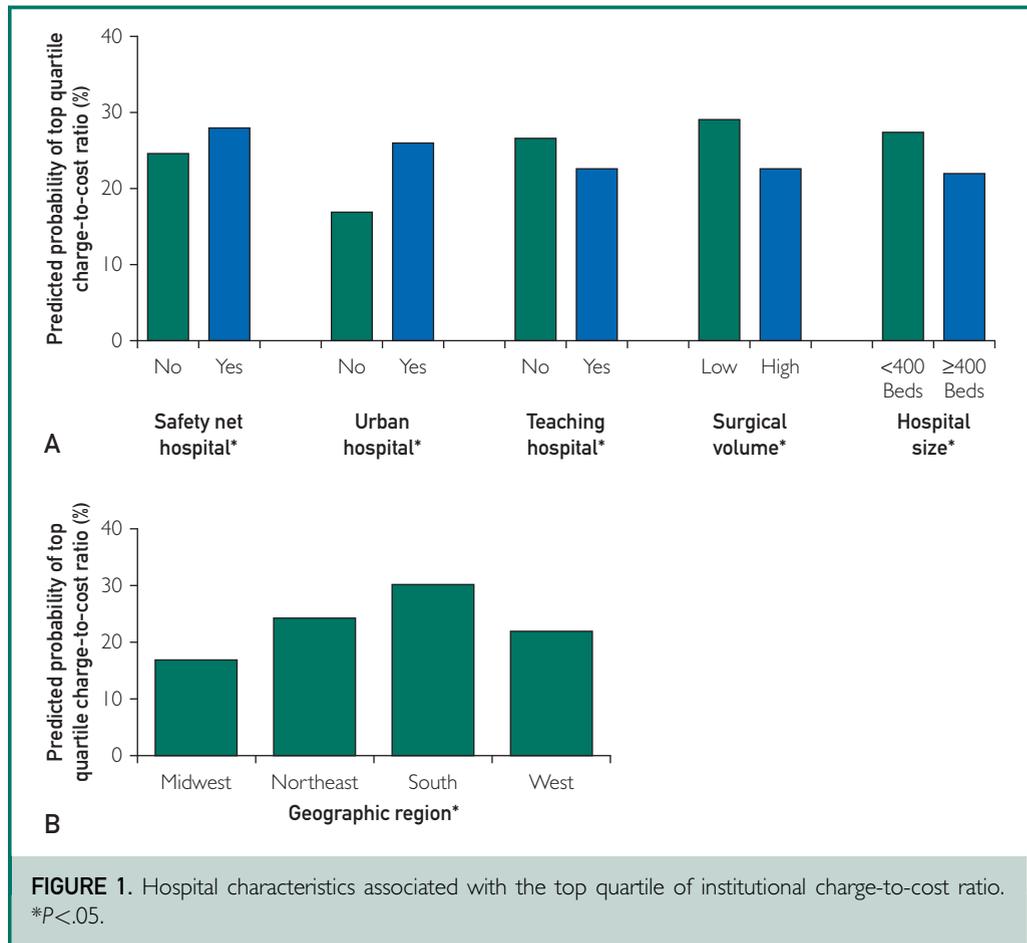
Characteristic	Hospitals (%)
Hospital size	
<400 beds	75.77
≥400 beds	24.23
Location	
Rural	20.15
Urban	79.85
Geographic location	
Midwest	25.77
Northeast	10.46
South	45.92
West	17.86
Teaching hospital	
No	71.94
Yes	28.06

those with less than 400 beds (27.65% vs 21.77%;  $P < .001$ ).

As shown in Figure 2, the reported median cost per encounter for this group of procedures was \$6824 in 2005 and trended downward to \$5586 in 2015 ( $P$  for trend  $< .001$ ). However, with respect to reported charge per encounter, there was an increase from \$20,210 in 2005 to \$25,773 in 2015 ( $P$  for trend  $< .001$ ). This represented a rise in median CCR from 2.96 in 2005 to 4.61 in 2015. These same trends were observed across subgroup analyses of each individual procedure.

**DISCUSSION**

We found a stark discordance with respect to trends in cost relative to charge per episode of urologic surgery over the preceding decade, as charges have increased steadily and substantially while hospital-reported costs have declined. High-CCR institutions were more likely to be safety net hospitals, urban, and located outside the Midwest. The findings in this first analysis of surgical CCR trends could indicate some degree of success in recent cost-containment efforts for procedural episodes of care. Higher hospital charges, however, may be increasingly used to buttress reimbursement from third-party payers and compensate for escalating costs in other areas.



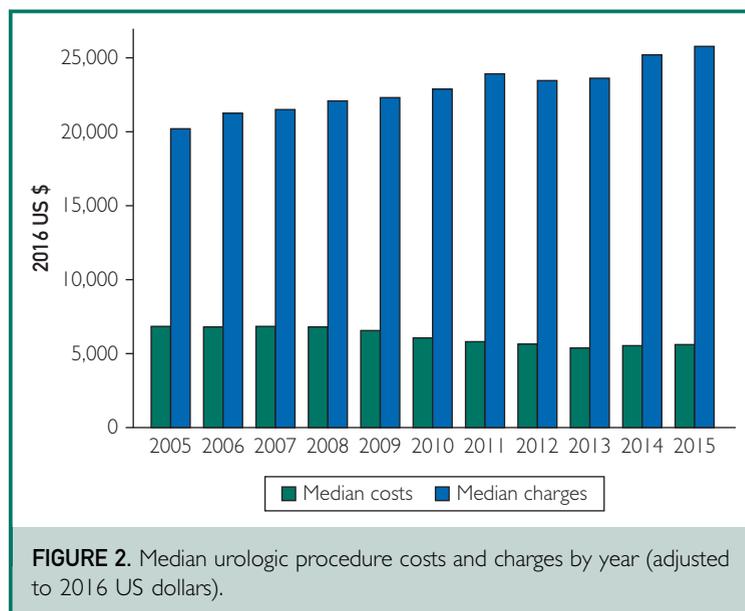
These data provide a temporal context for pricing of health care services and constitute the first such analysis for surgical episodes of care over time. A more basic relationship of charge to cost or reimbursement, however, has been detailed in recent studies. For example, a review of 2014 utilization and payment data from the Centers for Medicare and Medicaid Services (CMS) compared overall charges with total Medicare allowable amounts for respective services.<sup>9</sup> This yielded a median charge-to-payment ratio of 2.5 (interquartile range, 1.8-3.6), with the highest ratios seeming to exist in specialties for which there is the least ability to discriminate based on caregiver or network affiliation (ie, anesthesiology, pathology, or emergency medicine). Bai and Anderson<sup>3</sup> looked to further characterize institutions with particularly high charges, extracting overall hospital CCR from 2012

CMS Medicare cost reports to determine the degree of markup in chargemaster rates over Medicare-allowable costs. The 50 hospitals in the country with the highest CCR were identified, with charges 9.2 to 12.6 times cost. Most of these 50 hospitals (76%) were in southern states, and 40% were in Florida alone. High-CCR hospitals were more likely for profit, system affiliated, urban, and nonteaching.

This practice of highly inflated charges, illustrated clearly in the present analysis, has become a deeply entrenched component of the American health care system, and it is not without consequence. Although most reimbursement is issued via third-party payers and in that sense most patients are not affected by higher out-of-pocket fees at the time of service, higher charges still result in a variety of adverse systemic effects.<sup>1</sup> First, this practice results in higher overall

spending. Charge variation and inflation are largely by-products of provider market share rather than quality of care; in this manner, consolidation and strengthened bargaining power allow health care organizations to set higher charge rates and ultimately negotiate higher reimbursement.<sup>19</sup> Second, under this pricing scheme, cost shifting is encouraged. This practice refers to health care organizations responding to revenue shortfalls in one area by increasing charges in another. In the context of the findings presented herein, it is conceivable that higher CCRs in safety net hospitals could be evidence of compensatory increased charges that retain higher reimbursement from private payers and help offset lower payments coming from their large Medicaid and uninsured populations.<sup>20-23</sup> Third, inflated charges act as a barrier to entry for new insurance plans. Although established insurers possess the requisite patient volume to negotiate discounts off of set hospital charges, one can imagine that a new entrant into the marketplace would find it more difficult to secure discounts sufficient to offer competitive premiums.<sup>24</sup> Last, current pricing practices hinder efforts to increase care coordination and reduce spending. Conventional cost accounting systems struggle to accurately determine true costs of care.<sup>25</sup> Without these data and the ability to set charges that are more closely calibrated to true resource utilization, benchmarks for decreasing costs throughout a cycle of care (which is particularly applicable to surgical fields) become a moving target. Inflated charges also incentivize higher reimbursing out-of-network care on the provider side, which is antithetical to the tenets of coordinated care in value-driven health care.

There are a variety of potential legislative or policy solutions that could reverse the trends illustrated herein and begin to use pricing as a mechanism of change in controlling spending.<sup>3</sup> First would be to require price transparency, in particular to require hospitals to make public their charges and CCR in a manner that consumers could both access and comprehend, an idea that was, to some degree, recently articulated as a CMS priority in



their ongoing updates to payment policies and rates.<sup>26,27</sup> Although the idea of consumer-directed health care (in essence shifting some per-episode cost in employment-based health plans directly to consumers) has been proposed via such mechanisms as high annual deductible plans, Reinhardt<sup>7</sup> noted that this in essence puts “the cart before the horse” unless patients are empowered with sufficient usable information on which supposed cost-conscious decisions can be based.<sup>28</sup> The second possibility involves setting a maximum CCR that a hospital is permitted to charge. Although this would most tangibly affect individuals paying at or near full cost per episode of care, it is also conceivable that constraining CCR for out-of-network patients would yield greater incentives to join networks and agree to lower negotiated rates, thereby positively affecting in-network patients as well.<sup>3,29</sup> This approach could, however, counterproductively incentivize providers to set their CCR to immediately below maximum value. Last, all insurers could be required to use a common payment system. Although this would not by definition require the same rates to be used across payers, having all insurers base their payments on the same system (ie, surgical bundle or diagnosis-related group) would

allow for more practical cost comparisons across providers. The state of Maryland uses a variant of this approach, with charges set by a state regulatory body known as the Health Services Cost Review Commission; as such, their rates do not vary by payer.<sup>30</sup> This has resulted in Maryland having the lowest CCR of any state in the country (1.5).<sup>3</sup>

Perhaps the most important underlying principle for any such reforms in pricing structure is a sound understanding of true resource utilization associated with care. Currently, most hospital cost accounting systems operate on the department level rather than on the patient level, thereby perpetuating the current system of unclear cost, fictitious charges, and cost shifting.<sup>8</sup> True resource utilization, or “true costs,” have been found to vary from costs recorded in traditional hospital cost accounting systems by 10% to 50%.<sup>31-34</sup> In this context, despite using directly sourced institutional data, it remains questionable whether the decreased costs in the present study represent an actual drop in cost to the institutions. Time-driven activity-based costing (TDABC) is an accounting tool that has been used across multiple industries to address this problem by more effectively understanding workflows and resource utilization.<sup>35</sup> Time-driven activity-based costing is a bottom up approach that relies on defining the cost of each resource needed in a cycle of care (including personnel, clinical space, equipment, and consumables), as well as the total time it is used. The result is concrete clinical process maps and highly granular cost data.<sup>36,37</sup> This not only allows costs to become more accurate and more closely aligned with charges, but also provides the basis for care redesign under value-based reimbursement. It has been suggested that the emerging landscape of reimbursement could lend complex cycles of surgical care (ie, those with high cost and a high degree of variability) best suited for the TDABC approach, with traditional cost accounting persisting in more simple applications.<sup>38</sup>

Limitations of this study include an inability to account for costs outside of line item charges. This includes capital investments such as purchase or maintenance of a surgical robot. In addition, the Premier Healthcare

Database is limited to hospital facilities; as a result, it is unclear whether the findings herein are representative of outpatient procedures in such settings as private ambulatory surgical centers. Third, although we believe that the breadth of indications (benign and oncologic) and surgical approaches (open, endoscopic, and minimally invasive) in the field make urology an ideal candidate for the present analysis, there remains a question of whether the trends observed herein extend to other surgical specialties. A related fourth limitation is that although we believe that the procedures studied herein represent the field in a comprehensive manner, there remains a portion of urologic surgeries that are not fully characterized herein. Fifth, it remained outside the scope of this analysis to determine whether there exists an association between cost or charge parameters with quality of care, which represents the other half of the value equation. Note, however, that previous analyses have not shown that increased spending reliably translates to higher-quality care.<sup>39-41</sup> Sixth, although limiting this study only to hospitals with cost accounting systems yielded the highest quality data possible, there still exist innate limitations in these data anchored in traditional cost accounting. Using an approach such as TDABC that more directly correlates with resource utilization would yield more accurate cost figures. However, traditional cost accounting remains the far more predominant approach in health care and comprises the best available data for larger-scale analyses. Last, although higher CCR has been previously suggested to be a strong factor in hospital profitability, we were unable to explore that relationship in the present study due to a lack of available reimbursement data.<sup>42</sup> Because profit represents the margin between cost and reimbursement (rather than charge), it cannot be assumed that overall hospital profits have widened along with the gap between cost and charge. The opposite, in fact, may be true because recent data have shown health system operating margins to have dropped to an all-time low.<sup>43</sup>

## CONCLUSION

We report an important finding regarding trends in pricing of surgical services, as charges

in episodes of urologic surgery have continued to rise in the face of decreasing costs. Future research is necessary to determine how the divergence of cost and charge trends relates to reimbursement and profitability of specific services in health care organizations, as well as the motivations behind progressively escalating charges. With payment reform inevitable, coincident redesign in charge practices and more accurate cost accounting hold the potential for pricing to become a key component in value-based health care delivery.<sup>44</sup>

**Abbreviations and Acronyms:** CCR = charge-to-cost ratio; CMS = Centers for Medicare and Medicaid Services; TDABC = time-driven activity-based costing

**Potential Competing Interests:** The authors report no competing interests.

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