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## THE SYNTHESIS PROJECT

NEW INSIGHTS FROM RESEARCH RESULTS

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# How has hospital consolidation affected the price and quality of hospital care?

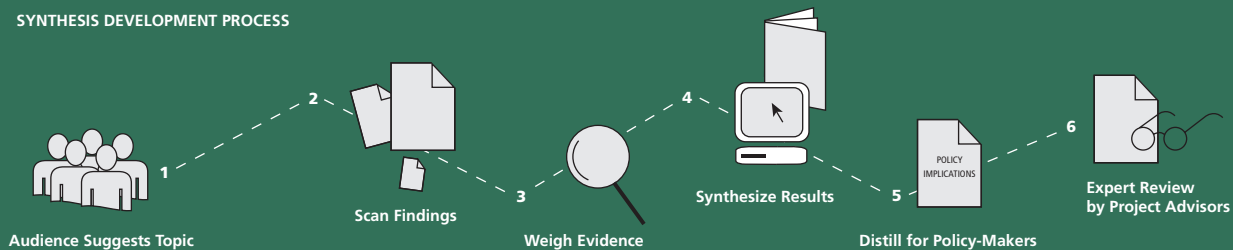
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**THE SYNTHESIS PROJECT** (Synthesis) is an initiative of the Robert Wood Johnson Foundation to produce relevant, concise, and thought-provoking briefs and reports on today's important health policy issues. By synthesizing what is known, while weighing the strength of findings and exposing gaps in knowledge, Synthesis products give decision-makers reliable information and new insights to inform complex policy decisions. For more information about the Synthesis Project, visit the Synthesis Project's Web site at [www.policysynthesis.org](http://www.policysynthesis.org). For additional copies of Synthesis products, please go to the Project's Web site or send an e-mail request to [pubsrequest@rwjf.org](mailto:pubsrequest@rwjf.org).

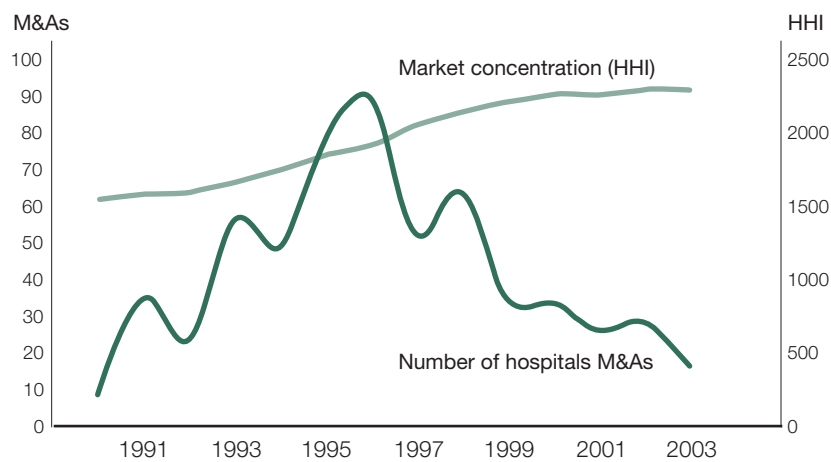
### SYNTHESIS DEVELOPMENT PROCESS



## Introduction

Over the 1990s the hospital industry underwent a wave of consolidation that transformed the inpatient hospital market place (Figure 1). By the mid-1990s, hospital merger and acquisition activity was nine times its level at the start of the decade. The wave of mergers dramatically increased market concentration for inpatient hospital services as measured by the Herfindahl Hirschman Index (HHI).<sup>1</sup> In 1990, the typical person living in a metropolitan statistical area (MSA) faced a concentrated hospital market with an HHI of 1,576. By 2003, however, the typical MSA resident faced a hospital market with an HHI of 2,323. This change is equivalent to a reduction from six to four competing local hospital systems. By 1990, almost 90 percent of people in populous MSAs sought care in highly concentrated markets.<sup>2</sup>

Figure 1. Trends in hospital mergers and acquisitions, 1990–2003



Source: American Hospital Association and authors' calculations

Figure 1 graphs the total number of horizontal mergers, acquisitions and system expansions (we refer to this collective consolidation activity as "M&A") across populous metropolitan statistical areas (MSAs) from 1990 to 2003.

Facing increasing growth rates in hospital spending, stakeholders and policy-makers have raised concerns that market concentration has increased the price of inpatient care. Several stakeholder groups, including the Blue Cross and Blue Shield Association and the American Hospital Association have published studies on this issue, with divergent results (4, 9–14). The Federal Trade Commission and Department of Justice have recently held extensive hearings on competition in health care markets and released a report on these issues (9).

This synthesis summarizes the research on hospital consolidation to assess the likely effects of past and possible future hospital consolidation on health care prices, costs and quality. We critically examine the available research and reach conclusions based on our assessment of the literature, noting where evidence is inconclusive, lacking, or otherwise limited.

<sup>1</sup> For these purposes we are defining a market to be a metropolitan statistical area.

<sup>2</sup> According to the U.S. antitrust enforcement agencies, a market with HHI greater than 1,800 is highly concentrated. In 1990, 71 percent of populous MSAs, representing a population of 56.2 million people, were highly concentrated. By 2003, 88 percent of populous MSAs, representing a population of 122 million people, were highly concentrated. We define a populous MSA to be an MSA with population equal to or greater than 100,000.

## Findings

### The synthesis distills the research findings on the following questions:

1. What were the reasons for the wave of hospital consolidation during the 1990s?
2. What are the effects of hospital consolidation on the price of inpatient care?
3. What are the effects of hospital consolidation on the quality of inpatient care?
4. What are the effects of hospital consolidation on hospital costs?

### What were the reasons for the wave of hospital consolidation during the 1990s?

**The hospital consolidation wave was national in scope, but was most striking in the South.** Average hospital concentration increased substantially across all regions (Figure 2), but increased the most in absolute terms in the South, where a greater percentage of hospitals consolidated and there was relatively little hospital regulation. Hospital consolidation varies regionally because of differing demographic histories, differences in past and present regulatory environments, differences in the structure of health insurance markets and differences in the number of beds per capita and the age distribution of the existing hospitals.

Figure 2. Changes in hospital consolidation by region

Region	Average HHI 2003	Change in hospital HHI 1990–2003	Percent of hospitals that consolidated from 1990–2003
East	1,982	697	7.0
Midwest	2,356	743	7.4
South	3,016	939	9.4
Southwest	2,494	674	6.7
West	2,242	548	5.5

Source: American Hospital Association and authors' calculations

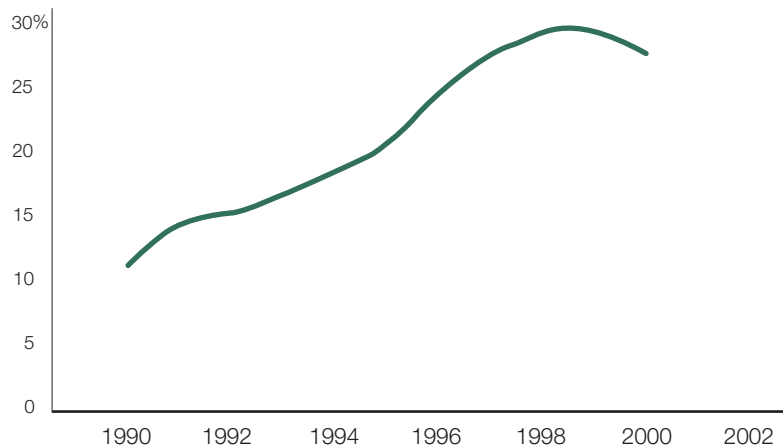
**Economic theory suggests that many changes in the competitive environment may cause merger waves.** Changes in demand, input prices, financial markets, tax laws or production technology all can affect the relative benefits of consolidation. In surveys, hospital executives most commonly cite: 1) strengthening their financial position, 2) achieving operating efficiencies, and 3) consolidating services as reasons for merging (3). Although many potential causes of increased merger activity may exist, significant ongoing consolidation cannot proceed unless antitrust enforcers, the courts, or both allow it.

**Research does not provide conclusive evidence for why the merger wave occurred.** Several market changes that might have spurred consolidation occurred in the 1990s, and disentangling their effects is difficult. During this period, for example, technological progress in medical treatments moved many inpatient procedures to the outpatient setting and lowered the length of stay for remaining inpatient procedures. These technological advances reduced the demand for inpatient hospital beds leaving the hospital industry with excess capacity. Rationalizing the reduction of capacity may be more easily accomplished if hospitals combine operations.

## Findings

**While the research findings are mixed, the preponderance of the evidence suggests that the rise in managed care did not cause the hospital merger wave.** Over the 1990s, both hospital consolidation and HMO penetration rose dramatically (Figure 3), suggesting a possible association between the two. Theory provides some support for this view. The rise of managed care probably reduced the profit margins of hospitals; and some theories of hospital mergers predict that a decrease in profit margins increases the gains from a merger.

Figure 3. HMO penetration in populous MSAs, 1990–2000\*



Source: InterStudy

\* Annual, population-weighted, average HMO penetration (Medicaid, Medicare, commercial) from 1990 to 2000 in MSAs with population over 100,000.

A natural way to test the association of managed care and hospital consolidation is to compare hospital consolidation activity in locations that experienced large increases in managed care penetration with activity in those locations that did not have large increases. Three papers perform this type of analysis. One study of large cities (8) finds a positive correlation between the level of managed care activity in 1985 and the growth in hospital concentration between 1985 and 1994. A later study (16), however, finds no relationship between managed care penetration and hospital consolidation. A third (15) uses individual hospital data and again finds little association between managed care penetration and the likelihood that a hospital will be acquired.

On balance, the evidence from quantitative studies suggests that the rise of managed care is not correlated with hospital merger activity, although the small number of studies and mixed evidence tempers this conclusion. Nevertheless, qualitative anecdotal accounts often point to “managed care” as the reason for hospital consolidation, suggesting that the threat of managed care, rather than its actual realization, may have played a role in the merger wave.

## Findings

### What are the effects of hospital consolidation on the price of inpatient care?

**Research suggests that hospital consolidation in the 1990s raised prices by at least five percent and likely by significantly more.** The great weight of the literature shows that hospital consolidation leads to price increases, although a few studies reach the opposite conclusion. Studies that examine consolidation among hospitals that are geographically close to one another consistently find that consolidation leads to price increases of 40 percent or more.

**There are three approaches to hospital price competition research:** the structure-conduct-performance approach, the event study approach and the simulation approach.<sup>3</sup> Because each approach uses a different methodology and makes different measurement assumptions, the resulting literature presents different findings on the pricing consequences of hospital consolidation. For example, simulation studies have produced estimates of consolidation-specific price increases of as much as 53 percent. In contrast, the strongest examples of the event study approach estimate 10–40 percent price increases, while the structure-conduct-performance approach yields lower estimates of 4–5 percent. The following material discusses each approach in greater detail and offers examples of well-constructed studies using the different methodologies.

#### Structure-Conduct-Performance (SCP) Studies

**According to the strongest SCP literature, inpatient prices increased five percent in the 1990s due to hospital consolidation.** A typical study using the SCP approach estimates the association between the price of a hospital's inpatient care and the structure of the market in which the hospital competes (typically measured by the HHI). SCP studies do not analyze actual mergers. Instead, the idea is to learn the relationship between price and HHI and then to use that relationship to predict how the merger will affect price. For example, if we know that markets with an HHI of 2800 tend to have a price five percent higher than do markets with an HHI of 2000, then we might conclude that a merger increasing HHI from 2000 to 2800 would result in a price increase of five percent.

The SCP methodology requires assessment of several difficult-to-measure variables, including price of services, market structure and factors that affect hospital costs. Because researchers using this approach exercise wide latitude in how they define and measure those variables, inconsistencies and even inaccuracies can creep into the findings. As we discuss in the methodological appendix (Appendix II), even well conducted SCP studies have significant shortcomings and tend to underestimate the effect of consolidation on prices. Figure 4 offers an overview of the measurement variations that can affect SCP findings.

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<sup>3</sup> For more information on the distinct methodologies of each approach, and for a discussion on the measurement assumptions and challenges that may qualify their results, refer to Appendix II.

# Findings

Figure 4. Analysis of alternative measurement approaches used in SCP studies

Measure	Weaker approach	Stronger approach
Price	<ul style="list-style-type: none"> <li>• Charges</li> <li>• Discounts from charges</li> <li>• Adjusted charges</li> </ul>	Transaction prices with controls for: <ul style="list-style-type: none"> <li>• Patient conditions and severity</li> <li>• Insurance type</li> </ul>
Definition of the market	<ul style="list-style-type: none"> <li>• MSAs</li> <li>• Counties</li> </ul>	Hospital-specific definition: <ul style="list-style-type: none"> <li>• Fixed radius</li> <li>• Patient flows</li> </ul>
Controls for marginal costs	No or poorly designed controls for marginal costs	Controls for marginal costs include: <ul style="list-style-type: none"> <li>• Wages</li> <li>• Scale of operations</li> <li>• Hospital teaching status</li> <li>• Hospital ownership status</li> </ul>

Of particular note among the SCP studies are one by Keeler et al. (36),<sup>4</sup> which uses strong market definition, strong cost controls and reasonable pricing data and another by Capps and Dranove (19), which uses transaction prices, strong market definition and reasonable cost controls.<sup>5</sup> Both of these studies also use reasonably recent data. These two studies give an average estimate for the merger effect of about five percent.

Figure 5, adapted, expanded, and updated from (34), describes the SCP studies included in our review.<sup>6</sup> In addition to descriptive information on study date, geographical area, hospital services covered and price measures, the table highlights the studies with the strongest definitions of measures and estimates the price impact that each study implies.

<sup>4</sup> This study appears to use an incorrect method to calculate HHI—one which ignores joint ownership of hospitals. To the extent that this introduces measurement error into their HHI, one might expect that their results understate the impact of HHI on price.

<sup>5</sup> A previous study by the same research group (41) is also strong; however, it uses older data.

<sup>6</sup> We used the results of each study to calculate the price increase that would result from a merger of two firms in a market with five equally sized firms, assuming no reallocation of output after the merger. This amounts to a change in the HHI from 2000 to 2800, or an increase of 800 points. As we discuss in the introduction, average HHI in populous MSAs rose by 747 points (1,576 to 2,323) over 1993–2000. Obviously, there is some art involved in bringing 13 dissimilar studies onto the same footing in this way. Some studies used the number of firms, rather than the HHI, for example, in which case we considered a merger from 5 to 4. Where it makes a difference, we assume that the merging hospitals are not-for-profit.

## Findings

Figure 5. Summary of structure-conduct-performance literature\*

Study	Data			Price		Measurement strengths
	Year	Place	Services	Measure	Merger effect	
Noether (43)	1977–78	U.S.	Various diagnoses	Charges	-1%	Controls for marginal costs
Staten, Umbeck and Dunkelberg (45)	1983	IN	All inpatient	Discounts from charges	+2%	
Melnick et al. (41)	1987	CA	All inpatient	Transaction price	+2%	Price measure, market definition, controls for marginal cost
Dranove, Shanley and White (29)	1988	CA	Hospital cost centers	Adjusted charges	+5%	
Dranove and Ludwick (27)	1989	CA	10 common procedures	Adjusted charges	+17%	Controls for marginal cost
Lynk (38)	1989	CA	10 common procedures	Adjusted charges	-1%	Controls for marginal cost
Brooks, Dor and Wong (18)	1988–92	U.S.	Appendectomy	Transaction price	+2%	Price measure
Simpson and Shin (44)	1993	CA	All discharges	Net revenue per discharge	+10%	Controls for marginal cost
Keeler, Melnick and Zwanziger (36)	1994	CA	10 common procedures	Adjusted charges	+6%	Market definition, controls for marginal cost
Lynk and Neumann (39)	1995	MI	All inpatient	Transaction price	-3%	Price measure
Dor, Grossman and Koroukian (25)	1995–96	U.S.	Heart bypass	Transaction price	+2%	Price measure
Dor, Koroukian and Grossman (26)	1995–96	U.S.	Angioplasty	Transaction price	+3%	Price measure
Capps and Dranove (19)	1997–01	Various	All inpatient	Transaction price	+4%	Price measure, market definition

\* The merger effect is the effect on price predicted by the study for a consolidation from five equally sized hospitals to four hospitals in the market, amounting to an increase in the HHI from 2,000 to 2,800.

### Event Studies

**The best event studies find that, relative to controls, hospital prices rose 10 percent and more after mergers.** The findings in this literature are heterogeneous, but the weight of the evidence and the best evidence indicate large effects of hospital consolidation on price.

**In event studies of hospital mergers, researchers use data from before and after mergers to assess the effect of consolidation on price.** The price changes at merging hospitals are contrasted with price changes at control (non-merging) hospitals, and the difference between these changes is taken to be the effect of the merger. To capture the effects of within-market mergers (the ones that are most likely to have implications for competition), one must identify merging firms in the same market, which requires a proper market definition. Second, as before, price must be properly measured. Third, an adequate control group must be found. To do so, one must identify hospitals similar to the merging hospitals in other markets that neither merged themselves nor were affected by any other hospitals' merger (Appendix II).

**The most recent and strongest event study finds that consolidation raises prices by 40 percent.** In this study, Dafny (24) measures the effect of a merger, not on price increases at the merging hospitals but on the prices charged by rivals of the merging firms, thereby addressing



## Findings

selection concerns. The analysis of rival hospitals is particularly interesting because economic theory predicts that when firms merge to enhance their market power, their prices and also those of their rivals will rise. Dafny focuses on mergers between closely neighboring hospitals that are likely to have competitive consequences. The study concludes that mergers raise prices by about 40 percent in the long run. The care with which merging hospitals are identified (only merging hospitals within 0.3 miles of each other are used) and the use of rival analysis make this a strong event study. The price measure, however, is not ideal.

A study by Vita and Sacher (47) analyzes the 1990 merger of the two hospitals in Santa Cruz, Calif. Prices at the merged hospital rose about 23 percent and prices at the nearby rival rose about 17 percent relative to controls, supporting the notion that when merging firms raise prices, it is easier for rivals to do so as well. The strength of this study is its careful attention to the identification and description of the Santa Cruz market for hospital services and its careful search for a comparable set of control hospitals. Its weakness is the difficulty in generalizing from a single merger.

Krishnan (37) analyzes mergers in the states of Ohio and California between 1994 and 1995 involving 22 and 15 hospitals, respectively. She uses the merging hospitals as their own control group by comparing procedures in which the merger increased HHI by 2000 or more with procedures for which the merger increased HHI by less than 250. She finds that prices (adjusted charges) rose about 10 percent more in the concentration-enhancing procedures than in the non-concentration-enhancing procedures. The strength of this study is its solution to the problem of finding a comparable control group, but it uses a problematic price measurement and an overly broad market definition.

Capps and Dranove (19) use transactions prices from a PPO to analyze 12 hospitals involved in HHI-enhancing consolidation between 1997 and 2001. They find large price increases among these hospitals relative to controls. Some of the differences were spectacular, with one hospital raising prices 66 percent relative to 0 percent at the median control hospital.

Other studies reach different conclusions, but the evidence is weaker. Connor et al. (21) and Connor and Feldman (22) examine 122 hospital mergers occurring from 1986 through 1994. They compare price changes in areas with and without mergers. Unlike other studies, they find that prices rose more slowly in merger than in non-merger areas except where concentration was high to begin with. These studies are not as strong as the others because they used an overly broad market definition, poorly selected controls and a flawed price measure.

### Simulation Studies

**Simulation studies find large merger-induced price increases, even in markets that would be judged quite competitive by other methods.** Using the unique methodology of this approach, researchers have found price increases: 1) often greater than five percent even in the relatively unconcentrated Los Angeles market, 2) of more than ten percent even in the relatively unconcentrated San Diego market, and 3) of more than 50 percent in a merger from triopoly to duopoly in San Luis Obispo, Calif.

**The strongest simulation studies have revealed the importance of geographical distance in mediating the effects of consolidation.** Mergers among hospitals that are close together geographically generate greater price increases than do mergers among distant hospitals.

## Findings

### **The newest approach to hospital price competition research examines hypothetical hospital mergers via simulation.**

In other words, researchers use existing data to estimate the demand, market power and cost conditions facing the various hospitals in a given market. This comprehensive information forms a virtual model of the market in which researchers can play out hypothetical scenarios—such as a hospital merger—and analyze their effects.<sup>7</sup>

The earliest simulation analysis of hospital competition is Town and Vistnes (46). Considering Los Angeles and Orange Counties, Calif. in the early 1990s the authors estimate the demand for hospital inpatient care and find that many hospital mergers in their sample would result in price increases at the merging hospitals of more than five percent. Though this estimate may seem modest, in context these are large merger effects: there are over one hundred twenty hospitals in the two counties studied, and a merger between any two of them would have a small effect on the HHI of this area.

Capps, Dranove and Satterthwaite (20) use a similar framework to examine hospital mergers in San Diego County for 1991, and find a more than ten percent merger effect from a merger among three hospitals in the southern suburbs. Again this is a large effect, given that San Diego County had 25 hospitals in 1991.

Gaynor and Vogt (34) model the market for inpatient hospital care at virtually all community hospitals in California in 1995 and find that a three-to-two hospital merger in San Luis Obispo, which was attempted but prevented by the FTC, would have raised prices by more than 50 percent, a much larger rise than would have been predicted by the SCP literature summarized above. Ho (35) takes the next step in this literature, using actual transaction prices and finds that consolidated hospitals have prices 15 percent higher than independent counterparts.

### **What are the effects of hospital consolidation on the quality of care?**

#### **A slim majority of studies find that, at least for some procedures, increases in hospital concentration reduce quality. The strongest studies confirm this result.**

We identified 10 studies that examined the direct effect of hospital market concentration on quality of care. The studies are summarized in Figure 6. The findings from this literature run the gamut of possible results. Of the 10 studies reviewed, five find that concentration reduces quality for at least some procedures, four papers find quality increases for at least some procedures and three studies find no effect.

On balance, the evidence suggests that increasing hospital concentration lowers quality. This finding has caveats, however. It is not robust across the research and there are significant holes in our knowledge. This conclusion is sensitive to both type of procedure and geography. Clearly, more work is needed that addresses basic methodological hurdles.

The best of these papers use national samples, rely on changes in concentration to identify the effect of competition on quality and formulate concentration measures that are less prone to reverse causality (56, 57).<sup>8</sup> (If patients are more likely to go to high quality hospitals, there can be reverse causality. That is, an increase in a hospital's quality may cause changes in the market HHI.)

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<sup>7</sup> Over the last 10 years, merger simulation has become a common practice in the prospective evaluation of mergers for antitrust purposes (c.f. 31, 32, 48).

<sup>8</sup> Another paper that uses actual mergers to assess the impact of hospital competition on quality (58) yields imprecise estimates of the impact of hospital mergers on the quality of care.

## Findings

Figure 6. Studies of hospital concentration and quality

Author	Geographic scope	Patients	Type of data analyzed	Quality measure	Effect of increasing concentration on quality
Shortell et al. (64)	Multiple states	All	Cross-section	Mortality for 16 conditions/procedures aggregated	No effect
Hamilton and Ho (58)	CA	All	Mergers	Newborn 48 hour discharge rate, AMI, stroke mortality	No effect
Kessler and McClellan (57)	U.S.	Medicare	Longitudinal	AMI mortality	Decreases
Mukamel et al. (59)	U.S.	Medicare	Cross-section	All cause, AMI, CHF, pneumonia and stroke mortality	No effect
Sari (62)	U.S.	All	Longitudinal	7 HCUP QI categories	Decreases
Mukamel et al. (60)	CA	All	Cross-section	All cause, AMI, CHF, pneumonia and stroke mortality	Increases
Gowrisankaran and Town (55)	LA county	All	Cross-section	AMI and pneumonia mortality	Decreases for HMO patients; increases for Medicare patients
Shen (63)	U.S.	Medicare	Longitudinal	AMI mortality	No effect
Kessler and Geppert (56)	U.S.	Medicare	Longitudinal	AMI mortality	Decreases
Volpp et al. (66)	NJ and NY state	Under-65	Longitudinal	Cardiac catheterization rate, revascularization rate, AMI mortality	Increases
Mutter and Wong (61)	U.S.	All	Cross-section	38 HCUP QI measures	Increases for some procedures, decreases for others

These papers find that increasing hospital concentration decreases quality. Furthermore, Kessler and McClellan (57) find that HMO penetration affects this relationship—in areas with a significant HMO presence hospital concentration decreases quality while in areas without a significant HMO presence, there is no relationship.

### What are the effects of hospital consolidation on the cost of providing inpatient care?

**The balance of the evidence indicates that hospital consolidation produces some cost savings and that these cost savings can be significant when hospitals consolidate their services more fully.** Two recent, strong cost function studies (69, 76) find increasing returns to scale for merged entities as does one recent strong event study (75); however, at least one recent high-quality study does not (85).

When interpreting the evidence on hospital costs, it is important to keep two distinctions clearly in mind. The phrase “cost savings” means a savings in cost *to the hospital*. It does not mean a savings in cost from the point of view of payers. Also, “hospital consolidation” comes in two types: ownership consolidation only and facilities consolidation. An ownership (or system) consolidation occurs when two formerly independent hospitals come to be owned by the same firm, but continue each to offer roughly the same service lines as they did before the merger. A facilities consolidation

## Findings

occurs when an ownership consolidation is followed either by the closure of one of the hospitals or by a significant consolidation of service lines across the merging hospitals.

**Hospitals often claim that there are important economies of scale in their industry.**

They state that it costs less to produce hospital care in a larger hospital than in a smaller one, and, therefore, that it will cost less to produce the same care at the larger, post-merger scale.

**Hospitals also claim that merging will allow them to reduce the amount they spend on the “medical arms race.”**

The medical arms race is the allegedly wasteful non-price competition hospitals engage in over the acquisition of, for example, helicopters, open-heart surgical suites and various advanced medical technologies.

**The event study literature shows lower cost growth for merged hospitals but the evidence is weakened by flawed controls.**

Event studies of hospital costs identify hospital mergers, collect data on costs for the merging hospitals and a control group, and then compare costs and cost growth between the merging and non-merging hospitals. Several studies (21, 67, 71, 84) covering hospital mergers that occurred from the mid 1980s through the mid 1990s find that cost growth was slower, post-merger, at merging hospitals than it was at control hospitals. All of these event studies have significant problems with differences between the merger and control groups, however, so we should be cautious in drawing conclusions from them.

**Consolidations involving actual consolidation of facilities seem to lower hospital costs, while those not combining facilities produce no appreciable effects.**

Dranove and Lindrooth (75) do the best job of matching merging hospitals to similar controls. They use a statistical technique called propensity score matching to match merging hospitals with the non-merging hospitals that look most similar. Furthermore, they distinguish between two types of mergers: mergers in which the two merging hospitals continue to operate with separate hospital licenses and mergers in which the two merging hospitals give up one license and operate under a single license. These latter cases, they argue, are more likely to represent mergers in which true consolidation of the hospitals’ services occurred. Of the 122 mergers between 1989 and 1996 they study, 81 were license-combining. They find significant (about 14 percent) cost savings in the case of license-combining mergers and no significant cost savings in the non-license-combining mergers.

**Managed care expansion cools the medical arms race, lowering hospital costs.**

**Hospital concentration seems to temper, not enhance, this effect.** A study set in the early 1990s (68) finds that rising managed care penetration reduces cost growth in relatively unconcentrated hospital markets but not in relatively concentrated ones. This finding counters the claim that merging will allow hospitals to reduce the amount spent on the medical arms race.

## Implications for Policy-Makers

Any review of the scholarly literature can only be a snapshot in time. With that in mind, we offer our conclusions on hospital consolidation from our review of what we know now:

- From 1990–2003 there was a large, national wave of hospital consolidation.
- The average metropolitan resident saw a reduction in hospital competition, effectively, from six to four local competitors.
- By 2003, at least 88 percent of metropolitan residents lived in highly concentrated hospital markets, and probably more non-metropolitan residents did so as well.
- Consolidation occurred throughout the U.S., but was most significant in the South.
- The best quantitative evidence suggests that consolidation was not driven by the rise of managed care, although the results of the literature are mixed and the fear of managed care may still have contributed.
- The balance of the evidence indicates that the 1990–2003 consolidation in metropolitan areas raised hospital prices by at least five percent and likely by significantly more.
- There is evidence from several studies indicating that consolidation among hospitals that are geographically close to one another lead to large price increases. Studies have found consolidation-specific price increases of 40 percent and more.
- Although the results of the literature are mixed, a narrow balance of the evidence and the evidence from the best studies indicates that hospital consolidation more likely decreases quality than increases it.
- Although the results of the literature are mixed, the balance of the evidence indicates that hospital facility consolidation produces cost savings for the consolidated hospitals.

### The Evanston Case

Prior to the Evanston case, the U.S. Department of Justice (DOJ) and the Federal Trade Commission (FTC) have been unsuccessful in seven consecutive attempts to block hospital mergers and had not won a hospital case since 1989.

An October 2005 ruling to dissolve a 2000 merger in Evanston, Ill. reverses this pattern and is an important landmark for at least three reasons. First, the court found that the hospital market was geographically limited. Second, the court found that a modest increase in concentration led to a significant increase in hospital prices. Third, the judge ordered the divestiture of the merged entity.

The Evanston case highlights the importance of understanding the impact of hospital concentration on prices, costs and quality of inpatient care. The ruling also establishes that consummated hospital mergers raising antitrust issues may be reexamined.

The rise in consolidation in local hospital markets raises several issues and trade-offs for policy-makers to consider.

**Hospital markets in most parts of the country have not become monopolized.** As Figure 1 shows, the typical MSA had slightly more than four effective competitors in 2002. In most industries, market consolidation goes in waves. Should there be another unchecked wave of hospital competition in the future, such a wave is likely to result in higher prices and lower quality. In some markets, there may be a monopoly provider, and these markets present special challenges for regulators.

## Implications for Policy-Makers

**Geographical markets for hospital services appear to be narrower than courts have typically found to date.** Properly assessing the geographical market for hospital care is a critical step in the evaluation of hospital mergers. Consolidation between closely neighboring hospitals appears to lead to significant price increases even in markets that would appear to be relatively competitive under typical market definition strategies.

**Policy-makers might consider encouraging new hospital entry as a way to increase competition, but this raises several issues.** There are a number of mechanisms policy-makers might use to increase competition by encouraging new hospital entry including relaxing CON laws and restrictions on specialty hospitals. It is important to consider, however, possible costs associated with entry. For example, if specialty hospitals focus only on profitable lines of business, they may impair general hospitals' ability to deliver quality care to patients in unprofitable lines of business. Furthermore, in markets with excess capacity, additional entry may exacerbate this problem, increasing health care costs.

## The Need for Additional Information

There are a number of important areas for future research:

- Studies to reconcile the differing results in the three areas of the price and consolidation literature are needed to determine which estimates are more accurate.
- Validation studies of merger effects are needed. A validation study would use transactions prices to look at consummated mergers and ask which of the currently available models of hospital competition would have best predicted the price effects of the merger.
- New quality and competition studies incorporating better measures of competition (i.e. moving away from the SCP methods) and incorporating more and better measures of quality are needed.
- Studies of the interaction between provider and insurer market power are needed. Hospitals and physicians often complain about the market power of insurers and further claim that provider consolidation is needed to “level the playing field.” Today, little is known about the effects of insurer market power on provider markets and nothing is known about the interaction between insurer and provider market power.
- Research is needed on how changing health care practice—which increasingly moves care from hospitals and towards both preventive and highly specialized and pharmaceutical-based treatment—will shift the nature of hospital competition and the effect of hospital mergers.

### Introduction and Reasons for Consolidation

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### Hospital Pricing

Although the question of what impact hospital consolidation has on hospital prices sounds straightforward, in practice it is not. First, what do we mean by a hospital's price? Hospitals sell hundreds of different products: treatment for a heart attack, treatment for pneumonia, etc. Researchers deal with this problem in a number of different ways. Some calculate revenue per day or revenue per discharge, essentially assuming that either hospital days or discharges are homogenous. Other researchers calculate some sort of price index. That is, they calculate separate prices for treatment for heart attack, treatment for pneumonia, etc. and then average these prices together in a standardized way.

Further problems arise in dealing with severity. A heart attack may be mild or severe. The person having a heart attack may be relatively healthy or he may have many other diseases. Failing to deal with these problems may bias the results of research. Some hospitals treat mostly simple cases, and some hospitals treat more complex cases. If a researcher does not have a good way to adjust for case mix and severity, he will overestimate the prices of hospitals with severe cases and underestimate the prices of hospitals with easier cases.

Hospitals' products are sold to patients holding different types of insurance coverage such as Medicare, Medicaid, fee-for-service plans, point-of-service plans, health maintenance organizations and preferred provider organizations. In addition, patients without health insurance either pay for themselves out of pocket or depend on charity care. Hospitals charge different prices for patients with different types of coverage, and may also charge different prices to different insurers within each plan type. Some of this complexity may be safely ignored. Since a government authority sets Medicare and often Medicaid prices, they are essentially unresponsive to competitive conditions, so that research on pricing and consolidation should (and generally does) focus only on private sources of payment.

Few good data sources on hospital prices exist. Hospital "charges" are commonly available in data collected by state governments. Charges are list prices for the hospital's services. Virtually all payers demand and receive discounts from charges, however; only those paying out of pocket may face full charges. Furthermore the sizes of these discounts vary from hospital to hospital and payer to payer. Thus, hospital charges are nearly useless as a price measure.

There are two popular approaches to collecting price data. First, some states, notably California, collect financial data at the hospital level, which identify gross revenues (aggregate charges) and net revenues (aggregate actual payments) by payer type. Researchers then "adjust" individual charge data by multiplying them by the ratio of net revenues to charges. A second approach involves the use of insurance company claims data. Some researchers have been able to obtain claims reimbursement data from health insurers and to use those data to construct actual prices. The first approach has the strength that all the data for a state is represented; however, it requires the assumption that discounts from charges are uniform across payers. The second approach has the strength that actual prices are observed; however, this approach is necessarily less representative since only insurers who are willing to share data are included in the study.

### Studies Of Consolidation And Inpatient Prices

Even well-conducted studies depend for their validity on underlying assumptions about how the world works. Each of the study types we discuss in this section requires different kinds of assumptions to be valid.

Because they are easy to perform, SCP studies form the bulk of our evidence on the effects of consolidation on prices; however, there are strong reasons to believe that these studies, even when well-conducted, produced biased estimates of the relationship of interest and that the typical bias will be toward finding an effect smaller than the true effect. This is because the key variable used to proxy market structure and market power, HHI, is affected by numerous factors left out of the model. For example, large cities may have both high prices (because of high costs) and low HHI because many hospitals are needed to service the population. If the study does not adequately control for cost differences, this correlation will introduce bias. Similarly, markets that are highly profitable because demand is high or inelastic will have both high HHI and high prices.

In evaluating an SCP study, several considerations are critical. First, price should be measured accurately, with transaction prices being much more reliable than measures based on charges. Second, market structure should be measured accurately. To do so requires that the analyst identify the market a firm competes in correctly—that is, the analyst must find all of a firm’s competitors. Excluding relevant competitors makes HHI too large, and including firms that are not competitors makes HHI too small. Third, factors affecting hospitals’ costs (labor costs, scale of operations, capacity utilization and potentially other factors) must be included and well measured to avoid confounding cost differences with structure differences.

There are numerous other reasons to believe that the estimated price-HHI relationship will be biased even in well-conducted SCP studies (30, 34). This conclusion does not mean the studies have no value. They provide an important method of summarizing the price-concentration patterns in the data, and, as long as we keep in mind the existence and likely direction of the (unavoidable) bias, they provide important information.

Event studies suffer from several important limitations as well. As we discuss below, market definition and control group selection are the critical study design elements in an event study. Either poor market definition or poor control group selection is likely to produce biased results.

Finally, simulation methods also have significant limitations. To do a structural model of hospital mergers, researchers must assume the form that demand and costs take. They must assume the form of hospital objectives. They must assume the broad form of pricing conduct. Then they must decide for which hospitals to simulate the merger. Any of these steps can lead to biased results. The functional form chosen for demand affects the result of the merger simulation, and usually little theoretical or empirical justification exists for any particular choice. Note that the logit functional form used in the literature reviewed above is considered a conservative choice for merger effects—it produces smaller merger effects than do other choices (23).

### Methodological Issues For SCP Literature

Consider first the measurement of price. The best measure is the price actually paid to the hospitals by insurers, appropriately adjusted for the treated patient’s condition and severity. The best studies on this dimension are those using transactions prices. Of the studies that use transactions prices, Dor and colleagues (18, 25, 26) have the most careful controls for patient conditions, insurance type, and patient severity. The least reliable measures of price are in Noether (43) who uses charges and Staten, Umbeck and Dunkelberg (45) who use discounts (the difference between charges and transaction price), neither of which corresponds very well to actual prices. Between these studies in terms of the quality of their price measures are the several California studies using adjusted charges. These prices are probably right on average, but they miss pricing differences among the different types of insurers and adjust their price measures only for patient conditions and not severity.

Next, consider the definition of the market and the measurement of concentration. Most studies define markets according to geopolitical divisions such as MSAs or counties. These definitions do not, as a general rule, correspond well to economic or antitrust hospital markets. MSAs are usually too big and counties may be too big or too small depending on where they are along the urban-rural continuum. Most of the 13 studies use either county or MSA as their market definition. The better market definitions, however, are constructed hospital-by-hospital. Simpson and Shin (44) define each hospital's market as a fixed radius around it (15 miles for urban and 20 miles for rural hospitals). Melnick et al (41), Keeler et al (36), and Capps and Dranove (19) use the best market definitions. They construct "variable radius" market definitions that look at patient flows at the zip code level to infer the geographical size of the market in which each firm competes.

Finally, consider the inclusion of appropriate controls for marginal cost differences. These should include controls for wages, scale of operations, hospital teaching status, and hospital for-profit/not-for-profit/government ownership status. The strongest studies in terms of cost controls are Noether (43), Melnick et al (41), Keeler et al (36), and Lynk and Neuman (39), and the weakest is Staten et al (45).

### Methodological Issues For Event Studies

To estimate the size of the price increase that would have occurred in the absence of the merger, researchers construct a control group of hospitals. Ideally, these are hospitals that: 1) resemble the merging hospitals, and 2) are not themselves affected by the merger. Then, the researchers assume that the price increase that occurred among hospitals in the control group is a good estimate of the price increase that would have occurred among the merging hospitals had the merger not occurred.

The estimated effect of the merger is the increase in price at the merging hospitals minus the increase in price at the control hospitals. For example, if two hospitals merge on January 1, 1995, then we might compare the prices for those two hospitals in 1994 and 1995 and discover that the 1995 price was 10 percent higher than was the 1994 price. Suppose that the average price at the control hospitals was six percent higher in 1995 than in 1994. This would lead us to conclude that the merger caused a four percent price increase (10 percent minus six percent).

### Literature On Competition And Quality

Economic theory has little conclusive to say about the effects of competition on quality. While the profit margin decreases as concentration decreases (lowering the incentive to compete for patients via quality), the sensitivity of patient volume to quality changes probably increases as a hospital faces more competitors raising the incentive to compete for patients via quality. At the risk of oversimplification, the stronger of these forces will determine how hospital consolidation affects quality of care. Since 2000, 10 papers have studied the relationship between hospital competition and the quality of care.

Researchers must overcome substantial methodological challenges to generate a reliable estimate of the relationship between hospital competition and the quality of care. They must identify appropriate indicators of hospital quality and measure hospital competition accurately. Moreover, variation in hospital competition must not be correlated with other, uncontrolled for, correlates of hospital quality.

The most common measure of quality used is risk-adjusted mortality for a particular condition or procedure. The advantage of using risk-adjusted mortality as a quality marker is that it is straightforward to measure and mortality is unambiguously a bad outcome. The disadvantages of this measure (and most currently implemented hospital quality measures) are that they are susceptible

to measurement error and capture only one dimension of hospital quality. Hospitals sell many services, and, for most of those, mortality is not a relevant marker of quality. Thus, while the quality measures that are employed in quality analyses have validity, they are noisy markers of quality.

Most studies of the quality-concentration relationship use some form of the HHI to measure hospital concentration. The HHI has practical appeal as a summary measure of concentration, but its use in empirical analysis of hospital quality has similar problems to those discussed in the context of the relationship between price and concentration. Furthermore, if patients are more likely to go to high quality hospitals, there can be reverse causality. That is, an increase in a hospital's quality may cause changes in the market HHI. Three papers (55–57) modify the way in which the HHI is calculated in order to avoid this reverse causality problem, while the majority of the literature ignores this issue.

### Literature On Hospital Costs

The hospital cost function literature evaluates the claim of scale economies by examining how costs, at the facility level, vary with the scale of the facility. This literature is therefore relevant for evaluating the effects of facilities consolidation on hospital costs. It has revealed few firm conclusions about whether hospitals exhibit increasing, decreasing, or constant returns to scale, although the most recent and methodologically sophisticated work does suggest significant scale economies. Those recent findings provide some support for the claim that hospital facilities consolidation achieve savings by producing economies of scale. There is, however, little evidence that hospitals achieve significant cost savings via ownership consolidation alone.

The early cost function literature is reviewed in Cowing and Holtmann (70). A typical study in that literature examines the association between hospital average cost and number of beds. The findings are mixed but tend to show mild increasing returns to scale for hospitals of less than 200 beds or so, but constant or mildly decreasing returns to scale above that size. Dranove (73) in a paper in the tradition of this early literature finds that there are no scale economies in such hospital cost-centers such as laundry and housekeeping for hospitals beyond about 200 beds.

Beginning in 1983 with Cowing and Holtmann (70), the hospital cost function literature began to incorporate significant methodological improvements, as health economists began to use so-called “flexible functional forms.” Some studies in that literature find increasing returns to scale (70, 72, 86), while others find constant or decreasing returns (85).

The failure to reach any firm consensus in this field is probably caused by three related problems. First, although hospitals provide hundreds of different services, their output is usually captured through highly aggregated measures such as discharges or patient-days. Second, in studies to date no provision is made for the severity of patients' illnesses. Third, the failure of the literature to date to incorporate quality measures is a problem. Since it is quite plausible that larger hospitals systematically have sicker, more expensive patients and that they provide higher quality care, the inability to control for these things probably imparts significant bias to the studies in this literature.

In a sophisticated study addressing this problem, Carey (69) finds that, when one controls for unobserved, hospital-specific differences (presumably having to do with unmeasured case mix, severity and quality), hospitals appear to have much larger economies of scale. Similarly, Gaynor and Anderson (76), in a cost function analysis that also controls for unobserved hospital-specific differences, find significant increasing returns, albeit smaller than those found by Carey.

## Notes



## Notes

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