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US Hospitals Are Still Using Chargemaster Markups To Maximize Revenues

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ABSTRACT Many hospital executives and economists have suggested that since Medicare adopted a hospital prospective payment system in 1985, prices on the hospital chargemaster (an exhaustive list of the prices for all hospital procedures and supplies) have become irrelevant. However, using 2013 nationally representative hospital data from Medicare, we found that a one-unit increase in the charge-to-cost ratio (chargemaster price divided by Medicare-allowable cost) was associated with $64 higher patient care revenue per adjusted discharge. Furthermore, hospitals appeared to systematically adjust their charge-to-cost ratios: The average ratio ranged between 1.8 and 28.5 across patient care departments, and for-profit hospitals were associated with a 2.30 and a 2.07 higher charge-to-cost ratio than government and nonprofit hospitals, respectively. We also found correlation between the proportion of uninsured patients, a hospital's system affiliation, and its regional power with the charge-to-cost ratio. These findings suggest that hospitals still consider the chargemaster price to be an important way to enhance revenue. Policy makers might consider developing additional policy tools that improve markup transparency to protect patients from unexpectedly high charges for specific services.

In 2014 the United States spent $972 billion, or 6 percent of its gross domestic product, on hospital care.[1,2] The starting point of the billing process for most hospitals is still the chargemaster: a list of billable items and prices for all services provided to patients.[3–5] Studies conducted by the Medicare Payment Advisory Commission (MedPAC), the Government Accountability Office, and other entities have reported that hospitals have sole discretion in determining their chargemaster prices and that there is a lack of rigorous methodology for constructing those prices.[5–8]

Until 1985 the Medicare program used information from individual hospitals' chargemasters and Medicare cost reports to determine reimbursement rates for hospitals; researchers found that hospitals made considerable effort to manipulate chargemaster prices to increase Medicare reimbursement.[9] Since Medicare changed its hospital reimbursement formula to the prospective payment system in 1985, the chargemaster has diminished in importance in determining Medicare reimbursement but is still used in determining Medicare outlier payments (extra payments for cases incurring extraordinarily high costs). Commercial insurers pay hospitals, after negotiation, based on either diagnosis-related groups, per diem, or the discounted chargemaster price.[5,10,11] The bottom line is that most public and commercial insurers do not pay hospitals their full chargemaster prices.

As a result, many hospital executives and economists have argued that the chargemaster primarily performs a bookkeeping function and that the chargemaster price is set for conve-

nience and is largely irrelevant to patients (examples of arguments against the relevance of the chargemaster are listed in online Appendix Exhibit A1).[12] This type of argument has been made so successfully that the chargemaster price has not been a major concern of policy makers when debating hospital pricing policy, despite numerous media reports on excessively high hospital bills.[13]

In this article we demonstrate that, contrary to the above argument, the chargemaster has remained an important revenue-seeking function because it affects patients who lack negotiation power with hospitals. Uninsured and out-of-network privately insured patients are generally billed the chargemaster price, unless the hospital offers them a discount.[4,5,11,14,15] Auto insurers and casualty and workers' compensation insurers could be expected to pay the full or a large proportion of the chargemaster price when dealing with clients' claims unless rates are set by state laws.[5,11] A higher chargemaster price can increase the payment from private insurers, which often pay for outpatient and ancillary services based on discounted chargemaster prices.[10] Hospitals with substantial market power can also use high chargemaster prices to gain leverage against private insurers because the existence of such prices motivates insurers to keep hospitals in their networks. If a hospital leaves an insurer's network, the insurer's subscribers would be forced to pay high out-of-network prices for services provided in the hospital, thus reducing the value of the plan to potential enrollees.[11,16]

To test the proposition that the chargemaster still performs a revenue-seeking function, we first examined the association between the hospital markup (that is, the charge-to-cost ratio) and patient care revenue per adjusted discharge. The null hypothesis is that the chargemaster price has no effect on hospital revenues. We then studied whether hospitals systematically vary price markups across patient care departments. Our null hypothesis is that hospitals have consistent markups for all departments; different markups in different departments require additional effort, and rejecting the null hypothesis would suggest that hospitals are using chargemaster prices to maximize revenue.

Finally, we examined whether the markup systematically varies by hospital type. The null hypothesis is that markup ratios are the same for all hospital types. We tested the hypothesis that for-profit hospitals, with the objective of maximizing shareholder value, are more likely than government or nonprofit hospitals are to prioritize profitability.[17] We then tested the hypothesis that hospitals whose markets contain a high proportion of uninsured patients derive a greater marginal benefit from a high chargemaster price than hospitals with fewer uninsured patients, since most uninsured patients are billed the full price unless the hospital offers a discount.[11] We also tested the hypothesis that hospitals with substantial market power obtain a greater marginal benefit from high markups than hospitals with less market power because high markups give them more leverage during price negotiations.[11]

Despite numerous reports on excessively high hospital markups, there has been little empirical analysis of the variation in markups beyond describing the time-series trend of the chargemaster price. A study published in 2006 described the widening gap between hospitals' total chargemaster prices and net prices after 1990.[4] A series of studies have confirmed this continuing trend,[5,11,14] which suggests that hospitals have continued to place importance on the chargemaster. Our study empirically examined markup variation across hospitals and departments and its association with hospital revenue in 2013.

Study Data And Methods

DATA Our main data source was the 2013 Medicare cost reports. The cost reports contain financial information for all Medicare-certified hospitals for fiscal years beginning between October 1, 2012, and September 30, 2013. We obtained wage index and case-mix index from the 2013 Centers for Medicare and Medicaid Services (CMS) Final Rule Data for all acute care hospitals participating in the inpatient prospective payment system. We obtained the estimated proportion of the uninsured population for each US county from the Census Bureau's 2013 Model-based Small Area Health Insurance Estimates. The merged data set contained 3,255 acute care hospitals. We excluded 246 hospitals whose records were missing the data required to determine the values for the variables in the statistical analysis and 586 hospitals with 50 or fewer beds. We also excluded 14 hospitals that had apparent data entry errors, such as having a charge-to-cost ratio lower than 0.2 or above 15.0. The final data set consisted of 2,409 acute care hospitals.

MARKUP MEASURE A hospital's charge-to-cost ratio (the chargemaster price divided by the Medicare-allowable cost) measures the level of markup.[5,11] Medicare-allowable cost is a hospital's overall cost, for all patients, deemed to be directly related to patient care by Medicare.

The charge-to-cost ratio for a department is calculated as the chargemaster price for all services provided by that department divided by the Medicare-allowable cost of that department. The latter includes the direct cost traceable to the

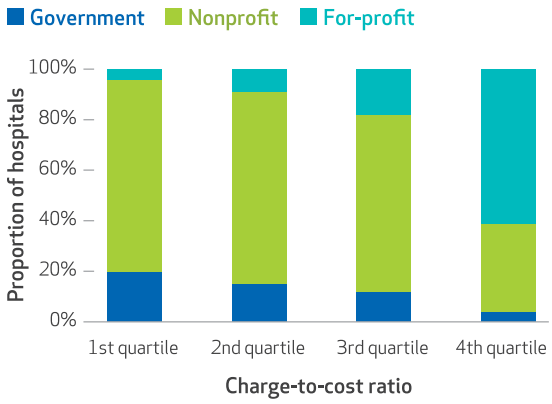
department and the indirect cost allocated to the department, such as administrative expenses, laundry, and social services. CMS requires hospitals to use a specific step-down method to allocate indirect cost and provides detailed instructions on the order and base of allocation. Both hospital and department charge-to-cost ratios are calculated using information on Medicare Cost Report Worksheet C, Part I.

PATIENT CARE REVENUE MEASURE To compare patient care revenue across hospitals that differ widely in service output, we first divided patient care revenue by the number of adjusted discharges. The number of inpatient discharges can be a proxy for inpatient care output volume, but it does not measure outpatient visits. Following the health economics literature, we used adjusted discharges instead, calculated as the number of discharges multiplied by the ratio of total to inpatient gross revenue.[18] Since wage levels and case complexity also vary across hospitals, we included each hospital's Medicare wage index and case-mix index in the denominator, to make patient care revenue more comparable across hospitals—an approach consistent with that in the health care finance literature.[19,20,21] In sum, the patient care revenue measure is calculated as the revenue from patient care services divided by adjusted discharges, wage index, and case-mix index.

UNINSURED PATIENTS MEASURE AND MARKET POWER MEASURE As a proxy for the proportion of uninsured patients treated by a hospital, we used the estimated proportion of the uninsured population in the county where a hospital was located. To measure a hospital's market power, we used two proxies. The first proxy was *system*, a dummy variable that took the value of 1 if a hospital was affiliated with a multihospital health system and 0 if it was not. The second proxy, *regional power*, measured a hospital's dominance in its hospital referral region (defined by the Dartmouth Atlas of Health Care).[22] The market concentration of each referral region was measured by the Herfindahl-Hirschman Index of the regional system.[23–25] We calculated a hospital's market share as either its discharges (if independent) or the discharges of its system (if affiliated with a system) divided by the total number of discharges in the region. By recognizing hospital market share based on system affiliation, we avoided treating hospitals owned by the same system as potential competitors. We compared a hospital's market share with its regional system Herfindahl-Hirschman Index to quantify its relative regional power.[26] If a hospital's market share was greater than its regional system Herfindahl-Hirschman Index, then *regional power* took the value of 1; it took the value of 0 if it was not.

EXHIBIT 1

Hospital ownership distribution, by charge-to-cost ratio quartiles, 2013



SOURCE Authors' analysis of data from Medicare cost reports obtained from the Centers for Medicare and Medicaid Services for 2013.

REGRESSION ANALYSIS We used regression analysis to examine the association between markup and patient care revenue per adjusted discharge. Consistent with prior literature and MedPAC analyses, we included a set of variables to control for hospital characteristics: number of beds, rural location, resident-to-bed ratio, proportion of Medicare discharges, proportion of Medicaid discharges, and average length-of-stay.[17,27] We also included *price regulation*, which was 1 if a state had price regulation (Maryland and West Virginia) and 0 otherwise. As a sensitivity test, we added state fixed effects in the statistical model to control for unobserved state-level regulatory, political, and socioeconomic variations, and we added cost per adjusted discharge to control for operating efficiency. In addition, we used data across three years (2011–13), a hospital fixed effects model, and a first differencing model to test the robustness of the results.

To examine markup across patient care departments, we regressed the department-level charge-to-cost ratio on hospital and department fixed effects. The latter estimated the association between markup and department-specific characteristics that did not change across hospitals, such as service complexity.

Finally, we used regression analysis to explain the variation in markup across hospitals, using all control variables listed above.

LIMITATIONS Our study had a number of limitations. First, Medicare cost reports are based on administrative records submitted by hospitals, so the data might contain inaccuracies. Second,

the lack of patient-level information in the data prevented us from quantifying the variation of the impact of high markup on revenue by insurance category. Third, the case-mix index used in this study was for Medicare patients only and might not represent other groups of patients. Fourth, we do not know the extent of out-of-network patients treated by any hospital, which might be an important factor affecting markup.

Study Results

DESCRIPTIVE STATISTICS In 2013 the average hospital charge-to-cost ratio for all hospitals in our sample was 4.32, with ratios of 3.47 for government, 3.79 for nonprofit, and 6.31 for for-profit hospitals.[28] Hospitals with a higher proportion of uninsured patients than the median hospital in their market had an average ratio of 4.91, compared to 3.71 for hospitals with median or lower proportions of uninsured patients. System-affiliated hospitals had an average ratio of 4.76, versus 3.54 for independent hospitals; hospitals with regional power had an average ratio of 4.56, versus 4.16 for hospitals without regional power. All of these differences were statistically significant ($p < 0.01$; data not shown).

To further illustrate the variation of markup across hospitals, we split the sample by quartiles of charge-to-cost ratio to examine whether there was a "dose response" to certain variables. For hospitals with markup ratios in the lowest (first) quartile, 20 percent were government, 76 percent were nonprofit, and 4 percent were for-profit; for hospitals whose markup ratios were in the highest (fourth) quartile, 4 percent were government, 35 percent were nonprofit, and 61 percent were for-profit (Exhibit 1).

We also plotted the average percentage of uninsured patients in the county where a hospital was located, the proportion of hospitals affiliated with a system, and the proportion of hospitals with regional power across quartiles of charge-to-cost ratio (Exhibit 2). Moving from the lowest (first) quartile to the highest (fourth) quartile, the percentage of uninsured patients increased from 14 percent to 20 percent, the proportion of system-affiliated hospitals jumped from 44 percent to 85 percent, and the proportion of hospitals with regional power rose from 28 percent to 43 percent.

We next ranked twenty-five common patient care departments based on their average charge-to-cost ratios. The following departments had the highest markups: computed tomography (CT) scan (28.5), anesthesiology (23.5), and magnetic resonance imaging (MRI) (13.6) (Exhibit 3). The three departments with the lowest charge-to-cost ratios were general routine care (1.8), intensive care unit (2.1), and nursery (2.7). Charge-to-cost ratios appeared to be higher in departments with greater service complexity. Patients and insurers in these departments would have more difficulty comparing charges across hospitals.

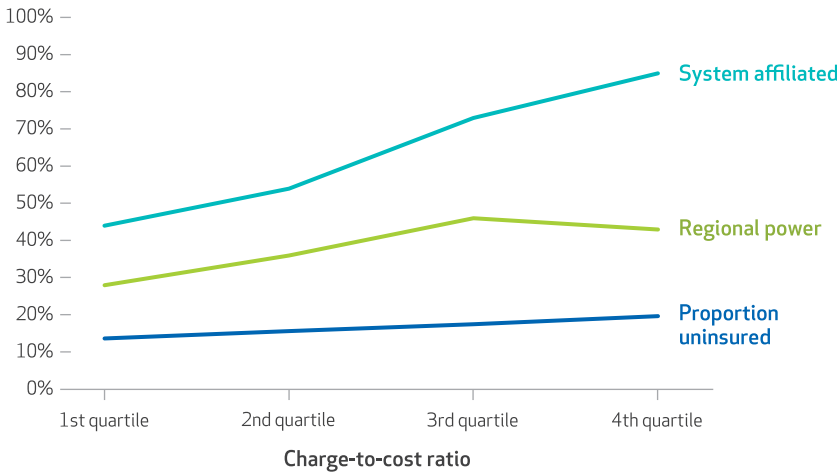
REGRESSION ANALYSIS We found that a one-unit increase in hospital markup (that is, an increase of 1.0) is associated with $64 higher patient care revenue per adjusted discharge. This effect was $120 in the state fixed effects model. The descriptive statistics for variables included in the model appear in Appendix Exhibit A2,[12] and the regression results for the association between hospital markup and patient care revenue per adjusted discharge are shown in Appendix Exhibit A3.[12] In Appendix Exhibit A4, we report regression results using three years of data (2011–13) and three model specifications: pooled, hospital fixed effects, and first-differencing.[12] The association between markup and patient care revenue was robust across models.

In Appendix Exhibit A5, we present the estimated hospital department fixed effects associated with the department charge-to-cost ratio.[12] The magnitude and ranking of department fixed effects in the Appendix are comparable to those of the average department charge-to-cost ratios presented in Exhibit 3.

For-profit and nonprofit hospitals were associated with a 2.30 and 0.23 higher charge-to-cost ratio than government hospitals, and the two coefficients were statistically different from each other (Exhibit 4).[29] (Full regression results ap-

EXHIBIT 2

Proportion of uninsured patients, affiliation with a hospital system, and hospital regional market power, by charge-to-cost ratio quartiles, 2013



SOURCE Authors' analysis of data from Medicare cost reports and Final Rule Data obtained from the Centers for Medicare and Medicaid Services for 2013 and the Census Bureau's Model-based Small Area Health Insurance Estimates for 2013.

EXHIBIT 3

Average charge-to-cost ratios for selected hospital patient care departments, 2013

Rank	Department	Charge-to-cost ratio
1	Computed tomography scan[a]	28.5
2	Anesthesiology[a]	23.5
3	Magnetic resonance imaging[a]	13.6
4	Electrocardiology[a]	12.4
5	Electroencephalography[a]	9.3
6	Cardiac catheterization[a]	8.7
7	Laboratory[a]	8.5
8	Medical supplies charged to patients[a]	8.3
9	Radioisotope[a]	7.2
10	Renal dialysis[a]	6.5
11	Radiology-diagnostic[a]	6.4
12	Drugs charged to patients[a]	5.9
13	Emergency[b]	5.7
14	Respiratory therapy[a]	5.5
15	Recovery room[a]	5.3
16	Operating room[a]	5.1
17	Occupational therapy[a]	5.0
18	Speech pathology[a]	4.8
19	Labor room and delivery room[a]	4.4
20	Implantable device charged to patients[a]	3.6
21	Clinic[b]	3.0
22	Physical therapy[a]	3.0
23	Nursery[c]	2.7
24	Intensive care unit[c]	2.1
25	General routine care[c]	1.8

SOURCE Authors' analysis of data from Medicare cost reports and Final Rule Data obtained from the Centers for Medicare and Medicaid Services for 2013. **NOTE** Only patient care departments for which more than half of hospitals in the sample reported non-missing charge-to-cost ratios are included. [a]Ancillary care. [b]Outpatient care. [c]Inpatient care.

pear in Appendix Exhibit A6.)[12] *Percent uninsured* was associated with a 0.08 higher ratio, which suggests that a one-standard-deviation increase (or 5.5 percent) in the proportion of uninsured patients in the county where a hospital is located (for example, from 10.0 percent to 15.5 percent) was associated with a 0.44 increase in the charge-to-cost ratio. *System* and *regional power* were associated with 0.42 and 0.14 higher charge-to-cost ratios, respectively, which indicates that hospitals with market power, through either system affiliation or possessing a large market share in the region, were more likely than others to set a high markup.

The results also indicate that hospitals located in states that regulate price have lower markups. Urban hospitals, hospitals with low resident-to-bed ratios, and large hospitals tend to have higher markups. In our results, a higher proportion of Medicare patients was associated with a higher markup, while a higher proportion of Medicaid patients was associated with a lower markup. These results might be explained by the fact that Medicare outlier payments are influenced by hospitals' chargemaster prices.[5]

As a robustness check, we added state fixed effects in the model (Exhibit 4). Most estimated coefficients with state fixed effects were similar to those without fixed effects. The one variable whose predicting power was reduced in the model with fixed effects was *percent uninsured*. A possible explanation could be the low levels of variation of this county-level variable within each state.

Discussion

We found that the charge-to-cost ratio varied systematically across hospitals and between departments and was associated with higher patient care revenue per adjusted discharge, which suggests that hospitals were still using the chargemaster price to maximize revenue in 2013. These results are inconsistent with the argument made by many hospital executives and economists that the chargemaster price is largely irrelevant.

A recent study showed that some hospitals set their chargemaster prices more than ten times higher than their Medicare-allowable costs.[11] The present study shows that two departments (CT scan, 28.5, and anesthesiology, 23.5) charged more than twenty times their Medicare-allowable costs. These high markups can impose financial pressure on uninsured patients, out-of-network patients, auto insurers, and casualty and workers' compensation insurers. The high charges can lead to personal bankruptcy or avoidance of needed medical services and much higher auto, casualty, and workers' compensation insurance premiums.[11,30] They are also associated with surprise medical bills and can raise insurance premiums for privately insured patients and their employers.

Policy Implications

Previous studies have identified three types of policy options to address excessive hospital markups: improving transparency of hospital charges, setting a cap on the maximum markup that hospitals can charge, and requiring all patients to pay the same rates or use the same payment system to derive the actual rates.[5,10,11,15,31] In Maryland, for example, where the fee schedule is determined by an all-payer rate-setting system, the average charge-to-cost ratio (1.4) is the lowest in the nation and has risen little over time.[11]

We also believe that policy makers should con-

sider two additional policy recommendations. The first is to improve the transparency of hospital markup. Given that hospitals typically have more than 20,000 items in their chargemaster files, it is virtually impossible for a patient to compare prices across hospitals for individual services, especially since the patient does not choose the services. A few state price transparency initiatives, such as the California Common Surgeries and Charges Comparison and the Florida Health Finder, collect and release hospital chargemaster prices for some procedures;[8] we are concerned that the price information for 20,000 different items is not very useful. It needs to be combined with some sort of benchmark, such as the average cost or the amount Medicare would pay for the same service. Patients would then have a metric for comparison.

Hospital financial statements are widely used by various stakeholders.[32] Unfortunately, the generally accepted accounting principles for health care entities do not require hospitals to disclose total gross revenue, which is equivalent to the total chargemaster price billed for the fiscal period after some revenue-recognition adjustments. Financial Accounting Standard Boards might consider including the total gross revenue as a required reporting item in hospital income statements. Providing this information would not require significant extra effort from hospitals since it is readily available from chargemasters and routinely reported to CMS. With gross revenue information available on the income statement, patients and insurers can compare it with the hospital's operating expenses—another line item on the income statement—to approximate the hospital's charge-to-cost ratio.

This change alone, however, would not make a tangible difference in price transparency unless the financial statements are easily accessible by patients and private insurers. Mandatory disclosure of financial statements on each hospital's website might be an option. These changes in hospital reporting and disclosure policy could reduce patients' information disadvantage and deter hospitals from setting excessively high prices, thereby improving the efficiency of the hospital market.

The second policy recommendation is that policy makers consider requiring hospitals to set a uniform charge-to-cost ratio across all departments and services. Having access to the overall markup for the hospital is not very informative for the patient because there is substantial interdepartmental variation. From a patient's perspective, significant variation among services makes it difficult to compare markups across hospitals since they do not know exactly what services to compare. While hospitals might initially find it challenging, an initial goal could be to have a consistent markup across services within a hospital.

EXHIBIT 4

Variation in hospital markup, by type of ownership, regional power, and other characteristics, 2013

	Coefficient	
Variable	**Without state fixed effects**	**With state fixed effects**
For-profit status	2.30***	2.21***
Nonprofit status	0.23***	0.31***
Percent uninsured[a]	0.08***	0.01
System affiliated	0.42***	0.40***
Regional power	0.14**	0.20***
Price regulation	−1.88***	−2.24***
Rural location	−0.56***	−0.42***
Resident to bed ratio	−0.58***	−0.32**
Each additional 100 beds	0.11***	0.07***
Average length-of-stay	−0.03	−0.06
Percent Medicare	0.01*	0.01*
Percent Medicaid	−0.01***	−0.01
Case-mix index	−0.24	0.02

SOURCES Authors' analysis of data from Medicare cost reports and Final Rule Data obtained from the Centers for Medicare and Medicaid Services for 2013 and the Census Bureau's Model-based Small Area Health Insurance Estimates for 2013. **NOTE** $N = 2,409$. [a]Proportion of uninsured patients in the county where a hospital is located. *$p < 0.10$ **$p < 0.05$ ***$p < 0.01$

Conclusion

We found that a high hospital chargemaster markup was associated with higher patient care revenue per adjusted discharge in 2013. Markups also varied considerably across hospitals and departments: For-profit hospitals, hospitals whose markets have a large proportion of uninsured patients, and hospitals with market power were more likely than others to set a high markup. These results suggest that markups are being used to maximize revenue. To protect patients from unexpectedly high charges, policy makers should consider initiatives that target hospital markup, such as improving transparency and limiting interdepartmental variation in markups. ■

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NOTES

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12 To access the Appendix, click on the Appendix link in the box to the right of the article online.

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