

MARKET WATCH

Hospital Consolidation And Negotiated PPO Prices

Most consolidations among competing hospitals lead to higher, not lower, prices.

by Cory Capps and David Dranove

ABSTRACT: We examine the effects of hospital consolidation on the actual prices paid by preferred provider organizations. We find that price increases following consolidations among nearby hospitals invariably equaled or exceeded median price increases among other hospitals in the same market. Using multivariate regression analysis, we find that consolidation enables hospitals to increase prices in three of the four markets studied; these increases are generally statistically significant. In the remaining market, the measured effect was zero. Our results suggest that some, but not all, consolidations of competing hospitals facilitate price increases. We conclude that antitrust scrutiny of hospital consolidation is warranted.

DURING THE PAST DECADE hospitals consolidated at an unprecedented rate.¹ Hospital consolidations can have two contradictory effects on consumers. Some consolidations may help consumers by generating efficiencies, allowing hospitals to reduce their prices. If insurers then pass the savings along in the form of lower premiums, consumers would directly benefit.² At the same time, consolidations may increase hospitals' market power, allowing hospitals to raise prices and possibly resulting in higher premiums. A priori, it can be difficult to determine which effect will dominate.

The Federal Trade Commission (FTC) or Department of Justice (DOJ) sought to block a handful of consolidations where concern over the latter effect was particularly strong. Through the 1980s and early 1990s the agencies won every case; then, beginning in 1995,

the agencies lost five cases in a row. The federal antitrust agencies have not opposed a hospital consolidation since 1998. Nevertheless, their concerns remain high, as evidenced by a recently initiated series of joint hearings on health care policy and antitrust. Also, the FTC is now conducting postconsolidation review of hospitals' conduct and, depending on the results of that study, may attempt to undo consummated consolidations that it deems anti-competitive.

Clearly, such a step would disrupt the affected hospitals and their communities. Before taking such an action, the FTC will require information about the effects of past consolidations on hospitals' prices, costs, and quality. Our study offers new evidence on prices, using confidential data from hospitals' contracts with preferred provider organizations (PPOs).

Several prior studies of the effects of hospi-

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tal competition on prices generally document a positive relationship between hospital prices and a variety of measures of market concentration.³ However, these studies are somewhat limited by the failure to meet one or more of the following criteria: (1) They do not examine the actual prices received by hospitals, because most researchers lack such data.⁴ (2) Most studies examine a single cross-section rather than a time series. These studies often fail to distinguish between market power resulting from superior quality and that resulting from provider concentration. If hospitals gain market share because of superior quality, then an observed correlation between market share and price would not indicate any pernicious effects of market power. (3) Many studies fail to adequately control for patients' severity of illness. This is problematic because hospitals in urban markets generally treat more severely ill patients than rural hospitals treat. This causes urban hospitals to charge higher prices. Because urban hospitals also face more competition, failing to control for severity can create the illusion that competition is associated with higher prices.⁵

These problems suggest that simple price/concentration studies may generate biased findings. One approach for avoiding bias is to perform a longitudinal ("before/after") study of consolidation, examining whether prices change after consolidation. Robert Conner and colleagues performed such a study, but they used aggregate pricing data and, because of data limitations, had to include revenues from Medicare, for which market power should not be an issue.⁶

In this paper we use actual negotiated prices in four market areas for 1997–2001. We take two approaches to examining price changes. First, we present longitudinal "before and after" results for a dozen hospitals involved in consolidations that generated non-trivial increases in market concentration. We supplement this approach with a time series/cross-section study. We now describe both methodological approaches.

■ **"Before and after" pricing comparison.** Perhaps the most intuitive approach is to

conduct before-and-after studies. A total of twenty-five hospitals were involved in consolidations in the time period and geographic areas that we studied. Twelve of the consolidating hospitals (representing six distinct combinations) had substantial geographic overlap, resulting in increases in market concentration that exceeded the levels that would normally trigger an antitrust inquiry.⁷ We restrict our attention to pricing at these twelve hospitals.

We studied the effects of these consolidations by computing, for each hospital, the percentage increase in price over the period spanning one year before to one year after the consolidation. For example, if a consolidation occurred in 1999, we report the percentage price increase at each hospital from 1998 to 2000. Of course, over a three-year period such as this, most hospitals raise their prices. For comparison, we also report the twenty-fifth, fiftieth, and seventy-fifth percentiles of price changes for hospitals in the same market, over the same period of time.

■ **Cross-section/time series pricing analysis.** There was much consolidation before the time period covered by our data—far more than during the study period. To capture the broad impact of all consolidations on prices, we performed multivariate regression analysis. The dependent variable is the log of the negotiated price.⁸ The key predictor is a refinement of the Hirschman-Herfindahl Index (HHI), which is a commonly used measure of market power that ranges from 0 (perfect competition) to 1 (monopoly).⁹

In traditional antitrust analysis, the HHI is computed for an entire market area, such as a metropolitan area. The analyst then determines how a consolidation affects the overall market HHI. The goal of this approach is to predict the effect of a consolidation on price. The justification for this approach is the Cournot model of competition, in which firms are assumed to sell homogeneous goods. If this model is correct, more localized measures of concentration should have no predictive power and would not interest the courts.

Hospitals are not homogeneous, of course,

but are instead differentiated by location, service offerings, quality, and so forth. This has led many analysts to challenge the traditional marketwide measure of market concentration.¹⁰ Researchers have developed localized measures that appear to be significantly related to prices.¹¹ This suggests that localized measures are preferred to the traditional market-level measure for the purposes of predicting the effects of a hospital consolidation.

We adopted a commonly used localized refinement of the HHI.¹² We computed a hospital-specific measure of concentration that we call Hospital HHI. This measure accounts for competition localized down to the ZIP codes and major diagnostic categories from which each hospital draws its patients. As noted earlier, the coefficient on this hospital-specific measure of concentration might capture market-power effects, but it might also reflect quality effects. To isolate the effect of consolidation, we computed a second measure of concentration, which we call System HHI. This measure treats consolidated hospitals as a single entity. There are two alternative methods for computing System HHI, and we performed analyses using both.

Finally, we computed Change in HHI: the System HHI minus the Hospital HHI. Change in HHI is the key variable in our analysis. Change in HHI is approximately zero for independent hospitals.¹³ Change in HHI is positive for consolidating hospitals and rises in proportion to the overlap in their geographic and diagnostic “draw areas.” Note that Change in HHI is positive for all consolidated hospitals, not just the twelve considered in the before-and-after study. A significant positive regression coefficient on Change in HHI is evidence that consolidation has enabled hospitals to increase prices.¹⁴

Control variables in the multivariate regression analysis include Hospital HHI, other hospital characteristics (for example, teaching hospital, occupancy rate, and nurse staffing levels), a case-mix measure based on diagnosis-related group (DRG) weights, and ownership status. We tried several other controls that did not alter our main conclusions.

The Data

The prices that hospitals receive for inpatient services are determined by negotiations between hospitals and insurers. We approached several insurers to obtain their negotiated prices and obtained prices from insurers covering five different geographic areas for 1997–2001. The insurers’ geographic areas do not overlap: There is exactly one insurer, and thus one set of prices, per area. Because two of the geographic areas are relatively small and near each other, we combined them into a single regression. As a result, we estimated four different regressions for four distinct “markets.”

■ **Confidentiality concerns.** Insurers are naturally reluctant to release price information, as public disclosure could compromise their competitive stance or harm their relationships with hospitals. We offered to protect confidentiality in several ways. First, we do not identify the insurer(s). (We often refer to the “insurer”; this does not imply that the data were obtained from a single insurer.) Second, we do not identify the geographic markets that we study. We are permitted to say that our five geographic areas include two states (one in the Midwest and another in the Southwest) and three metropolitan areas (one among the five most populous in the nation; the other two are in the Northeast, have under two million total population, and were combined for empirical purposes). Finally, we can report only approximate sample sizes.

■ **PPO prices.** Insurers often have multiple contracts with providers, at potentially different prices. Ideally, we would like to know the prices negotiated with all hospitals. As a practical matter, insurers do not contract with all providers. Therefore, to maximize the available price information, we asked the insurer to provide price data for its most popular PPO product. This gave us prices for approximately 90 percent of all hospitals in the geographic areas that we study. (Missing hospitals were generally smaller than average and often located in isolated areas.) We asked the insurer to provide us with the price that the hospital was contractually entitled to receive for treating PPO patients, including patient

copayments. As the market-power dynamics affecting health maintenance organization (HMO) negotiations are similar to those affecting PPO negotiations, we expect that our findings would generalize to HMO pricing.

The insurers in the five markets relied on one of two methods to set price. In three markets, hospitals receive a fixed price per admission, using the DRG system to adjust payments. For these markets, we obtained the price paid to each hospital for a DRG of weight 1.0. In two markets the insurer paid hospitals a fixed per diem rate that varied according to the nature of the service (for example, medical/surgical acute care, intensive care, and so forth). In these markets we constructed a weighted average per diem rate.

■ **Inpatient data.** To measure the HHI indices, we used patient-level inpatient hospitalization data. In four of the five markets we used data from the Healthcare Cost and Utilization Project (HCUP) to compute market shares. The HCUP data contain one observation for every discharge from a hospital in any of the participating states. In the fifth market we used claims data from the insurer. HCUP data have the advantage of providing market share information about every hospital but

generate measures of market power that are relevant to the entire market rather than the payer in question. Claims data effectively exclude information from noncontracting hospitals but have the advantage of providing market-share information about the patients of greatest interest to the pricing negotiations.¹⁵ In any event, we did not obtain both HCUP and insurer discharge data in any market.

■ **Consolidations.** We identified consolidations using information from the American Hospital Association (AHA). We confirmed this information with the relevant insurer. We resolved discrepancies through further discussions with the insurer and, if necessary, information obtained from a variety of Internet searches.¹⁶ We also used AHA data to measure control variables in the multivariate regression analysis.

Study Results

■ Before-and-after pricing comparison.

Exhibit 1 reports the percentage price increases negotiated by hospitals that consolidated between 1998 and 2000, over the period from one year before consolidation to one year afterward. We confine our attention to those twelve hospitals involved in consolidations for

EXHIBIT 1 Change In Hospital Prices After Consolidation

Hospital	Market	Number of hospitals in market	Percent change in price from T-1 to T+1 ^a	Percentile of price-change distribution in corresponding period and market (%)		
				25th	50th	75th
1	Small MSAs	25-40	22.92	5.00	10.22	22.92
2	Small MSAs	25-40	10.22	5.00	10.22	22.92
3	Small MSAs	25-40	5.90	3.45	4.47	5.89
4	Large MSA	>70	4.91	0.00	0.00	7.19
5	Midwest state	>70	15.38	-1.02	2.86	6.21
6	Midwest state	>70	7.82	-1.02	2.86	6.21
7	Midwest state	>70	33.01	10.45	16.02	24.30
8	Midwest state	>70	36.25	10.45	16.02	24.30
9	Southwest state	40-70	65.98	0.00	0.00	6.07
10	Southwest state	40-70	0.00	0.00	0.00	6.07
11	Southwest state	40-70	0.00	0.00	0.00	6.07
12	Southwest state	40-70	9.33	0.00	3.20	10.00

SOURCE: Confidential payer data.

NOTES: Mergers occurred during 1998-2000. MSA is metropolitan statistical area.

^a T-1 refers to the year prior to the consolidation; T+1 refers to the year subsequent to the consolidation.

which Change in HHI is >0.05 . Such an increase in concentration is generally large enough to trigger antitrust scrutiny.

Nine of the twelve consolidating hospitals increased prices by more than the median price increase; three had price increases equal to the median price increase; and none had a price increase below the median price increase. A binomial test shows that the probability of obtaining nine price increases in twelve observations merely by random chance is $p = .08$. While this clearly suggests anti-competitive effects, we cannot rule out fully the possibility that this pattern is the result of random chance. We can reject the possibility of consolidation leading to price reductions.

In dollar terms rather than percentage changes, these price increases are substantial. Consider the Midwest state. Over the same period in which Hospitals 5 and 6 increased prices by an average of \$668 per admission (11.6 percent), the median price increase was only \$164 (2.86 percent).

■ **Cross-section analysis.** We supplemented our before-and-after analysis with a multivariate regression analysis of pricing by all hospitals in each market. The dependent variable in each regression is the log of the contract price (either per discharge or per diem). As noted above, we ran two regressions per market, using alternative measures of Change in HHI as the key predictor variable.

Sample sizes in the Southwest state and small metro area regressions were in the range of 100–240, or about twenty-five to sixty hospitals per year. Sample sizes in the Midwest state and large metro area regressions exceeded 300, or more than 75 hospitals per year. Adjusted R² ranged from .38 to .62.¹⁷

The control variables in our regressions generally have the expected signs. For example, teaching hospitals in every regression obtain higher prices, all else equal. Hospitals with higher case-mix also had significantly higher prices in all markets other than the Southwest state. We finally note that non-profits and for-profits appeared to be equally likely to exploit their market power. Specifically, the two markets with the most signif-

icant relationship between Change in HHI and price had virtually no for-profit hospitals.

Our key finding is that in three of the four markets studied, consolidation has enabled hospitals to increase prices (as evidenced by a positive coefficient on Change in HHI), and these price increases are generally statistically significant. In the remaining market, the measured effect was zero.

To interpret these results, we computed the predicted effect of various consolidations. For example, we considered hypothetical consolidations that cause the HHI to increase by ten percentage points (that is, Change in HHI = 0.10). Such an increase in market power is not uncommon in our data. In fact, Change in HHI equals or exceeds 0.10 for about 15 percent of study hospitals (that is, 0.10 is the eighty-fifth percentile of Change in HHI). Using the first of our two methods for measuring Change in HHI, we estimated that in the large metropolitan area, such an increase in market power would cause prices to increase by 6.6 percent.

Exhibit 2 reports the results of similar simulations, using various magnitudes of Change in HHI. All results are reported using coefficients from the first method for measuring Change in HHI. Results using the second method are somewhat larger in magnitude. For a Change in HHI of 0.10, hospitals in both the large metro area and the Southwest state are predicted to raise their prices by an average of more than 6 percent. Larger values of Change in HHI are associated with bigger price increases.

Discussion

The before-and-after results indicate that most consolidating hospitals raise prices by more than the median price increase in their markets. The cross-section results, which capture the effects of all consolidations, not just those that occurred during the study period, generate statistically significant findings of market-power effects in some markets but not others.

Overall, our results do not support the argument that efficiencies from consolidations among competing hospitals lead to lower

EXHIBIT 2

Simulations Of Effects Of Consolidation On Hospital Prices

Change in HHI	Percentile of hospitals	Change in price (%)			
		Large metro area	Two small metro areas	Midwest state	Southwest state
0.10	85th	6.6	-0.5	1.8	7.9
0.15	94th	10.1	-0.7	2.6	11.4
0.20	99th	13.7	-0.9	3.5	15.5

SOURCE: Authors' analysis of confidential payer data.

NOTE: HHI is Hirschman-Herfindahl Index.

prices. Instead, they are broadly consistent with the opposing view that consolidations among competing hospitals lead to higher prices. There are exceptions in our data; for example, there is virtually no evidence of market-power effects in one of the markets studied. An obvious direction for future research is to determine why market power affects prices in some markets but not in others.

Nearly all of the consolidations we studied would have been reviewed by the FTC or DOJ under the provisions of the Hart/Scott/Rodino Act. The vast majority of these went unchallenged by the antitrust agencies. When the FTC/DOJ did challenge a consolidation, the estimated increases in HHIs were comparable to the largest that we observed in our data: 0.15 or higher. Yet in every case since 1995, the courts ultimately ruled in favor of the hospitals. Depending on the market, our cross-sectional model predicts that these consolidations could generate no price change or might cause prices to increase by 10 percent or more. Such evidence might have influenced the courts' findings.

ONE OF THE OBVIOUS empirical challenges ahead is to determine why consolidation has affected prices in some markets but not in others. Undoubtedly, the courts will want to examine more data to obtain broader and more consistent evidence about consolidation effects. Nevertheless, the results presented here suggest that on balance, recent court rulings on hospital consolidations may have been overly permissive.

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NOTES

1. See C. Capps et al., "Antitrust Policy and Hospital Mergers: Recommendations for a New Approach," *Antitrust Bulletin* (Winter 2002): 677-714. From 1995 to 1999 there were more than 100 hospital consolidations per year.
2. David Dranove and Richard Lindrooth find evidence that mergers in which hospitals operate under a single license generate substantial savings, but system formation, in which hospitals keep their licenses, do not. D. Dranove and R. Lindrooth, "Hospital Consolidation and Costs: Another Look at the Evidence," *Journal of Health Economics* 22, no. 6 (2003): 983-997.
3. These studies include M. Noether, "Competition among Hospitals," *Journal of Health Economics* 7, no. 3 (1988): 259-284; M. Staten, J. Umbeck, and W. Dunkelberg, "Market Share/Market Power Revisited: A New Test for an Old Theory," *Journal of Health Economics* 7, no. 1 (1988): 73-87; G. Melnick et al., "The Effects of Market Structure and Bargaining Position on Hospital Prices," *Journal of Health Economics* 11, no. 3 (1992): 217-233; D. Dranove, D.M. Shanley, and W. White, "Price and Concentration in Hospital Markets: The Switch from Patient-Driven to Payer-Driven Competition," *Journal of Law and Economics* 36, no. 1 (1993): 179-204; and J. Gruber, "The Effect of Price Shopping in Medical Markets: Hospital Responses to PPOs in California," NBER Working Paper no. 4190 (Cambridge: National Bureau of Economic Research, October 1992).
4. Staten et al., "Market Share/Market Power Revisited"; and Melnick et al., "The Effects of Market Structure," examine actual prices but do not examine market power resulting specifically from consolidation.
5. See Dranove et al., "Price and Concentration in

- Hospital Markets,” for further discussion.
6. R. Connor et al., “The Effects of Market Concentration Horizontal Mergers on Hospital Costs and Prices,” *International Journal of the Economics of Business* 5, no. 2 (1998): 159–180.
7. Mergers that generate only trivial increases in concentration generally fall under an antitrust “safe harbor.” See U.S. Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines* (Washington: FTC, 8 April 1997). Also note that only a small percentage of FTC inquiries lead to court challenges.
8. Using logs is indicated by Box-Cox maximum likelihood tests and also permits direct comparisons of results across geographic areas.
9. The Hirschman-Herfindahl Index (HHI) usually describes the degree of competition in a market, so that all sellers are assigned the same value. The modification implemented in this paper measures the level of competition facing individual sellers in a market.
10. For example, see the discussion in Capps et al., “Antitrust Policy and Hospital Mergers.”
11. See, for example, E. Keeler, G. Melnick, and J. Zwanziger, “The Changing Effects of Competition on Non-Profit and For-Profit Hospital Pricing Behavior,” *Journal of Health Economics* 18, no. 1 (1999): 69–96.
12. For details of how we computed the HHI, as well as full regression results, see www.kellogg.northwestern.edu/faculty/dranove/htm/CDHealthAffairs/CDHealthAffairs.html.
13. It is not exactly zero because if an independent hospital competes with consolidators, then the HHI increases for every hospital. That is, when a merger occurs in a market, all hospitals’ HHIs will change, but for the nonmerging hospitals, the effect on Change in HHI will be slight.
14. It is possible that the decision to consolidate is correlated with unmeasured determinants of price. This could impart bias to the coefficient on Change in HHI. We suspect that the potential bias is small and in the conservative direction. If anything, we might expect hospitals with higher-than-expected prices to be less eager to merge (based on the “if it’s not broken, don’t fix it” view). If so, then the coefficient on Change in HHI is biased negative.
15. Our results for the one state for which we did not have complete data on patient utilization could be biased if missing hospitals were situated near included/nonconsolidated hospitals. This would hold down the latter’s prices, which we would misattribute to their absence of market power. We examined the data and did not observe such a confounding problem.
16. We primarily resolved discrepancies using Lexis-Nexis, which enables full-text search of national and local newspapers as well as health care trade journals.
17. We estimated robust standard errors to account for multiple observations of each hospital. This generally inflates standard errors and reduces t-statistics. For complete regression results, see www.kellogg.northwestern.edu/faculty/dranove/htm/CDHealthAffairs/CDHealthAffairs.html.