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Hospital Prices Grew Substantially Faster Than Physician Prices For Hospital-Based Care In 2007–14

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ABSTRACT Evidence suggests that growth in providers' prices drives growth in health care spending on the privately insured. However, existing work has not systematically differentiated between the growth rate of hospital prices and that of physician prices. We analyzed growth in both types of prices for inpatient and hospital-based outpatient services using actual negotiated prices paid by insurers. We found that in the period 2007–14 hospital prices grew substantially faster than physician prices. For inpatient care, hospital prices grew 42 percent, while physician prices grew 18 percent. Similarly, for hospital-based outpatient care, hospital prices grew 25 percent, while physician prices grew 6 percent. A majority of the growth in payments for inpatient and hospital-based outpatient care was driven by growth in hospital prices, not physician prices. Our work suggests that efforts to reduce health care spending should be primarily focused on addressing growth in hospital rather than physician prices. Policy makers should consider a range of options to address hospital price growth, including antitrust enforcement, administered pricing, the use of reference pricing, and incentivizing referring physicians to make more cost-efficient referrals.

According to data from the Henry J. Kaiser Family Foundation, total health spending on the privately insured in the United States increased in real terms by nearly 20 percent from 2007 to 2014.¹ Growth in health spending on this population can slow wage growth, increase the scale of federal subsidies for insurance bought on the Marketplaces, and make it more difficult for people to access health care services.² Previous work suggests that in the short run, growth in health care providers' prices plays a larger role in driving growth in health spending on the privately insured than the role played by changes in case-mix or utilization.³ However, to our knowledge, there is no work that has systematically compared growth rates of hospital versus physician prices over time.

In this study we examined growth in physician

and hospital prices in the period 2007–14 for total inpatient care and hospital-based outpatient care as well as for four high-volume services: cesarean section, vaginal delivery, hospital-based outpatient colonoscopy, and knee replacement. Using data containing the actual amounts paid by patients and insurers, we identified the share of the growth in total payments for each of those services that was driven by growth in physician and hospital prices.

Understanding whether there are differential rates of hospital and physician price growth for hospital-based inpatient and outpatient care is crucial for informing policy makers about where to target their efforts to control health spending on the privately insured.

Study Data And Methods

DATA SOURCE We used data from the Health Care Cost Institute (HCCI) that included claims for people with employer-sponsored insurance from Aetna, Humana, and UnitedHealthcare—three of the five largest insurers in the US. These data included the prices that insurers negotiated with hospitals and physicians. These negotiated prices are the real prices paid by insurers and patients, rather than hospital charges—which are list prices that providers are rarely paid. The HCCI data captured the health spending on approximately 28 percent of Americans with employer-sponsored insurance.⁴ We also used hospital data from the American Hospital Association and data on insurance coverage from the HealthLeaders-InterStudy database.

ANALYSIS We analyzed claims for inpatient care, outpatient care, and the four high-volume services listed above. We selected these services because they were performed frequently on the privately insured, were coded consistently during our period of analysis, and did not have any major changes in how they were performed in that period. We identified cesarean sections, vaginal deliveries, and knee replacements using diagnosis-related groups. We identified outpatient screening colonoscopies using *International Classification of Diseases, Ninth Revision (ICD-9)*, codes (see online appendix A for definitions).⁵

An important concern was that changes in the case-mix of patients over time could also be causing prices to change. To reduce case-mix variation, we limited our analysis to services provided to patients within the most common ten-year age group for each service we analyzed, and we limited our analysis to data on people with a Charlson Comorbidity Index score of 0 (that is, patients who had no significant comorbidities).⁶ In addition, we analyzed physician and hospital prices for all inpatient and hospital-based outpatient claims in our data. Analyzing all claims, by inpatient and outpatient setting, allowed us to show that our results were robust regardless of the types of services analyzed.

We were able to analyze physician and hospital prices separately because claims for services provided in a hospital or a hospital's outpatient department generate facilities claims, and physician services provided in these settings are paid separately on physician claims. We used the allowed amounts for each case—the sum of the patient and insurer payments—as our measure of the total payments made for each case in our data.

For inpatient care, we summed the allowed amounts on all facility claims for each patient during an admission. For hospital-based outpa-

tient care, we summed the allowed amounts for all facility claims on the day of service when the place-of-service code indicated that care was delivered at a hospital. Because there is heterogeneity in coding practices and payment structures across hospitals, we aggregated the amounts spent on each hospital claim within a case instead of focusing on the price paid for a specific *Current Procedural Terminology* code.

We followed an analogous approach to create an average national physician price for each of the four procedures per year. We captured the sum of the allowed amounts on each physician claim per case. For inpatient care, we matched physician prices to facility prices using episode identification numbers. For outpatient care, we focused on physician claims for services delivered to patients with facility claims for the same dates, where the place-of-service code indicated that care was delivered at a hospital. As a result, our physician price for a knee replacement, for example, was the sum of all of the physician payments made per case, including payments made to the orthopedic surgeon and the anesthesiologist. We then aggregated these to a yearly national average physician price per procedure, using weights to match the yearly spatial distribution of patients to the 2014 spatial distribution of patients across hospital referral regions (HRRs).

We also created regression-based measures of average physician and hospital prices for inpatient and outpatient care (see appendix B).⁵ These measures captured the average hospital and physician payments for the average inpatient and outpatient cases per hospital and controlled for the complexity of care delivered at each hospital. We weighted these measures in the same way that we weighted our procedure measures.

All prices were inflation adjusted to 2014 dollars using the All Items Consumer Price Index from the Bureau of Labor Statistics. We limited our analysis to episodes of care delivered in hospitals registered with the American Hospital Association. We also excluded cases with payments in the top or bottom 1 percent of the price distribution for that service, since these likely represented episodes with errors in coding (for example, a \$20 colonoscopy) or idiosyncratic complexity (such as a \$3 million knee replacement).

The number of lives covered by the HCCI data in each HRR changes year by year as the insurers gain or lose customers. As a result, a given year could appear to have higher prices because the HCCI insurers had more covered lives in markets with high provider prices. To address this, we created national average hospital prices for each condition each year by averaging all of the indi-

vidual case-level prices by procedure at the national level. To address the changing numbers of patients per HRR, we weighted each observation so that every HRR-year had the same share of patients as it did in 2014.

LIMITATIONS This research had several limitations. First, the HCCI data we used in this analysis covered approximately 28 percent of employer-sponsored lives in the US, and people covered by other insurers (such as Blue Cross Blue Shield) were not included. However, we tested the robustness of our results in samples of data for regions where the HCCI insurers had high or low market share.

Second, we included component prices, such as costs of implants and medical devices, in our hospital price measures. It is possible that, for example, the growth in knee replacement hospital prices reflected growth in the price of knee implants. To address this issue, we also measured prices for services (baby deliveries and colonoscopies) that did not involve implants or the use of medical devices.

Third, we analyzed the growth in physician prices for hospital-based care but not for office visits. Although it is unlikely, growth in physician prices for office visits in our sample could have differed from growth in physician prices for hospital-based care. However, a previous analysis using nationwide data with negotiated prices showed that from 2003 to 2010 the rate of growth in the prices physicians negotiated with insurers for office visits was similar to the rate of growth we observed in physician prices for hospital-based care.⁷

Fourth, growth in prices over time could reflect unobserved improvements in quality or increases in the amount of care delivered within cases over time. While it is impossible to rule this

possibility out, there is scant evidence that quality or the way care was delivered for the four procedures we analyzed changed substantially during the study period. Similarly, our regression-based approach for measuring inpatient hospital and physician prices controlled for annual changes in the severity of diagnosis-related groups and outpatient cases that could reflect changes in care delivery.

Study Results

Exhibit 1 shows summary statistics for each sample of hospital-based episodes. Not surprisingly, hospital prices accounted for the majority of the cost of care. The hospital component of the combined cost of care (physician plus hospital prices) ranged from 61 percent for vaginal deliveries to 84 percent for knee replacements.

Hospital prices grew much faster than physician prices for inpatient and outpatient hospital-based care in the period 2007–14 (exhibit 2). The same pattern was present for all four of our procedures (appendix figure 1),⁵ including knee replacement (exhibit 3).

In 2007–14 physician prices for inpatient and outpatient hospital-based care grew by 18 percent and 6 percent, respectively (exhibit 4). Hospital prices grew more, by 42 percent and 25 percent, respectively—more than twice as much as physician prices for inpatient care and four times as much as physician prices for hospital-based outpatient care.

Because hospital prices accounted for a larger share of the total cost of services and grew more quickly over time compared to physician prices, the majority of the growth in the total price of care was driven by growth in facility prices. Indeed, the growth in those prices as a share of the

EXHIBIT 1

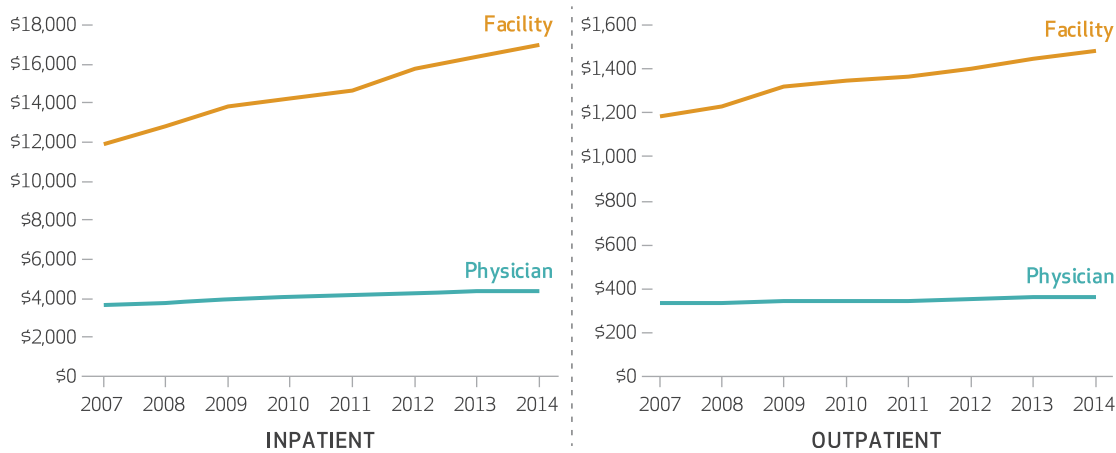
Hospital and physician prices for four hospital-based procedures and for total inpatient and outpatient care, 2007–14

Procedure	Observations	Total price	Mean physician price	Mean hospital price	Hospital component of total price	Median age group (years)
Cesarean section	362,908	\$12,854.58	\$4,575.49	\$ 8,279.09	64.4%	25–34
Vaginal delivery	461,296	9,278.54	3,664.88	5,613.66	60.5	25–34
Colonoscopy	254,825	2,419.41	628.37	1,791.04	74.0	45–54
Knee replacement	157,611	29,763.85	4,857.60	24,906.25	83.7	55–64
Inpatient	9,192,578	18,448.33	4,056.02	14,392.31	78.0	35–44
Outpatient	63,743,253	1,695.92	347.69	1,348.23	79.5	45–54

SOURCE Authors' analysis of data from the Health Care Cost Institute. **NOTES** A hospital is included in the inpatient sample if it had at least fifty inpatient episodes per year. For all other samples, the minimum is ten procedures. All prices are adjusted to 2014 US dollars using the Consumer Price Index. Prices are weighted by the lives covered per hospital referral region, so each year has the same spatial distribution of patients as was the case in 2014. "Total price" is the sum of mean physician and hospital prices (the next two columns). The "median age group" column shows the ten-year age groups examined for each procedure, as explained in the text.

EXHIBIT 2

Inpatient and outpatient physician and facility prices, 2007-14



SOURCE Authors' analysis of data from the Health Care Cost Institute. **NOTES** A hospital is included in the inpatient or outpatient sample for a year if the hospital had at least fifty inpatient or outpatient episodes, respectively, in that year. All inpatient and outpatient episodes are for patients ages 18-64. All prices are adjusted and weighted as explained in the notes to exhibit 1.

growth in the combined cost of a service ranged from 77 percent for colonoscopy to 97 percent for knee replacement.

We performed four additional analyses to demonstrate the robustness of our results. First, we restricted our analysis to episodes occurring at hospitals that did not employ physicians but instead had outside physicians work in their facilities (appendix table 1).⁵ We did this to illustrate that there were no systematic differences in results between hospitals that employed physicians and those that did not. When we focused

on hospitals that did not directly employ physicians, we found that 90 percent of the growth in inpatient prices and 93 percent of the growth in outpatient prices was driven by growth in hospital prices, similar to the percentages in our full sample for inpatient (89 percent) and outpatient (94 percent) services.

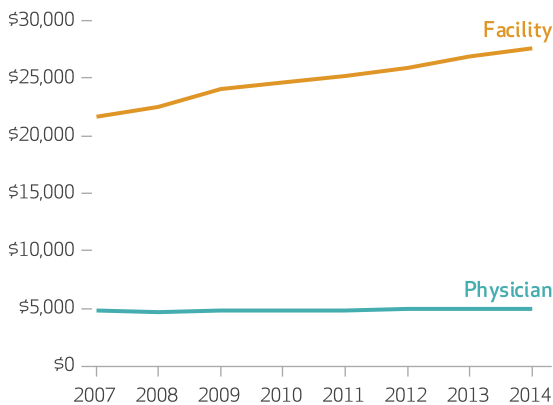
Second, we reran our analysis without weighting our observations by HRR (appendix table 2).⁵ In this specification we found that 88 percent of the growth in inpatient prices and 94 percent of the growth in outpatient prices was driven by growth in hospital prices.

Third, we weighted our analysis to match the spatial distribution of patients in our HCCI sample to the national distribution of privately insured lives per HRR (appendix table 3).⁵ This should have provided results that were more reflective of the national distribution of privately insured people in the US. With this weighting, we found that 89 percent of the growth in inpatient prices and 94 percent of the growth in outpatient prices was driven by growth in hospital prices.

Fourth, we analyzed the data separately for episodes that occurred in counties where the HCCI insurers had above- or below-median shares of covered lives (appendix table 4).⁵ This allowed us to determine whether our results were robust in areas where those insurers seemingly had more or less bargaining power. In areas where they had above-median shares of private lives, 87 percent of the growth in inpatient prices and 91 percent of the growth in outpatient prices was driven by growth in hospital prices. In areas where the HCCI insurers had below-median shares of private lives, 91 percent of the growth

EXHIBIT 3

Inpatient physician and facility prices for knee replacement, 2007-14



SOURCE Authors' analysis of data from the Health Care Cost Institute. **NOTES** A hospital is included in a year of the sample for a year if it had at least ten procedures in that year. All procedures are for patients ages 45-64. All prices are adjusted and weighted as explained in the notes to exhibit 1.

EXHIBIT 4

Changes in physician and facility prices for four hospital-based procedures and for total inpatient and outpatient care, 2007-14

Procedure	Physician price		Facility price		Total price		Facility component of total change
	Change, 2007-14	Compound annualized growth rate	Change, 2007-14	Compound annualized growth rate	Change, 2007-14	Compound annualized growth rate	
Cesarean section	5.9%	0.8%	41.9%	5.1%	27.8%	3.6%	91.7%
Vaginal delivery	7.1	1.0	46.8	5.6	29.4	3.8	89.4
Colonoscopy	34.1	4.3	41.7	5.1	39.6	4.9	76.9
Knee replacement	4.1	0.6	27.4	3.5	23.2	3.0	96.8
Inpatient	17.7	2.4	42.3	5.2	36.5	4.5	88.5
Outpatient	6.1	0.9	25.1	3.2	20.9	2.7	93.5

SOURCE Authors' analysis of data from the Health Care Cost Institute. **NOTES** A hospital is included in the inpatient sample or outpatient sample if it had at least fifty episodes per year. For all other samples, the minimum is ten procedures. Patient age groups for cesarean sections, vaginal deliveries, colonoscopies, knee replacements, and inpatient episodes are provided in exhibit 1. All prices are adjusted and weighted as explained in the notes to exhibit 1.

in inpatient prices and 99 percent of the growth in outpatient prices was driven by growth in hospital prices.

Discussion

To our knowledge, this article provides the first systematic comparison between the growth rates of hospital and physician prices over time. We exploited a unique data set that included the prices actually paid—those that insurers negotiated with providers—and found that in the period 2007-14 hospital prices grew much more quickly than physician prices for hospital-based inpatient and outpatient care. Our findings suggest that there may be significant differences in the bargaining leverage of hospitals and physicians. More work needs to be done to quantify the differences between the two groups' bargaining levers and the extent to which there are differences in the price elasticities facing the two types of providers.

Our results echo findings from previous work that analyzed insurance claims data from the California Public Employees' Retirement System, which found that in the period 2004-11 hospital prices grew more quickly than physician prices for baby deliveries.⁸ That study observed that physician prices for baby deliveries had a compound annualized growth rate of 6 percent per year, compared to 17 percent for hospital prices.⁸ The scale of price growth for physicians that we observed is similar to that in work that analyzed growth in prices for physician office visits using data from MarketScan.⁷ In that study Laurence Baker and coauthors found that physician prices for office visits had a compound an-

nualized growth rate of 1 percent in the period 2003-10.

Our results also have direct implications for strategies to address growth in health spending for the privately insured. For example, a bill recently introduced in the California legislature would allow state officials to regulate hospital and physician prices.⁹ Broad-brush efforts that do not discriminate by setting could miss the mark. Our work suggests that instead of focusing on growth of physician prices (which have grown roughly at the pace of inflation), in the short run policy makers should devote more of their efforts to addressing growth of hospital prices.

The results from this work may help policy makers as they consider where to target their efforts. While our research did not test specific policy interventions, a number of policy approaches that are supported by empirical evidence could be used to slow the growth of hospital prices. The first is active antitrust enforcement. A large empirical literature shows that mergers between hospitals can substantially increase hospital prices.¹⁰⁻¹² State and federal officials should review proposed mergers more vigorously, consider tougher remedies (for example, requiring divestiture of facilities or hospitals where there is significant market overlap), and block mergers that could raise prices.

A second policy option is regulating hospital payments, particularly in markets that are already highly concentrated. In other work we estimated that setting private inpatient prices at 120 percent of Medicare rates would lower private spending by 20 percent.¹⁰ However, policy makers should consider how regulating prices would affect the quality and quantity of the care

delivered.

Third, reference pricing has led consumers to access lower-price care and led to some modest reductions in provider prices.^{13,14} Reference pricing is an option that should be considered by private payers.

Finally, recent work has suggested that referring physicians have substantial influence over where their patients receive care and that vertically integrated physicians often refer their patients to more expensive locations.^{15–17} This suggests that payers should inform physicians about which hospitals deliver the most efficient care and incentivize physicians to refer their patients to those hospitals. Similarly, these findings suggest that antitrust regulators should consider the impact of vertical integration of hospitals and

physician groups on the functioning of hospital markets.

Conclusion

Across both inpatient and hospital-based outpatient care, hospital prices grew much more quickly than physician prices in the period 2007–14. In addition, inpatient physician and hospital prices grew more quickly than outpatient physician and hospital prices. As policy makers seek to address rising prices in health care, it is important to note that pricing patterns of hospitals and physicians differ greatly and that the price of inpatient care has grown more quickly than the price of outpatient care. ■

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NOTES

- 1 Henry J. Kaiser Family Foundation. Peterson-Kaiser health system tracker: health spending explorer [Internet]. San Francisco (CA): KFF; [cited 2018 Dec 13]. Available from: <https://www.healthsystemtracker.org/interactive>
- 2 Henry J. Kaiser Family Foundation. Health care costs: a primer [Internet]. San Francisco (CA): KFF; 2012 May 1 [cited 2018 Dec 13]. Available from: <https://www.kff.org/health-costs/issue-brief/health-care-costs-a-primer/>
- 3 Health Care Cost Institute. Health care cost and utilization report: 2011 [Internet]. Washington (DC): HCCI; 2012 Sep [cited 2018 Dec 10]. Available from: <https://www.healthcostinstitute.org/images/pdfs/2011-HCCI-Annual-Report.pdf>
- 4 For more information on the database, see Health Care Cost Institute [home page on the Internet]. Washington (DC): HCCI; c 2018 [cited 2018 Dec 10]. Available from: <https://www.healthcostinstitute.org>
- 5 To access the appendix, click on the Details tab of the article online.
- 6 Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987; 40(5):373–83.
- 7 Baker LC, Bundorf MK, Royalty AB, Levin Z. Physician practice competition and prices paid by private insurers for office visits. *JAMA.* 2014; 312(16):1653–62.
- 8 Foo PK, Lee RS, Fong K. Physician prices, hospital prices, and treatment choice in labor and delivery. *Am J Health Econ.* 2017;3(3): 422–53.
- 9 Mason M. An ambitious California bill would put the state in charge of controlling prices in the commercial healthcare market. *Los Angeles Times* [serial on the Internet]. 2018 Apr 9 [cited 2018 Dec 13]. Available from: <http://www.latimes.com/politics/la-pol-ca-california-health-care-price-control-bill-20180409-story.html>
- 10 Cooper Z, Craig SV, Gaynor M, Van Reenen J. The price ain't right? Hospital prices and health spending on the privately insured [Internet]. Cambridge (MA): National Bureau of Economics Research; [revised 2018 May; cited 2018 Dec 10]. (NBER Working Paper No. 21815). Available from: <https://www.nber.org/papers/w21815.pdf>
- 11 Gowrisankaran G, Nevo A, Town R. Mergers when prices are negotiated: evidence from the hospital industry. *Am Econ Rev.* 2015;105(1):172–203.
- 12 Gaynor M, Ho K, Tow R. The industrial organization of health-care markets. *J Econ Lit.* 2015;53(2): 235–84.
- 13 Whaley C, Brown T, Robinson J. Consumer responses to price transparency alone versus price transparency combined with reference pricing. *Am J Health Econ.* 2018 Mar 5 [Epub ahead of print].
- 14 Whaley CM, Brown TT. Firm responses to targeted consumer incentives: evidence from reference pricing for surgical services. *J Health Econ.* 2018;61(2):111–33.
- 15 Chernew M, Cooper Z, Larsen-Hallock E, Morton FS. Are health care services shoppable? Evidence from the consumption of lower-limb MRI scans [Internet]. Cambridge (MA): National Bureau of Economic Research; 2018 Jul [cited 2018 Dec 13]. (NBER Working Paper No. 24869). Available for download (fee required) from: <https://www.nber.org/papers/w24869>
- 16 Baker LC, Bundorf MK, Kessler DP. Vertical integration: hospital ownership of physician practices is associated with higher prices and spending. *Health Aff (Millwood).* 2014;33(5):756–63.
- 17 Baker LC, Bundorf MK, Kessler DP. The effect of hospital/physician integration on hospital choice. *J Health Econ.* 2016;50:1–8.