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Price Variations and Their Trends in U.S. Hospitals

Kathleen Carey, Ph.D.*
Professor
School of Public Health
Boston University

and

Avi Dor, Ph.D.
Professor
Milken Institute School of Public Health
The George Washington University

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Abstract

The Centers for Medicare and Medicaid Services (CMS) publishes hospital-specific charges for frequently billed discharges in over 3,300 hospitals. Actual payments differ widely from these, however, because Medicare payments are set administratively and commercial prices are negotiated between hospitals and insurers. This study tracks trends in prices paid to hospitals by commercial insurers over the period 2008 to 2014 using private sector claims data that contain actual payments. We contrast these with trends in the CMS published charges. Results indicate that variation in actual commercially-transacted prices is substantially lower than variation in published charges, and that while there is a downward trend in variation among prices over time, variation in charges is increasing.

1. Introduction

In the current state of uncertainty around the future of health care reform financing, policy makers are becoming increasingly interested in the role of prices in driving spending. Health care in the U.S. is relatively more "market-driven" than in other industrialized countries, yet prices paid by private health insurers have historically remained highly confidential.[1] In 2013, in an effort to provide price transparency, the Centers for Medicare and Medicaid Services (CMS) began publishing average list charges for 100 common inpatient diagnoses at over 3,300 hospitals.[2] The data release showed that hospitals charge as much as 10 to 20 times what Medicare reimburses them for the same procedure, intensifying a longstanding and heated debate over the methods hospitals use to determine prices.[3] Hospitals had difficulty in explaining such large differences in charges, which varied not only regionally but also within the same area or city.[4]

Medicare payments to hospitals are based on rates set administratively according to diagnosis-related groups (DRGs), but on the commercial insurance side, prices are based to a large extent on the list charges that CMS is now publishing. Actual billing, however, tends to differ widely from these because of hospital-insurer negotiated deep discounts off charges, or because a different method of payment is used such as per diems or a percentage of the Medicare DRG rate. Still, the prices ultimately paid by insurers are disturbingly high and many uninsured patients pay full list charges.[5] Prices for hospital services have shown steep increases in recent years: The national price index for hospital and related services grew 24.4 percent in the five-year period ending December 2015, compared to 15.0 percent for medical care overall, and 7.9 percent general inflation.[6]

While the growing level of hospital prices is problematic, a number of observers also have expressed concern over the large variation in prices observed across markets and more troubling, even within markets.[7-11] A recent Institute of Medicine Report concluded that while use continues to drive geographic variation in Medicare spending, the primary driver in the non-Medicare private insurance market is differences in commercial price markups.[12-13] The findings used two commercial claims databases for aggregated years 2007-2009 to analyze the total spending – including facility, provider and prescription drugs – incurred by a commercially

insured beneficiary. The values of the 90th to 10th percentile ratios of unadjusted per-member per-month spending across metropolitan statistical areas were 1.36 for one database and 1.50 for the other. A recent and very comprehensive study of hospital prices from a large insurance claims database averaged over the years 2007-2011 reinforces this finding and documents price variation within and across geographic areas.[14]

This study builds on the important theme of health care price variation in the privately insured market by exploring how hospital price variation is trending over time and during a more recent period. We also used a large national claims database that contained actual transaction prices to explore trends in variation in hospital prices across markets during 2008-2014. Two results stand out: Variation in actual transaction prices is substantially lower than variation in charges and while variation in charges is increasing over time, variation in prices appears to be decreasing.

2. Methods

Defining Prices

Data on prices came from *MarketScan® Commercial Claims and Encounters*, a commercial insurance claims database distributed by Truven Health Analytics. MarketScan assembles complete insurance claims for approximately 100 medium-size and large employers. The financial component of MarketScan includes actual transaction prices, or payments to providers, after applying negotiated discounts.

To define a representative "price" we began with the total payment to the hospital for an inpatient stay including patient cost-sharing but excluding professional fee components. We excluded cases in which the payment was less than zero and in which the payment was greater than the mean plus three standard deviations.[15]

For comparability across stays, we made two adjustments to the payment data. First, to account for case-mix differences, we divided the payment by the DRG weight for the hospitalization, which normalized the price for each hospital stay to payment for a one DRG unit. Second, we adjusted prices per DRG unit for comparability across different locations. CMS uses the Inpatient Prospective Payment System Wage Index to adjust hospital reimbursements for differences in production costs across geographic areas.[16] In the CMS adjustment, the labor portion of the payment rate is multiplied by the wage index value. We applied this procedure in reverse,[17] thereby removing price differences due to local input cost variation according to the formula:

$$\text{price} = \text{payment} / (0.620 * \text{wage index} + .4) \text{ if wage index} < 1.00$$
$$\text{price} = \text{payment} / (0.698 * \text{wage index} + .4) \text{ if wage index} \geq 1.00$$

such that all prices were on the same scale. Hence our final adjusted price for each inpatient stay is the payment per DRG unit, adjusted to a common base that accounts for geographic differences in labor costs.

Measuring Price Variation

We examined all inpatient stays in MarketScan for each year beginning 2008 and ending in 2014. The overall database does not identify individual hospitals. However, for the years 2008-2012, our data contained a subsample of observations that included hospital specific identifying information. Owing to this trade-off in the data between completeness and sample size, we considered price variation in two ways. First, for the subsample of observations that contained hospital identifiers, we averaged adjusted prices at the hospital level (deleting hospitals that had fewer than 30 observations) and examined nationwide variation among hospital representative prices (similar to the CMS charge reports). Second, for the overall sample, we averaged adjusted prices at the market level, which we defined as the Metropolitan Statistical Area (MSA). We examined variation of the market representative prices nationally.

We used the coefficient of variation (CV) as the primary analytic tool for examining price variation. The CV, a standardized measure of dispersion, is the ratio of the standard deviation (σ) to the mean (μ). Here the CV, calculated as $(100 \times \sigma) / \mu$, measures the variability of hospital representative prices and of market representative prices relative to the nationwide populations of hospital prices and of market prices.

3. Results

First, we present average hospital charges and hospital charge variation using the information reported publicly by CMS in Exhibit 1.[18] The CMS charge data are organized as the average charge for each of the 100 most frequent DRGs for each hospital, with a two-year lag. (In 2016,

Exhibit 1. Charges: Means and Coefficients of Variation across Hospitals: 100 Most Frequent DRGs

Measure	2011	2012	2013	2014	Percent Change Over Period
Mean Charge ($)	22,405	23,576	24,739	25,794	15.1
Coefficient of variation	47.38	47.69	48.68	48.87	3.1
Number of hospitals	3,291	3,279	3,254	3,223	---
Note: Data were adjusted by diagnosis-related group and by geographic location.					

the fourth year of publication, the 2014 charges were published for all DRGs. We selected the 100 most frequent DRGs.) Exhibit 1 summarizes hospital level average charges for each year for the top 100 DRGs, adjusted for case-mix index and geographic differences. Average hospital charges grew 15.1 percent, from $22,405 in 2011 to $25,974 in 2014. The coefficient of variation also grew between 2011 and 2014, from 47.38 to 48.87.

In Exhibit 2, we summarize mean prices and coefficients of variation at the hospital level for the period 2008-2012. For comparability with hospital level charges, we examined these for the most frequent 100 DRGs. We present results for two distinct groups of hospitals. The first panel

Exhibit 2. Prices: Means and Coefficients of Variation across Hospitals: 100 Most Frequent DRGs

Measure	2008	2009	2010	2011	2012	Percent Change Over Period
Observations on All Hospitals in the Year						
Mean Price ($)	9,064	9,753	10,450	10,792	11,241	24.0
Coefficient of variation	33.10	31.61	32.50	29.89	31.37	-5.5
Number of hospitals	579	625	555	513	465	---
Observations on All Hospitals with Data in All Years						
Mean Price ($)	9,158	9,931	10,440	10,603	11,188	22.1
Coefficient of variation	32.87	32.17	31.66	29.01	31.66	-3.7
Number of hospitals	334	334	334	334	334	---
Note: Data were adjusted by diagnosis-related group and by geographic location.						

of Exhibit 2 shows prices and CVs for all hospitals in the data that had at least 30 observations in the given year. In the second panel, we show prices and CVs for the 334 hospitals that had at least 30 observations in all five years. In the former group, prices grew 24.0 percent between 2008 and 2012; in the latter group, prices grew 22.1 percent. Variation across hospitals is substantially smaller than variation across charges shown in Exhibit 1; CVs lie in the range of 30-33 for prices compared to 47-49 for charges. Interestingly, unlike the variation in charges, we observe a declining trend in CVs over the period; the CV for the overall group of hospitals fell 5.5 percent between 2008 and 2012 and the CV for the group of 334 hospitals fell 3.7 percent. The bottom panel shows similar results for the restricted set of hospitals.

In Exhibits 3 and 4 we turn to variation in prices averaged at the MSA level. Exhibit 3 presents results for the 100 most frequent DRGs and Exhibit 4 presents the results for all DRGs.

Exhibit 3. MSA Mean Prices and Coefficients of Variation across MSAs – 100 Most Frequent DRGs

Measure	2008	2009	2010	2011	2012	2013	2014	Percent Change 2008 to 2014
Minimum Number of Cases ≥ 1,000 (109 MSAs)								
Mean Price ($)	8,778	9,631	10,089	10,234	10,814	11,107	11,498	31.0
Coefficient of Variation	14.36	14.28	14.32	13.07	13.51	12.85	12.15	-15.4
Minimum Number of Cases ≥ 2,500 (52 MSAs)								
Mean Price ($)	8,587	9,434	9,922	10,107	10,719	11,039	11,417	33.0
Coefficient of Variation	13.81	13.34	13.55	12.99	13.07	12.64	11.98	-13.3
Note: Data were adjusted by diagnosis-related group and by geographic location.								

The prices are MSA averages of patient level prices; the CVs represent variation across MSAs. Because of the limited sample size, we viewed variation across MSAs in two ways, trading off the minimum number of cases in an MSA required in each year with the number of MSAs that could be included. The top panel shows mean prices and variation for the 109 MSAs that had a minimum of 1,000 cases in each year; the bottom panel show these results for the 52 MSAs that had 2,500 observations in each year. Prices increased in the range of 31 percent and 33 percent between 2008 and 2014. For both views there was a downward trend in CV between 2008 and 2014. The overall fall in CV ranged from 15.4 percent for the group of 109 MSAs, to 13.3% for the group of 52 MSAs.

In Exhibit 4, we list the results of repeating the analyses for all DRGs. In this case we viewed the data in three ways: for MSAs with a minimum of 1,000 cases (218 MSAs), a minimum of 2,500 cases (111 MSAs), and a minimum of 5,000 cases (68 MSAs). We observe similar trends in mean prices and in variation. The increase in the mean prices was in the 30%-32% range. The CV measured across MSAs fell 7.4 percent, 9.5 percent, and 13.4 percent across the three views.

Exhibit 4. MSA Mean Prices and Coefficients of Variation across MSAs – All DRGs

Minimum of Cases in All Years	Number of MSAs	2008	2009	2010	2011	2012	2013	2014	Percent Change 2008 to 2014
Minimum Number of Cases ≥ 1,000 (218 MSAs)									
Mean Price ($)		8,894	9,659	10,075	10,152	10,772	11,163	11,560	30.0
Coefficient of Variation		16.39	16.09	16.19	15.68	16.25	15.43	15.17	-7.4
Minimum Number of Cases ≥ 2,500 (111 MSAs)									
Mean Price ($)		8,650	9,466	9,832	9,982	10,546	10,848	11,306	30.7
Coefficient of Variation		16.44	16.52	15.92	15.22	15.35	14.64	14.87	-9.5
Minimum Number of Cases ≥ 5,000 (68 MSAs)									
Mean Price ($)		8,539	9,310	9,740	9,949	10,522	10,833	11,284	32.1
Coefficient of Variation		14.26	13.36	13.45	13.41	13.30	12.39	12.35	-13.4
Note: Data were adjusted by diagnosis-related group and by geographic location.									

4. Discussion

Previous study of U.S. hospitals prices has focused on the drivers of price inflation and more recently on the extent of price variation. We extended this research by examining trends in hospital price variation over recent years in the context of trends in hospital list charges published by CMS. Two important findings emerge. First, variation in actual prices that hospitals receive is much lower than variation in charges published by CMS. Second, variation in prices has been declining in recent years. This stands in contrast to the first four years of variation in hospital charges published by CMS, which show an increasing trend in variation.

It is interesting to note that when average levels of a population are rising but variation is tightening, it automatically follows that increases in the lower range exceeds increases in the upper range. In the context of hospital prices, this means that overall, price increases among lower price hospitals were greater than price increases in higher price hospitals. While we were unable with available data to identify reasons for this observation, it is possible that growing awareness of differences in charges paid to hospitals for the same services is motivating lower price hospitals to negotiate more aggressively with insurers in order to try and "catch up" with higher price hospitals.

The direction in trend has interesting implications for public policy strategies aimed at containing hospital price growth. These commonly fall into two categories.[7] The regulatory approach typically involves state governments establishing common methods of payments across private payers and placing constraints on what hospitals can charge. The market-based approach generally consists of measures such as insurance benefit designs that boost patient incentives to choose lower price hospitals through lower cost sharing and price transparency tools that facilitate comparative shopping. To the extent that prices are growing faster among hospitals on the lower end of the price spectrum, the imposition of price ceilings may overlook some important dynamics involved in driving spending toward which more market oriented approaches may be more effective. However, policymakers need to be wary of a potential "race to the top" on the part of lower price hospitals, which could emerge as an unintended consequence of state-initiated efforts toward price transparency such as all-payer claims databases and online tools that are beginning to appear in some states.

The finding that actual price variation is lower than the variation in charges published by CMS, is encouraging. From the perspective of market function, it indicates that differences across hospitals and across markets are not as great as public reports suggest. This finding is also relevant to consumers and may underscore the policy case for the Department of Health and Human Services to add price variation measures to its public reporting. Although hospital price data are largely proprietary and confidential, emerging private claims databases such as those used in this study might be adopted for more systematic reporting.

There are limitations to this analysis. The main limitation is that with available data, we were unable to fully align hospital prices and charges. Some of the difference between price and charge variation can be due to the fact that Medicare includes a more complete set of hospitals. Nonetheless, there is a clear pattern of differences between prices and charges in both the level of CVs and the direction of trend. We examined numerous views of the data and this general result was persistent.

A second limitation is that factors for which we were unable to control, such as hospital quality, teaching mission, and service offerings, may affect variation in hospital prices. Among these, quality of care is particularly important. In a competitive market, high performing hospitals may be justified in demanding a premium on price to reward better quality service. What is highly debatable is the extent to which high quality is reflected in the prices that hospitals receive. However, some recent evidence suggests that public reporting of hospital quality on Medicare Hospital Compare has provided purchasers with leverage in moderating hospital price increases.[19]

Finally, it should be noted that MarketScan is not nationally representative of all commercially insured patients in the U.S. However, the data for this study contain observations on all 50 states

and from the District of Columbia, which should be adequate for capturing patterns of price variation across different regions of the country.

With a growing number of Americans seeking health care under the Affordable Care Act (ACA), concern over affordability is mounting. The ACA regulations that are directed at controlling hospital spending target reimbursement for Medicare patients. Yet a very large portion of spending for hospital care comes from private payers. Constraining growth in hospital spending is going to be extremely important to sustaining health care reform and further study of the actual prices that drives it will be very valuable.

Corresponding Author:

Kathleen Carey
kcarey@bu.edu
617-414-1459

References

1. Reinhardt UE. The pricing of U.S. hospital services: chaos behind a veil of secrecy. *Health Affairs* 2006;25(1):57-69.

2. Radnofsky L, Barry R. Data shine light on hospitals bills. The Wall Street Journal. 2013 May 9. [cited Sept. 2 2015] Available from: http://www.wsj.com/articles/SB10001424127887324059704578471453118371838

3. Meier B, McGinty JC, Creswell J. Hospital billing varies wildly, government data shows. The New York Times. 2013 May 8. [cited Sept. 2 2015] Available from: http://www.nytimes.com/2013/05/08/business/hospital-billing-varies-wildly-us-data-shows.html

4. Kliff S, Keating D. One hospital charges $8,000 – another, $38,000. The Washington Post. 2013 May 8. [cited Oct. 12 2015] Available from: http://www.washingtonpost.com/news/wonkblog/wp/2013/05/08/one-hospital-charges-8000-another-38000/

5. Brill S. Bitter pill: Why medical bills are killing us. Time Magazine. 2013 Apr 4. [cited October 12] Available from: http://time.com/198/bitter-pill-why-medical-bills-are-killing-us/

6. U.S. Bureau of Labor Statistics. Archived consumer price index detailed report information. [cited Sept. 28 2016]. Available from: http://www.bls.gov/cpi/cpi_dr.htm#2015

7. Ginsburg PB. Wide variation in hospital and physician payment rates evidence of provider market power. Center for Studying Health System Change. 2010 Nov. Research Brief No. 16.

8. Franzini L, White C, Taychakhoonavudh S, Parikh R, Zezza M, Mikhail O. Variation in inpatient hospital prices and outpatient services quantities drive geographic differences in private spending in Texas. *Health Services Research* 2014;49(6):1944-1963.

9. Brill S. America's bitter pill: Money, politics, back-room deals, and the fight to fix our broken healthcare system. New York: Random House; 2015.

10. Center for Health Information and Analysis. Health care provider price variation in the Massachusetts commercial market: Results from 2011. Commonwealth of Massachusetts; Feb 2013.

11. Reinhardt UE. Too many different prices paid to providers and the flawed theory of cost shifting: Is it time for a rational all-payer system? *Health Affairs* 2011;30(11):2125-2133.

12. Institute of Medicine. Variation in health care spending: target decision making, not geography. Washington (DC): National Academics Press; 2013.

13. Newhouse JP, Garber AM. Geographic variation in health care spending in the United States: Insights from an Institute of Medicine report. *Journal of the American Medical Association* 2013;310(12):1227–8.

14. Cooper Z, Craig S, Gaynor M, Van Reenen J. The price ain't right? Hospital prices and health spending on the privately insured. 2015. [cited Sept. 28 2016] Available from: http://www.healthcarepricingproject.org/sites/default/files/pricing_variation_manuscript_0.pdf

15. Moriya AS, Gaynor M, Vogt WB. Hospital prices and market structure in the hospital and insurance industries. *Health Economics, Policy and Law* 2010;5(4):459-479.

16. Centers for Medicare and Medicaid Services. Wage Index. 2016. [cited Sept. 28 2016] Available from: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/wageindex.html

17. Carey K. Price increases were much lower in ambulatory surgery centers than hospital outpatient departments in 2007-12. *Health Affairs* 2015;34(10):1738-1744.

18. Medicare Provider Utilization and Payment Data: Inpatient [Internet] Baltimore (MD): Centers for Medicare and Medicaid Services; [cited Sept. 28 2016] Available from: https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/Inpatient.html

19. Dor A, Encinosa WE, Carey K. Medicare's Hospital Compare quality reports appear to have slowed price increases for two major procedures. *Health Affairs* 2015;34(11):71-77.