



Hospital Merger Benefits: Views from Hospital Leaders and Econometric Analysis

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January 2017

I. INTRODUCTION

Hospital leaders consistently indicated in interviews that hospital mergers can result in substantial benefits, and their views are supported by our econometric analyses. In structured interviews with this study's authors, these leaders described several mechanisms through which mergers decrease costs, including benefits of scale, reduced costs of capital, and clinical standardization. While these cost reductions most greatly benefit the acquired hospitals, the benefits of scale inure to the acquirers as well. These views are confirmed in our empirical analyses, which find a statistically significant 2.5 percent reduction in annual operating expenses per admission at acquired hospitals. We also estimate a statistically significant decline in revenue per admission following acquisition, which appears inconsistent with studies that link hospital consolidation with higher prices paid by managed care organizations.

Hospital leaders also noted substantial quality benefits from hospital mergers, again due to standardization of clinical protocols as well as from investments made to upgrade services at acquired hospitals, deployment or recruitment of additional medical staff to the acquired hospitals, and concentrating provision of complex services at a limited number of system hospitals to benefit from increased volume. Our empirical analyses find modest support for these effects: our measures of changes in outcomes post-merger indicate some improvement, but by statistically insignificant amounts. This finding is perhaps not surprising, given the relative imprecision of publicly available measures of hospital quality as well as the time that it takes to implement quality-enhancing operational changes.

In the Federal Trade Commission's (FTC) recent statement closing its investigation of and challenge to Cabell Huntington Hospital's proposed acquisition of St. Mary's Medical Center in Huntington, West Virginia, the FTC expressed skepticism regarding the benefits of the acquisition, asserting:

We understand that coordination of care has the potential to further key goals of healthcare reform and consider those benefits when evaluating a provider merger... Claimed benefits, however, are only cognizable if they

are merger-specific. Many of the purported benefits of hospital mergers—including coordination of patient care, sharing information through electronic medical records, population health management, risk-based contracting, standardizing care, and joint purchasing—can often be achieved through alternative means that do not impair competition.¹

Many hospital leaders disagree with the FTC's view that the benefits of mergers and acquisitions can be achieved through looser affiliations that do not bind the parties financially. Based on their experience with a range of types of combinations, these hospital leaders find that such looser affiliations do not provide the commitment and accountability necessary to effectuate the change required to achieve the cost savings and quality benefits that health care reform initiatives promote.

This report outlines two distinct analyses of the questions relating to the benefits achieved through hospital combinations and the "merger-specificity"² of those benefits. First, we summarize the findings from structured interviews with hospital executives from 20 different hospital systems regarding their experiences with and "lessons learned" from myriad hospital affiliations—both mergers and looser affiliations—that they have undertaken in recent years. We describe the methodology used to conduct these interviews and provide general conclusions from the observations that were shared with us during the interviews. Second, we present the results of an econometric analysis that compares hospitals that have undergone mergers or acquisitions with similar hospitals that have not, both with respect to changes in hospital costs and publicly available measures of outcome.

In the next section, we provide background on the issues related to the benefits of hospital consolidation. In Section III, we present findings from our structured interviews with hospital executives, describing our methodology, analysis, and conclusions. The following section discusses our econometric analysis of cost and quality effects of hospital mergers. Section V concludes.

II. BACKGROUND ON THE ISSUES

It is evident from our discussions with hospital leaders, as well as reviews of the health care trade press and industry conferences, that many, if not most, hospital leaders feel that they are at a crossroads. While many still operate primarily in a fee-for-service world that encourages provision of greater volume of services and focuses on the price of each individual service, all recognize that these days are numbered. Many are already experiencing a shift to value-based payments for both their publicly and privately insured patients. Some are also experimenting with risk-based approaches in which they are reimbursed a fixed amount to provide high quality care, at least for a defined bundle of services, and sometimes more broadly for an entire patient population.

Traditional fee-for-service reimbursement methodologies motivate all providers to deliver more care, and do not distinguish beneficial services from those that are redundant or of questionable value. Hospital system leaders recognize that payment methodologies are evolving to change those incentives and that hospitals will be reimbursed based on the care delivered by the delivery system team in which they participate, rather than on their own performance. New payment approaches necessitate alignment of the financial and clinical incentives of an integrated team of providers.

Hospital leaders also recognize that such fundamental changes to the payment system require them to integrate both vertically, with other types of providers such as physicians and post-acute care providers, and horizontally, to form systems that achieve the scale necessary to make the substantial investments required to support the new health care delivery model or to bear the financial risk inherent in value-based payment systems. Our discussions with hospital leaders focused primarily on the motivations for and benefits achieved from horizontal integration, as horizontal combinations have been the primary focus of substantial recent antitrust scrutiny. However, many hospital leaders noted that they also focused extensively on vertical combinations to address the changing demands of health care.

The demands of the evolving health care delivery framework encourage the development of scale. For example, hospitals must make substantial investments in the clinical and

administrative information technology (IT) infrastructure necessary to provide the type of integrated care envisioned in both private and public health care reform initiatives. Infrastructure investments, such as construction of a robust and productive IT system, benefit from substantial economies of scale: they are expensive to develop and operate but are highly scalable. These systems require more than the installation of an electronic health record (EHR) system, which itself can be a costly undertaking. In addition, they require linkage of that system with financial data derived from a sophisticated cost accounting system, training of staff to input data, development and production of informative reports from the data to measure and monitor performance, usage of the reports to provide feedback to system participants, and development of reward systems that hold participants accountable to certain standards based on quality and cost.

Moreover, new payment initiatives that require providers to become financially responsible for the outcomes of the services they provide and the general health status of the population they treat also demand scale in order to mitigate the risk of inevitably high cost patients. Without sufficient patient volumes, a few unusually high cost patients can undermine an otherwise stable financial position. As a result, it is not surprising that hospital system leaders indicated that they are frequently approached by smaller hospitals and systems that see the need to become part of a larger system, because they cannot unilaterally enter into a payment approach that imposes downside risk.

At the same time, demand for inpatient hospital services has been declining, making it more difficult for hospitals to achieve scale unilaterally. Between 2004 and 2014, inpatient admissions at community hospitals fell by 5.8 percent (from 35.1 million to 33.1 million) while the number of inpatient days declined by 8.7 percent (from 197.6 to 180.5 million).³ These trends are causing even larger hospitals to seek scale externally.

Finally, for many hospital services, additional volume enables the delivery of higher quality at lower cost. Consolidation of clinical services across merging hospitals can allow them to

take advantage of these benefits. A recent review and synthesis of the literature on the effects of integrated delivery systems on cost and quality found that “the majority of these studies reported positive correlation between health system integration and quality of care.”⁴ Such improvements are

particularly feasible when the merging hospitals are geographically proximate and can combine clinical service teams. Combinations of hospitals in the same geographic region, however, are precisely those that are most likely to raise competitive concerns.

III. STRUCTURED INTERVIEWS WITH HOSPITAL EXECUTIVES

METHODOLOGY

Health systems were selected for this study to meet several criteria. While not intended to be a random sample of all hospital systems, we identified systems that present a variety of characteristics in terms of geographic location, geographic scope (single area vs multiple area), size, religious affiliation, ownership and organization, ownership of a health plan, and nature of affiliations undertaken in recent years. Appendix 1 presents the characteristics of the different systems. Interviewees were sent a list of discussion topics ahead of time. (See Appendix 2.) Interviewees were promised anonymity in order to encourage candor in the discussions.

BENEFITS OF HOSPITAL MERGERS

In this section, we summarize the views of the hospital executives with whom we spoke regarding a number of cost-saving and quality-enhancement outcomes stemming from hospital mergers. These benefits include cost reduction opportunities, improvements in clinical quality, and enhanced ability to assume payment risk. In the next section, we discuss why hospital leaders we interviewed generally find that looser affiliations are less successful in achieving these benefits.

Cost Reduction Benefits

Cost savings accruing from mergers fall into three broad categories:

- Cost reductions related to scale, i.e., allocation of fixed costs over larger patient volumes;
- Reductions in the cost of capital; and
- Savings due to adoption of standardized clinical processes, which also often lead to quality improvements.

Scale-Related Savings

All of the interviewees noted that mergers allow their systems to recognize substantial savings in fixed costs associated with supply chain (group purchasing), IT, back office overhead (e.g., administration, billing, revenue cycle), pharmacy and laboratory operations, and physical plant management.

Supply chain savings were typically noted as particularly substantial. While most hospitals participate in one or more group purchasing organizations that provide access to discounted rates for some supplies and equipment, often such arrangements do not produce the same extent of savings as those that can be achieved through direct negotiation with suppliers, frequently located overseas, for substantial volumes. Moreover, the smaller hospitals that are frequently the targets of acquisition do not have access to the same level of group purchasing organization (GPO)-provided discounts when operating independently, with relatively small purchase volumes.

In addition to the greater price discounts that can be achieved through larger purchases, central warehousing and distribution of supplies for hospitals in a common system (particularly those within a reasonably proximate geography) can also reduce costs substantially.

Standardization of purchases also results in substantial savings, due to the greater concentration of (and, therefore, larger) volume and also to the associated reduction in inventory management expenses stemming from the reduced number of individual items that must be stocked. Several systems, for example, noted their ability to substantially reduce the number of distinct types of implants that they purchase for joint replacement procedures. Such reductions produce savings by allowing greater volume discounts through

negotiation with medical device manufacturers, more efficient inventory management, and lower expenditures on the staff training necessary to accommodate multiple devices. Similar savings were noted with respect to medical equipment related to imaging or operating room monitoring, savings for which also include the ability to stock fewer parts and reduce the number of maintenance contracts. One hospital leader noted that his system operates about 70 imaging centers; outfitting all of them with standardized equipment reduces the costs associated with parts, maintenance, and staff training as well as enabling achievement of lower prices on the equipment purchases. Finally, several systems noted savings achieved by combining purchases and storage of blood. Since blood spoils, but demand for blood, particularly by smaller hospitals, is somewhat uncertain, reducing daily variation in blood utilization by pooling inventory can lead to substantial additional savings.

All the hospital leaders stressed that such standardization of clinical purchasing requires the buy-in of the hospital system's medical staff. The process necessary to obtain such support will be discussed further below, along with the clinical benefits that mergers can produce.

IT costs are also largely fixed. Such costs involve not only the installation and maintenance of an EHR system such as Epic or Cerner, but also staff training and the development of systems that integrate the EHR and other data systems to enable the combination of clinical and financial information. While the substantial implementation costs associated with systems such as Epic alone preclude their use by any except substantial hospital systems, several interviewees also noted that Epic does not typically market to smaller entities. While there are ways to align independent hospitals in a common installation, such an approach tends to be less effective and complete. Moreover, independent hospitals are reluctant to give up their existing systems for a contractual arrangement that may terminate in the future.

In addition, hospital systems are all recognizing the critical importance of developing and utilizing dashboards and other benchmarking metrics that can be easily maintained and updated to monitor, educate, and hold physicians and other clinical staff accountable for the patterns of care that they deliver. Such data tools are costly to develop and maintain. While "off-the-shelf" products do exist, most hospital leaders find that their medical staffs resist benchmark tools that were developed without their own or their trusted

representatives' involvement.

General back office services can also be consolidated through merger. Such services include management, finance including revenue cycle management, human resources, and physical plant maintenance. In addition, malpractice insurance costs can also be lowered through the pooling of risk into an internal, self-insured captive entity.

Typical estimates of the scale-related savings to acquired hospitals ranged from approximately 5 to 10 percent of the total operating costs, or about 50 percent of overhead costs, of the acquired hospital. When comparable systems are combined, the percentage savings may be somewhat smaller relative to a combined revenue base, but significant in dollar terms. For example, the leader of a system that had formed approximately three years ago, with approximately \$5 billion in combined annual net patient revenues, indicated that in the third year following combination, the new system achieved about \$160 million, or 3.2 percent of combined net patient revenues, in annual synergies. Another "merger of equals" resulted in about 5 percent in annual savings.

Interviewees also noted the benefits of size in attracting top management talent. Since hospital leadership is largely scalable, larger systems have the ability to pay to recruit top talent to serve as their administrative and clinical leaders. Such leadership can be instrumental in improving hospital financial and quality performance.

Capital Access and Avoidance

Capital-related savings from mergers generally take two forms. First, the costs to access capital in municipal bond markets are lower because larger systems typically receive higher ratings (and many smaller hospitals and systems are not rated at all). When, as is frequently the case, acquired hospitals have experienced declining operating margins and generally deteriorating financial performance, their access to capital declines as well. In turn, a deteriorating credit rating can set off a downward spiral in performance, as the hospital becomes unable to make investments to maintain or upgrade its physical plant and equipment and to recruit physicians and other clinical staff. An inability to reinvest often makes struggling hospitals less attractive to their medical staffs and to patients. Managed care organizations then also become less willing to pay sufficient amounts to cover the increasing costs to maintain these hospitals in their provider networks.

As patient volumes decline, financial performance further deteriorates.

The credit rating agencies acknowledge the importance they place on scale: for example, a Moody's Investors Service analyst noted that "[t]he largest hospitals have long generated stronger operating margins and revenue growth owing to factors such as their economies of scale and ability to drive revenue growth through expanded services."⁵ Similarly, Fitch Ratings considers that it can be "helpful in credit ratings" for "systems [to] have multiple hospitals or clinics in other markets [in order to] have diversity across the continuum of care."⁶

These statements are consistent with the views of the hospital leaders we interviewed. Almost all of the acquisitions that their systems have undertaken have required investments in order to upgrade services and physical plant that the acquired hospitals had been unable to afford.

Second, mergers can often allow capital expenditures to be avoided. Frequently, the acquiring hospital is highly utilized and faces capacity constraints. This is particularly the case when the acquirer is an academic medical center (AMC) with a well-established brand. Often the AMC would like to expand its tertiary/quaternary services or establish a new clinical program but cannot undertake such growth without building a new bed tower or otherwise expanding its physical plant. In these situations, the AMC's capacity constraint can be at least partly attributed to a large volume of patients who do not require high-end services, but still seek the brand of the AMC. Proximate community hospitals, on the other hand, often have substantial excess capacity, in part, perhaps, because of financial difficulties that have led to reduced patient volumes. In these situations, when the AMC and community hospital combine, the AMC can invest resources in the community hospital to enhance its services and medical staff. These resources are designed to enable the community hospital to care for some of the patients that had been using the AMC for less complex services. Moreover, for many patients, travel distances to the acquired community hospital are shorter than to the AMC, thereby enhancing patient convenience. As a result, space is made available at the AMC, enabling it to forego the extensive capital investments of a new bed tower or similar expansion. The capital requirements to upgrade the community hospital are typically substantially lower than those that would be required for the AMC to expand its own capacity

unilaterally. Moreover, because the credit rating of the AMC is typically better than that of the acquired community hospital, the AMC can make capital investments at the community hospital at a lower cost than the community hospital could itself.

Clinical Standardization to Reduce Cost and Improve Quality

The hospital leaders with whom we spoke universally indicated that some of the most significant savings that they have achieved through merger result from the standardization of clinical processes, which, as one interviewee explained, tighten and shift leftwards the "cost-quality bell curve." He cited the Cheesecake Factory approach to "making care coherent, coordinated, and affordable," as a theory of change "from a Jeffersonian ideal of small guilds and independent craftsmen to a Hamiltonian recognition of the advantages that size and centralized control can bring."⁷

Some hospital systems believe that the benefits from standardization of clinical protocols exceed those associated with more traditional back office and other fixed cost savings that they enjoy from mergers. Clinical standardization reduces the costs associated with "outlier" patients by identifying avoidable complications (also resulting in quality benefits). In addition, standardization results in lower supply and equipment costs by concentrating volume with fewer suppliers, thereby enabling negotiation of lower prices. Moreover, staff training and maintenance costs are reduced.

While hospital leaders acknowledge that mergers do not automatically extend an acquirer's best clinical practices to the hospitals it acquires, they indicate that mergers facilitate the critical process of engaging the medical staff in otherwise difficult-to-generate, meaningful change. All agreed that such physician engagement is key to standardizing clinical protocols; that is, the process must involve the medical staff directly in the development and enforcement of whatever protocols are adopted. "Off-the-shelf" benchmarks do not tend to be effective, as every medical staff finds that its patients and circumstances are unique.

These hospital system leaders all described generally similar processes that involve a steering group of physicians who represent different hospitals in the system and are typically organized along specialty lines. The steering group establishes the protocols and is responsible for disseminating them to

the medical staffs across different departments and hospitals, as well as for ensuring that the medical staffs comply with the protocols. The steering group itself meets on a regular basis, generally several times annually, to ensure regular communication and feedback. In order for this process to be effective, members of the hospitals' medical staff need to view the physicians involved in the steering groups as representing their views and experience, and with sufficient authority to execute on those views.

The hospital leaders stressed that, in order to develop effective protocols, the steering groups must be provided with data from the hospital system's own clinical and cost experience, drawn from an integrated EHR. The interview participants did not always insist that a single EHR system is required across all participating hospitals, but any separate EHR systems must at least be interoperable. Moreover, the EHR system must be able to generate meaningful reports that associate both clinical and financial information with respect to particular conditions and treatment patterns, in order to educate the medical staffs about how particular clinical treatment protocols affect the cost and quality of care. That is, protocol development must be data-driven and evidence-based. Examples of cost-reducing clinical programs include better targeting of those patients requiring high-cost pharmaceuticals, reduction in blood use during surgery, and prospective identification of, and intervention with, patients who are at high risk of adverse events. Quality improvements include reductions in adverse events, shortened lengths of stay, and reduced readmission rates, among other outcomes.

Several hospital leaders noted substantial reductions in average length of stay when uniform care protocols are adopted; for example, when an acquirer's protocols were adopted by an acquired hospital with similar case mix but previously lacking a care management system, average lengths of stay at the acquired hospital fell by a day. Similarly, aligning the programs of a system's community hospital and academic medical center to treat babies who are born addicted to opiates resulted in substantial reductions in lengths of stay at the community hospital. One hospital system attributed annual savings of approximately \$50 million (roughly 2 percent of the system's revenues) to implementation of a data-driven system that, using cost accounting and clinical information, identifies and eliminates avoidable quality variation. This quality intervention approach was developed by a team that included physicians, nurses, and representatives from the

finance department from throughout the hospital system.

These approaches to standardization of clinical care are being adopted by hospital systems regardless of whether they are acquiring other hospitals or just trying to improve the cost effectiveness of care within their existing system. In either context, system integration and scale are critical elements in the process. As a result, hospital leaders see care standardization as a key benefit of their acquisitions, as acquired hospitals generally do not possess the scale or resources to undertake the process unilaterally. Moreover, to the extent that acquiring hospitals have developed tools and technology, scale obtained from acquisitions allow them to spread the costs of operating these costly systems across larger numbers of patients.

In order to further their objectives of increasing value-based care, the interviewed hospital leaders stressed the importance of physician engagement in, and accountability to, consistent clinical practices across their health systems. Such engagement has resulted from a range of arrangements with their medical staffs: some system models rely upon largely employed medical staffs, while others operate mixed models of employed and independent physicians.

Role of Geographic Proximity in Recognizing Cost Reductions

The system leaders whom we interviewed noted that geographic proximity facilitates achievement of greater cost savings. Geographic proximity is particularly important with respect to clinical savings for several reasons. First, as discussed above, it is important to engage physicians directly in any moves to standardize clinical protocols, and such engagement generally requires at least some "face-time." Second, any type of clinical consolidation, reorganization of services, or simply sharing call coverage or support teams across different hospital facilities can only occur within a reasonable travel radius for patients and physicians. Third, it is not possible to negotiate with managed care organizations to become the anchor to a narrow network product without broad geographic and service scope within a particular region. Fourth, while it is possible to leverage some back office functions such as IT and finance over a broad geographic area, others such as human capital and compliance require a more local presence. While purchasing can be organized over a broad geographic area, one system indicated that it relies on a central warehouse that is no more than 50 miles from

its facilities to balance cost and accessibility considerations. Finally, in part because of the complex nature of health care delivery, hospital leaders stressed the general importance of face-to-face contact with the leaders of their individual hospitals and other system entities. One hospital leader indicated that when acquisitions are within the same community, the acquired hospital's local board is disbanded but is represented on the hospital system's board to encourage a common culture. With more distant acquisitions, local boards must be maintained to ensure that the local communities have a voice in their local hospital's governance.

As a result, it is not surprising that the systems that have a presence in multiple states generally operate in contiguous states. Leaders of the few that own hospitals that are more geographically dispersed stressed the importance of not operating "orphan" hospitals in any particular market. Indeed, a few noted that they have divested hospitals that were the only ones that they owned in a particular market, because they could not operate them efficiently and could not offer reasonable geographic coverage to a managed care organization (MCO) interested in developing a narrow network for its members.

Confounding the operational difficulties that distance creates at the hospital level, several leaders noted issues with "cowboy" physicians located in areas remote from the rest of the system. In these situations, medical staffs were not well-integrated with other physicians practicing at other system hospitals and were more likely to be unwilling to adopt clinical protocols intended to be applied across the system, as discussed above.

Ability to Participate in Risk-Bearing Arrangements

Interviewed hospital leaders have had varying degrees of experience with risk-bearing arrangements including accountable care organizations (ACOs), bundled payment programs, and full insurance risk or population health initiatives. However, they anticipated a need to be able to accommodate alternative payment arrangements in which they are no longer paid more when they keep hospital beds full or provide additional outpatient services. As a result, they are at least beginning to develop the necessary systems that will allow them to manage the continuum of care for the patients whom they serve. They also understand that they

need both scope—that is the ability to provide all services along a care continuum—and scale—to create and support the necessary data and system infrastructure as well as to bear risk—to undertake the provision of population health. Such systems need vertical affiliations with providers of the services that patients require before and after acute hospital episodes of care, but also, more generally, that maintain patients' health to avoid hospitalizations entirely. Hospital leaders recognize that the key to controlling cost is to be accountable for all the services that are utilized, as they recognize that utilization is the most important determinant of total cost of care. They understand that cost control involves ensuring that unnecessary services are not provided, that necessary services are delivered by the most appropriate provider in the optimal setting, and that the system has the breadth in terms of geographic and service coverage to keep patients' care within the system. Hospital leaders view management of post-acute care as critical, including the availability of less costly settings in order to discharge patients safely as soon as possible, while minimizing readmissions. In addition, care of high utilizers, who generally live with chronic conditions, that minimizes their time spent in costly settings such as inpatient hospitals, is particularly essential to efforts to "bend the cost curve." All of such efforts require vertical integration of clinical services. They also require financial integration in order to provide the holistic system incentives necessary to reduce inpatient hospital utilization in clinically and economically appropriate fashions.

In addition to the importance of vertical connections to discharge patients from the hospital into less costly settings, as noted earlier, patients who need inpatient care can, in some cases, be treated at a local community hospital close to their residences and families, rather than at more costly, and often more distant, AMCs. Indeed, based on our interviews, AMCs are frequently motivated to acquire local community hospitals to enable triaging of patients across inpatient hospital settings according to their medical needs. Often, as noted above, AMCs are highly utilized and seeking to free up capacity to enable greater specialization into high-end services. Mergers between AMCs and community hospitals permit a realignment of services that augments the primary and secondary services that are available at community hospitals and redirects patients to them, thereby permitting AMCs to focus more extensively on the sickest patients with the most complex medical needs. As discussed later, while theoretically such

service realignment could occur in an arrangement short of merger, in reality the capital investments necessary to upgrade services and facilities at the community hospitals require the type of long term commitment that can only be realistically achieved through merger.

AMCs also recognize the importance of offering MCOs a group of hospitals that includes both community and academic medical centers, which allows each patient to be treated in the setting that minimizes costs for his or her particular needs. In other words, they view acquisition of lower cost community hospitals as critical to being able to steer patients based on the complexity of their health care needs to a community or academic setting. AMCs also recognize the importance of providing health plans with geographic scope within a metropolitan area. Without these offerings, AMCs are concerned that they will be excluded from narrow network products, except for the most complex services and will be unable to continue to support their costly specialized services (e.g., burn units or Level I trauma centers) as well as their teaching and research missions.

Since physicians are gatekeepers to patient care, close relationships with physicians are also viewed as critical to bearing risk for the cost of population, or even episode-based (bundled) payment arrangements. While, as noted earlier, views about the benefits of physician employment vary, hospital leaders all acknowledge that it facilitates efforts to align incentives for efficient behavior by, for example, sharing savings achieved from more cost-effective care delivery without risking violations of the Stark and anti-kickback laws. Without close alignment of physicians, it is difficult to prevent leakage of services from the system and therefore it is much more difficult to control the cost of services covered under the risk-bearing arrangement.

Scale is equally important to successful participation in risk-bearing arrangements, according to hospital leaders. Any sort of risk-bearing arrangement is premised on the idea that the inevitable unpredictable high-cost cases are counterbalanced by cases with costs that are below average.⁸ The “law of large numbers” makes such balance more likely and minimizes the risk that a few costly outliers undermine even normally efficient operations. Smaller hospital systems indicate that they lack the necessary volume of patients to mitigate otherwise substantial payment risk.

In addition, to undertake risk-based arrangements that do

not compensate providers based on the number of individual services provided (i.e., the inputs to care) but rather on a predetermined bundle of services or some measure of output, substantial investments are required in infrastructure. Such infrastructure tracks patient utilization of different services, provides information and feedback to providers who are managing those patients and services, and holds providers accountable to clinical protocols. As one hospital leader explained, “you need data to manage risk.”

Several hospital system leaders whom we interviewed indicated that they are ready and eager to enter into risk-sharing arrangements with MCOs, but the MCOs are reluctant to change historic payment structures. Some interviewees believe that the MCOs in their markets themselves do not yet possess the data systems necessary to offer new payment arrangements, while others recognize that the MCOs that bear risk, i.e., offer fully insured products, are still profiting from such arrangements (and stand to benefit from measures that reduce the utilization of health care services) and are, therefore, reluctant to introduce change that might reduce their earnings.

Clinically Integrated Networks

Many of the systems whose leaders we interviewed operate or participate in Clinically Integrated Networks (CINs) that contract with MCOs on behalf of the CIN members. Some of the CINs represent affiliations with other integrated health systems, while others are limited to the independent medical staff members of a single hospital system. Those that participate in broad multi-system CINs indicated that they limit membership to “high-performing” systems, both in quality and cost dimensions. As a result, CINs may exclude the targets of many acquisitions: hospitals that are financially troubled and unable to independently upgrade their services. Since CINs that have been “blessed” by the FTC⁹ can negotiate with managed care plans to bear risk, the systems with whom we spoke believe that it is important to ensure that they can manage quality and cost effectively. They also all stressed the necessity of ensuring that participating physicians are engaged in reducing clinical variation. Several provide financial incentives in the form of shared savings to their participating physicians. In negotiating with health plans, the CINs attempt to develop narrow network products in order to reduce patients’ use of providers outside the CIN. However, hospital leaders do not appear to view multi-system CINs as substitutes

for full system mergers. First, as discussed below, they may not provide the long term commitment of an ownership combination, and second, they risk the same sorts of antitrust review as full mergers, but may yield fewer benefits.¹⁰

Operation of Health Plans

Beyond risk-bearing arrangements with independent health plans, approximately half of the systems that we interviewed operate health plans either unilaterally or through joint ventures. As noted above, these plans range in size from about 50,000 to almost 700,000 members, and include arrangements limited to a system's own employees as well as commercial, Medicare Advantage, and Medicaid managed care plans. Those that operate health plans indicated that, in order to control risk effectively, they must cover an entire geographic area and provide comprehensive services; in other words they must have both scale and scope. Otherwise, they risk substantial leakage from their internal provider network and are, as a result, less able to control the cost and utilization of services for their members. Apart from one system with a health plan only for its own employees and another system that focuses on Medicaid and exchange plans, all of the systems that operate health plans earn at least \$2.5 billion annually in patient revenues (i.e., from the provider divisions of their businesses).

MERGER SPECIFICITY

The FTC and many state attorneys general have generally been skeptical of hospitals' claims that mergers are necessary to accomplish the benefits described above. Rather, the FTC has stated that it believes that most benefits can be achieved through looser affiliations that do not involve meaningful financial integration or joint contracting. Because the FTC dismisses the merger-specificity of most claimed merger benefits, it is generally unwilling to engage in a calculus that balances the potential for increased market power and concomitant anticompetitive behavior against the cost savings and quality benefits that may be achieved through the merger.¹¹

The courts have expressed mixed views about merger specificity. For example, ruling on a challenge by the FTC and Idaho Attorney General to the acquisition of an independent physician group by a hospital system that also employed physicians¹² in Nampa, Idaho, a federal district court judge noted "the acquisition was intended by St. Luke's

and Saltzer primarily to improve patient outcomes. The Court is convinced that it would have that effect if left intact...." However, while recognizing the need for integrated provider systems, the Court rejected defendants' arguments that integration through ownership was critical for these benefits to accrue, opining that "there are other ways to achieve the same effect...."¹³ Recently, however, a federal district court judge in Pennsylvania disagreed. Ruling on the FTC and Pennsylvania Attorney General's challenge of a proposed combination of Penn State Hershey Medical Center and PinnacleHealth System, the Court found that "[t]he patients of Hershey and Pinnacle stand to gain much from a combined entity.... The decision further recognizes a growing need for all those involved to adapt to an evolving landscape of healthcare that includes, among other changes, the institution of the Affordable Care Act, fluctuations in Medicare and Medicaid reimbursement, and the adoption of risk-based contracting.... Like the corner store, the community medical center is a charming but increasingly antiquated concept."¹⁴ This opinion was recently overturned, however, on appeal to the Third Circuit. That Court did not rule specifically on the merger specificity of the hospitals' efficiency claims, but noted that the "claimed efficiencies... are insufficient to rebut the presumptions of anticompetitiveness."¹⁵

Hospital leaders with whom we spoke believe that it is not possible to achieve benefits that are as extensive or durable as those that can be accomplished through merger or acquisition through looser affiliations, echoing recent articles that note that "many [multisystem alliances] do not survive in the long run."¹⁶ They cited several factors, including:

- Lack of accountability and long-term commitment,
- Inability to align incentives sufficiently to make the difficult choices necessary to substantially improve the efficiency of care delivery,
- Acquirers' unwillingness to invest substantial capital without commitment for the returns on the investment,
- Legal or regulatory prohibitions on sharing financial information as well as detailed clinical information,
- Reluctance to share valuable intellectual property with a loose affiliate, and
- Failure to create a common culture.

They stressed the need for long-term commitment to undertake the change in the organization of care delivery that promotes cost-effectiveness and increases in quality.

Such change can involve consolidation of services—for example, relocation of much high-end tertiary and quaternary care to the AMC while channeling as much primary and secondary service to community hospitals in order to free up capacity at the AMC. Another example could be development of specialty-specific centers of excellence at specific hospitals within a geographic area. Such service reconfiguration implies that the involved hospitals give up some services and no longer provide a full range of services in order to gain the cost and quality benefits that come with scale-creating consolidation.

Unless all parties can make binding long-term commitments to such an arrangement, participating hospitals are understandably reluctant to exit from a service line that they would need to reinstall should the affiliation fall apart. Similar considerations apply to the consolidation of support services: when a hospital system centralizes back office services, the participating individual facilities may no longer operate their own finance or human resources function (for example). Should the arrangement fall apart, those hospitals would lack critical infrastructure with which to operate. As a result, they are reluctant to cede control of support services unless they will definitely not need them in the future, even if they can forego substantial costs by eliminating such duplicative services.

Relatedly, it is difficult to align incentives across independent, and sometimes competing, hospitals. Certainly, such hospitals are unlikely to be willing to reorganize service delivery if it implies forsaking existing, profitable revenue streams, even though the group of independent collaborating hospitals could deliver care more cost effectively through such consolidation. Even if, for example, a service realignment that relocates most complex services to a “hub” AMC while simultaneously redirecting primary and secondary services to “spoke” community hospitals would not likely lead to reduced revenues for the community hospitals, the risk of that occurring could make independent community hospitals’ unwilling to participate in the reorganization. (This factor would be in addition to the previously discussed unwillingness to relinquish services if they believe that an affiliation could fall apart.) In the context of a merger, on the other hand, the system can hold the community hospitals harmless for a potential decline in their specific financial performance in order to align the incentives to take actions that maximize the care delivery of the system as a whole.

As discussed earlier, many acquisitions involve hospitals that have become weak financially as independent institutions. While such hospitals are generally not “failing” as defined in the Horizontal Merger Guidelines,¹⁷ they are less competitively relevant. As a result, managed care organizations are often less willing to pay sufficient amounts to maintain the hospitals’ financial stability. Such a pattern leads to ever increasing disparities between independent community hospitals and better capitalized and scaled system hospitals.

Many acquisition agreements therefore involve substantial capital investment commitments by the acquirer to address the cumulative shortfall that has been experienced by the acquired hospital. Such investments may include upgrades to physical plant and equipment, recruitment of additional physicians, and replenishment of inadequate pension funds. It should not be surprising that acquiring hospitals are unwilling to invest substantial funds without a reasonable expectation that they will benefit from such investments.¹⁸ Such a commitment is difficult to enforce without common ownership or similar financial integration. Moreover, accounting regulations that limit how minority interests can be reflected on a partial owner’s balance sheet favor full asset acquisitions in handling debt service costs.

Hospital leaders also indicated that it is difficult to achieve meaningful changes to clinical practice patterns to improve quality and reduce cost in looser affiliations. While looser affiliations may permit sharing of some clinical information, without accompanying financial information it is impossible to demonstrate why certain practice protocols are more cost effective than others—that is, how new protocols that standardize practice patterns utilize fewer or less-costly resources, while simultaneously maintaining or even enhancing the quality of care. In arrangements that are short of mergers, sharing of financial information is generally prohibited.

It is sometimes argued that clinical protocols that describe “best practices” are publicly available and can be acquired as “off-the-shelf” products from commercial vendors or government sources. However, as explained above, hospital leaders generally indicated that unless physicians on their medical staffs buy into any proposed protocols, they are not adopted. Moreover, it is difficult to convince the medical staffs to change their practice patterns unless they believe that the revised protocols reflect their own personal

experience and that they have had an opportunity either to participate directly in the development process or to delegate the protocol development and review to physicians whom they know and trust.

Theoretically, protocols developed at one hospital could be made acceptable to the physicians at another if sufficient physician trust could be developed across a looser affiliation of medical staffs of the independent hospitals. In reality, however, even if this is possible, most hospitals are unwilling to share the intellectual property that they have developed themselves with independent, competing hospitals. Such development of clinical protocols and best practices requires investment in costly data analysis and valuable time of busy clinical staff. As a result, hospital leaders are understandably reluctant to give the resulting intellectual property away with few strings attached.

Finally, most interviewees spoke about the critical importance of adopting a common culture. While “common culture” doesn’t have a precise definition, hospital leaders use the phrase to imply a commitment by all hospital system members (and their clinical staff) to the same vision of how to move toward a delivery model that rewards value-based, rather than volume-based, care. This implies substantial economic and clinical integration to eliminate the incentive to make decisions based on a unilateral view of their benefits and costs rather than a system-wide perspective.

The views of hospital leaders with whom we spoke are consistent with standard economic theory regarding the situations in which ownership is more efficient than contracting, which was first articulated by Ronald Coase in 1937.¹⁹ A substantial subsequent literature notes that when transaction costs of contracting are high, either because there are too many contingencies to anticipate or articulate in specifying the contract, or because monitoring and enforcement of the contract are difficult, then ownership is more likely to emerge as the favored approach. Such situations are most likely to result, all else constant, when products are specialized, market conditions are changing, and information is imperfect.²⁰ Many would say that these are all conditions that describe the health care sector.

Experiences with Looser Affiliations

While many of the interviewed hospital leaders expressed skepticism about the extent to which loose affiliations can

achieve the same objectives as full mergers or acquisitions, most have some experience with such looser arrangements. The impediments they cited represent a mirror image of the benefits of full asset combinations or tight joint ventures.

- Participants don’t enter into the arrangement with the same objectives, and the arrangement doesn’t provide the mechanisms to force alignment,
- No “glue” or long-term commitment binds the parties together,
- They are subject to changes in one participant’s leadership that change the motivations of that participant,
- A lack of clarity about where decision-making authority rests results in key decisions not being made, and
- A lack of trust causes all participants to focus primarily on ensuring that they are benefitting at least as much as other participants from the affiliation.

Most successful loose affiliations are narrowly defined to minimize the impact of these impediments. Combining supply chain efforts, including the procurement and maintenance of equipment, appears to be a common shared function for looser affiliations. In some cases, back office functions such as data centers are also developed collaboratively, although they generally are limited to development of the infrastructure and do not involve pooling and sharing different affiliates’ data. One joint venture among multiple systems, some large and academic and others that are smaller and more community care-oriented, has achieved success in “clinical engineering” types of services—procurement of costly equipment, service contracts, and staff training as well as development of an internal group purchasing organization. This joint venture is discussing possible future initiatives related to data sharing, but is currently focused primarily on development of the necessary infrastructure to support it.

When loose affiliations venture into clinical areas they tend to be limited to support services, such as laboratory or pharmacy. Other arrangements, focused on particular individual clinical services, have experienced varying degrees of success. Services involved in such affiliations are typically relatively complex and costly and can include oncology, cardiac surgery, or orthopedics. Some interviewees indicated success with arrangements in which physicians from one institution come to practice at a second but may refer the most complex services back to their home institution. One interviewed executive described a 50-50 joint venture

with a specialty hospital, for which the entities obtained antitrust approval, to operate the specialty service in the joint venture with a single bottom line. This particular venture has apparently been successful in achieving efficiencies by having the specialty hospital deliver those services in which it specializes at the general hospital as well as its own campus. On the other hand, an executive of an urban AMC described an affiliation with another AMC in the same metropolitan area for a single high-end surgical specialty. The affiliation was designed to gain critical mass in staffing, operating room scheduling and supply acquisition, as well as to develop optimal clinical protocols. However, because the surgeons of the respective hospitals continued to “wear different jerseys,” no savings or care advancements have been possible. Another affiliation of several systems has been working for several years to develop common clinical protocols for diabetes and joint replacement, but has made only “slow progress.” One example of an affiliation that apparently has had success in developing and adopting some clinical protocols involved two complementary groups of physicians—one academic group participant excelled at inpatient care, while the other community-focused group focused primarily on the ambulatory setting. In this situation, both physician groups recognized they could benefit from their complementary perspectives.

In summary, it seems that the narrower the focus and the tighter the financial integration (to the point of requiring antitrust approval), the more that an affiliation short of merger is likely to succeed. Moreover, success in clinical areas is generally more likely when each party contributes something unique to the arrangement, e.g., expertise in different areas, or technical expertise versus a pool of referrals. In general, affiliations that are looser than mergers tend to achieve the greatest cost and quality benefits when they:

- Are narrowly focused,
- Involve hospital systems that do not otherwise compete significantly, for example, an AMC and one or several community hospitals, or hospital systems in adjacent, but not identical, geographic areas, and
- Invest substantial time in face-to-face contact in order to establish operating principles and protocols, as well as to develop trust among participants.

Two of the systems that we interviewed also have experience in managing other smaller hospital systems. An executive of one of these systems compared its experiences with hospitals

that it owned and those that it managed. This executive noted that the system has found that the financial and clinical benefits that accrue from management are substantially smaller than from ownership. The potential for benefit is reduced, not only because of the difficulties described above, but also because of the inability to make needed capital investments and concerns about exposure to Stark and anti-kickback law violations. Moreover, there is a substantial range of management agreements. Another large system described two models that it offers: one that involves shared services to provide management of employed physician practices and strategic sourcing, and the other that includes complete management services. While the system doesn't obtain data from its shared services partners, it believes that it achieves substantially greater cost savings and quality benefits when it is allowed to assume complete control of a hospital's management.

SUMMARY OF INTERVIEW FINDINGS

System leaders whom we interviewed all articulated the compelling need for scale and breadth of services in order to meet the demands of health care reform initiatives. Scale is necessary to accommodate the substantial requirements for data, IT infrastructure, and underlying systems to enable “accountable care.” It also permits providers to bear risk and be accountable for the care that they deliver. As a result, it is not surprising that substantial consolidation of hospitals continue. Acquired hospitals recognize that they will not remain competitively viable as independent institutions, while systems find further scale-related efficiencies in expansion, particularly as the demand for traditional inpatient services continues to decline.

Interviewees also explained that the largest savings, as well as quality benefits, that health systems can accomplish often stem from standardization of clinical care patterns to eliminate unnecessary and unproductive utilization as well as to prevent avoidable adverse events. Development and adoption of these clinical protocols must be spearheaded internally by trusted members of the medical staff in order to be successful.

Interviewees provided numerous explanations why most of the significant benefits, particularly for acquired hospitals, can only be achieved through full financial integration of hospitals. In looser affiliations, the lack of accountability and commitment prevent investment of substantial capital,

combination of services and functions, and sharing of data and intellectual property. In addition, convincing medical staffs to change their traditional practice patterns to adapt to standard clinical protocols requires close integration among them and sharing of confidential information that is typically not sanctioned among competitors by the antitrust agencies.

As a result, it should not be surprising that looser affiliations have largely only successfully collaborated over less controversial back office and supply chain function sharing or in narrowly focused clinical initiatives that take advantage of complementary, non-overlapping skills.

IV. QUANTITATIVE ANALYSES OF THE COST AND QUALITY EFFECTS OF HOSPITAL MERGERS

Our interviews with the leaders of 20 hospital systems revealed that those hospital systems experienced significant reductions in cost and improvements from hospital mergers. While these 20 systems represent a diverse spectrum of types and locations of hospitals, as we noted earlier, these systems were not randomly selected and it is possible that their experiences and the ability of these systems to affect change may not be typical of all hospitals nationwide. As such, we supplement the conclusions of our interviews with an empirical analysis of the cost and quality benefits associated with hospital mergers in the United States between 2009 and 2014. Although previous studies have assessed the cost and quality benefits of hospital mergers, most examine the effects of hospital mergers that occurred in the 1990s, and many of these studies (particularly those related to costs) are limited to estimating the benefits that accrue when two previously independent hospitals combine to operate on a single license,²¹ which reflects a small minority of mergers that occur. Moreover, several are limited to analyzing hospital mergers that occurred in a single state. The results of those studies, therefore, may not reflect the general ability of hospitals to realize the benefits of mergers in an era of value-based payments, risk-based contracting, vertical integration with other types of health care providers, the need for significant investments in IT, and declining demand for inpatient hospital care.

Using a database that tracks mergers of all non-federal short-term acute care hospitals in the United States between 2009 and 2014, we studied the effect of these mergers on the acquired hospitals' cost, revenue, and quality. Our work builds on previous research in two important ways. First, our study examines the effects of recent hospital mergers,

which reflect the current environment faced by hospitals, whereas previous research largely examined mergers that occurred decades earlier. Second, rather than being limited in geographic scope or to mergers that result in two hospitals combining to operate on a single license, our study incorporates information on all hospital acquisitions nationwide over this six-year period.

We find that these mergers were associated with a 2.5 percent reduction in operating expense per admission at the acquired hospitals.²² The average annual operating expense of the merging hospitals in our study is approximately \$235 million, implying merger-related annual savings of \$5.8 million at each hospital. We also find that net patient revenue per admission—which includes revenue associated with patients covered by commercial MCOs—declined at the acquired hospitals in our study relative to revenue at comparable non-merging hospitals, a finding which is at odds with other recent studies suggesting an association between hospital consolidation and hospital prices. Our analyses find less conclusive support for the quality benefits of hospital mergers that were highlighted in our interviews. Using measures of readmission rates and mortality rates for AMI, or, more colloquially, heart attacks, heart failure, and pneumonia, we find small positive, but generally statistically insignificant effects of hospital mergers on these outcomes. These less precise findings on quality, however, may be related to the difficulty in developing reliable, comprehensive metrics with which to measure quality: Because of data limitations, our study relies on two relatively uncommon outcomes (readmission and death) for only three specific conditions.

Our findings are broadly consistent with much of the previous empirical literature on hospital mergers, which has focused on the effects of mergers on hospitals' costs or total net patient revenue,²³ rather than the effects of mergers on quality. Most of these studies have shown that mergers are associated with a decrease in revenue as well as a decrease in costs at merging hospitals, relative to non-merging hospitals. Studies regarding the effect of hospital mergers on quality have generally found mixed results: some quality metrics improve while others decline, and many of the differences are statistically insignificant.

Connor et al. (1998) studies the effect of hospital mergers that occurred between 1986 and 1994.²⁴ The authors limit their study to mergers in which the hospitals operate on the same license post-merger, which is a relatively small subset of all hospital acquisitions. They find that these types of mergers are associated with a 5 percent decrease in both costs and revenue. Similarly, Alexander et al. (1996) studies mergers of two independent hospitals onto a single license that occurred between 1982 and 1989.²⁵ While this study is simpler than our own in that it does not attempt to account for many of the confounding factors that might affect costs (apart from the merger itself), the authors do find that this limited set of mergers is associated with a statistically significant decrease in operating costs.

As with the two previous papers, Spang et al. (2001) studies the effects of mergers resulting in the merging hospitals operating on the same license post-merger.²⁶ The authors limit their analysis to mergers of non-rural short-term acute care hospitals between 1989 and 1997. Consistent with the results of the previous studies, the authors find that mergers are associated with decreases in both costs and revenue, relative to non-merging hospitals. Finally, Dranove and Lindrooth (2003) studies the effects of hospital mergers on costs.²⁷ The authors study mergers between 1986 and 1996, and limit their study to mergers of two independent hospitals that form a new system (that may or may not operate on a single license). They find that mergers where the hospitals subsequently operate under a single license result in reduction in cost of 14 percent, but mergers where the two hospitals continue to operate on their own licenses post-merger have no effect on costs.

Previous research into the effects of mergers on hospital quality is more limited and has yielded mixed results, which may reflect the inadequacy of most existing measures

of quality to appropriately adjust for patient comorbidities or severity of illness or otherwise measure hospital quality sufficiently precisely to detect systematic variation across hospitals. Ho and Hamilton (2000) study mergers in California between 1992 and 1995.²⁸ They use discharge data to study the effects of mergers on patient outcomes, and find that the mergers studied had no impact on mortality rates, but, in some cases, readmission rates as well as early discharges of newborns increased as the result of mergers. Kessler and Geppert (2005) is one of the few papers that studies both costs and quality.²⁹ Using nationwide longitudinal Medicare claims data for patients suffering a heart attack between 1985 and 1996, the authors are able to follow individual patients over time and observe patients' outcomes. However, the study does not directly estimate the effects of hospital mergers on costs and quality, but rather estimates the relationship between hospital market concentration and costs and quality. The authors find that increased market concentration is associated with higher costs and lower quality. Finally, Capps (2005) uses data from New York hospitals to study the effects of mergers, occurring between 1994 and 2000, on quality.³⁰ His results show that for most quality measures, mergers had no effect on hospitals' quality.³¹

Our study builds on these previous studies in two important ways. First, our study updates previous work by examining the effects of hospital mergers between 2009 and 2014—reflecting the current environment faced by hospitals—whereas previous research largely examined mergers that occurred in the 1990s. Second, we study the universe of hospital mergers that have occurred nationwide and include different types of post-merger organizational structure. As a result, our analysis allows for more general conclusions. As noted above, previous work has often been limited to analyzing the effects of hospital mergers in a specific state (e.g., New York or California), mergers that result in changes in operating licenses, or both.

In this study we examine the effects of mergers on cost, revenue, and quality. The measures of cost (total operating expense per adjusted admission) and revenue (net patient revenue per adjusted admission) that we use are the same as those used in many of the studies described above. As described previously, consistent with these previous studies, we find that mergers are associated with decreases in both cost and revenue. To study the effects of mergers on hospital quality, we use patient outcome measures of mortality and readmission rates for AMI, heart failure,

and pneumonia. Our results are indicative of quality improvements associated with hospital mergers but, as with earlier studies, the effects are generally small and statistically insignificant.

In the next section, we describe the cost, revenue, and quality measures that we use in our analyses, as well as other data sources on which we rely. The final section summarizes our findings.

DATA DESCRIPTION

Hospital Transaction Data

We rely primarily on the American Hospital Association's (AHA's) Annual Survey to identify hospital mergers and acquisitions, either those reported in the AHA's *Landscape Changes in US Hospitals*, which accompanies the Annual Survey data, or by identifying changes in a hospital system's affiliation as reported in the AHA Annual Survey itself. To ensure that we have a comprehensive list of all hospital mergers and acquisitions, we supplement the AHA data with information on hospital mergers and acquisitions compiled by Irving Levin Associates.³² While these data have been relied on in many previous studies of hospital mergers, they are limited in their utility as they report *announced* transactions, but do not note when or if the transaction was consummated. Since many announced hospital transactions are subsequently abandoned, the Levin data by themselves overstate the number of consummated hospital transactions. Moreover, identifying the date at which a transaction is completed is critical to being able to assess when the benefits, if any, start accruing. For each hospital transaction that we identify by either AHA or Levin, we independently verify that the transaction closed and determine the date on which it closed.

Using these sources, we compile a list of all consummated mergers and acquisitions involving non-federal short term acute care hospitals in the United States between 2009 and 2014.³³ We also collect data on all non-federal short term acute care hospitals that were not involved in merger transactions to serve as a benchmark against which to measure changes in cost, revenue, and quality. As we discussed in the summary of our interviews with hospital leaders, many hospitals are involved in looser affiliations that fall short of full asset acquisitions. As we do not eliminate hospitals involved in these looser affiliations from our set of benchmark hospitals, to the extent these looser affiliations provide some

cost and quality benefits, including these hospitals in the control group is conservative as it would tend to bias our results towards finding no effect of mergers.³⁴

As discussed above, previous research has sometimes distinguished between hospital combinations where two hospitals combine to operate on a single license and those where a hospital or hospital system purchases the assets of another hospital but maintains its separate license post-acquisition. Although our data allow us to distinguish between these types of transactions, and previous research has suggested that reductions in costs might be greater for hospital mergers, there are too few single-license combinations between 2009 and 2014 to distinguish meaningfully between the two types of arrangements in our analysis.

Cost and Revenue Data

We use hospital cost and revenue data from CMS's Healthcare Cost Report Information System (HCRIS). The HCRIS database contains annual cost reports that all hospitals participating in the Medicare program must file; a separate report is filed for each licensed hospital.

We measure costs as expenses incurred during the ordinary course of operating the hospital, which include expenses associated with both inpatient and outpatient care. We normalize these costs across hospitals by dividing them by the number of "adjusted admissions" to the hospital.³⁵ Several hospital leaders with whom we spoke indicated that they monitored this financial metric as part of their hospitals' operations, and the metric was also used by several previous studies of the effect of hospital mergers on costs.³⁶

While not the focus of our study, we also examine the effect of hospital mergers on revenue, using a measure of hospital revenue that has also been used in previous research as well as operationally.³⁷ Specifically, to measure revenue, we define net patient revenue per adjusted admission, which includes revenue associated with both inpatient and outpatient care and accounts for contractual allowances and other discounts given by the hospital. This measure includes revenue for traditional Medicare and Medicaid beneficiaries, which is set administratively, and for commercial plans and Medicare Advantage plans, which is negotiated by the hospital and managed care organizations (MCOs). Consistent with our cost measure, we normalize revenue by the number of

adjusted admissions. While not solely a measure of negotiated prices, we would expect (all else equal) revenue per adjusted admission to increase if negotiated commercial or Medicare Advantage prices increased following a merger. However, since changes in revenue per adjusted admission may also be affected by changes in payor mix or service mix, results involving this measure should be interpreted accordingly.

Hospital Quality Data

We measure hospital quality using metrics published in the Hospital Compare database compiled by the Centers for Medicare and Medicaid Services (CMS). We focus on outcome measures of quality—rather than process or patient satisfaction measures—since outcomes of care provided by hospitals are of greatest concern in the evolution to value-based care. Six outcome measures are consistently collected by CMS over the time period of our study: three measures of 30-day readmission rates for acute myocardial infarction (AMI), heart failure (HF), and pneumonia (PN) and three measures of 30-day mortality rates for heart attack, heart failure, and pneumonia. To reduce the variability in these measures of quality, we combine the six separate outcome measures tracked by CMS into three composite outcome indices: one for mortality, one for readmission, and one that combines both mortality and readmission measures.³⁸

Other Factors Affecting Cost, Revenue, and Quality

We account for other factors unrelated to mergers that may affect hospitals' cost, revenue, or quality. Briefly, we rely on the AHA Annual Survey to identify the ownership type (for-profit, not-for-profit or public) and whether the hospital self-reported as being a rural hospital or was located in an area defined as rural by the Office of Management and Budget. We identify major teaching hospitals as those that are members of the Council of Teaching Hospitals.

We also account for differences in hospitals' payor mix and size based on the numbers of Medicare days, Medicaid days, and total inpatient admissions, as defined in the AHA Annual Survey. To account for service mix we use the percentage of gross revenue accounted for by outpatient services from the CMS HCRIS database. To account for differences in the cost of services across hospitals, we use the hospital's case mix index (CMI), which is a measure of

the complexity and resources associated with inpatient services provided by the hospital to Medicare beneficiaries, and the hospital's wage index, which is used by CMS to adjust for geographic differences in the cost of employing the hospital's patient care staff. We obtain both these measures from CMS's provider-specific files.

Finally, we compare merging hospitals with nearby non-merging hospitals based on each hospital's Hospital Referral Region (HRR), as defined by the Dartmouth Atlas.³⁹ HRRs are commonly used to group hospitals into relatively homogeneous geographic areas.

Overall, our analysis includes data for approximately 3,000 non-federal, short-term acute care hospitals between 2009 and 2014, corresponding to nearly 14,000 hospital-year observations. Among these hospitals, 375 were involved in an acquisition or merger (as the target, not the acquirer) between 2009 and 2014. Appendix 3 presents summary measures of our variables and describes the analytic methods that we used.

RESULTS AND DISCUSSION

Consistent with much of the previous literature, we find that hospital mergers are associated with statistically significant decreases in both cost and revenue, relative to the non-merging comparison hospitals. Moreover, whereas many previous studies of the effects of hospital mergers on costs focused only on those transactions perhaps most likely to result in cost savings—where the two merging hospitals combine their operations onto a single license—we find effects for a much broader set of acquisitions. Specifically, we find that a merger is associated with a statistically significant decrease in operating expense per adjusted admission of 2.5 percent. (A table presenting the complete set of our results for cost, revenue, and quality measures is contained in Appendix 4.) The average annual operating expense of the merging hospitals in our sample is approximately \$235 million, implying a reduction in annual merger-related savings of \$5.8 million.

We also find that a merger is associated with a statistically significant decrease of 3.9 percent in net patient revenue per adjusted admission (or \$9.1 million, based on average annual net patient revenue of \$236 million for the acquired hospitals).⁴⁰ While consistent with the previous research reviewed above concerning hospital mergers, these results may be inconsistent with several other recent studies that

have found a direct association between hospital consolidation and the prices paid by commercial MCOs, i.e., commercial MCOs pay higher prices to hospitals located in areas with fewer hospitals or hospitals that belong to a larger system.⁴¹

Our results concerning the effect of hospital mergers on quality are less conclusive. We do find that mergers are associated with small improvements in quality, as measured by a slight decrease in all three composite indices, the 30-day readmission rates composite index, the 30-day mortality rates composite index, and the overall outcome composite index. However, of these three estimates, only the result associated with readmission rates is statistically significant at the 10 percent level. To put the magnitude of this effect in context, we can assume the entire effect is attributed to only one of the underlying 30-day readmission measures. For example, the estimated effect is equivalent to a decrease of 1.0 percent in the 30-day readmission rate for AMI, assuming there are no changes in the 30-day readmission rates for either heart failure or pneumonia. Similarly, our estimates indicate that a merger is associated with a decrease of 1.2 percent in the 30-day readmission rate for heart failure, or with a decrease

of 1.1 percent in the 30-day readmission rate for pneumonia.

The modest results for quality measures may be indicative of the limitations of quantitative measures of hospital quality. First, the measures are based on only the subset of inpatients that have one of the three conditions: acute myocardial infarction, heart failure, or pneumonia, rather than being comprehensive measures of quality for all patients. Second, even within these conditions, the measures capture the prevalence of two relatively uncommon outcomes: death and readmission to the hospital, and as a result there is relatively little variation in these measures across hospitals. Finally, any meaningful comparisons of mortality and readmission rates must be risk-adjusted to account for differences in patients' comorbidities and severity of illness, which may be difficult to address adequately without access to patients' detailed medical records in addition to the administrative data used by CMS to calculate the measures. Our results, while consistent with previous research on the quality effects of hospital mergers—which generally find inconsistent or statistically insignificant effects—suggest that this an area that would be well served by additional research.

V. CONCLUSION

As hospitals respond to increasing pressures of health care reform, they are attempting to integrate both horizontally and vertically to be able to deliver integrated, cost-effective care. While various forms of affiliation are being pursued, many hospital leaders believe, based on their own experiences and observations, that complete mergers and acquisitions are the most effective means for making progress toward meeting

the aims of value-based population health. This study, which combined both structured interviews with the leaders of 20 hospital systems and econometric analysis of the universe of hospital mergers and acquisitions that occurred between 2009 and 2014, identifies and confirms the benefits that accrue from complete mergers.

APPENDIX 1

CHARACTERISTICS OF HEALTH SYSTEMS	
Measure (Median)	Number of Systems
Beds (2,200)	
< 1,000	3
1,000 to < 2,000	5
2,000 to < 5,000	9
≥ 5,000	3
Acute Discharges (104,000)	
< 50,000	3
50,000 to < 100,000	7
100,000 to < 300,000	9
≥ 300,000	1
Net Patient Revenue (\$3.0B)	
< \$2B	5
\$2B to < \$4B	10
≥ \$4B	5
States	
1 State	12
2 or 3 States	6
> 3 States	2
Metropolitan Statistical Areas	
< 3 MSAs	4
3 to < 4 MSAs	4
5 to < 9 MSAs	8
≥ 10 MSAs	4
Total Medicare Inpatient Days (48%)	
< 40%	3
40% to < 50%	11
≥ 50%	6
Total Medicaid Inpatient Days (22%)	
< 20%	7
20% to < 30%	10
≥ 30%	3
Total Combined Medicare and Medicaid Inpatient Days (71%)	
< 65%	4
65% to < 75%	10
≥ 75%	6

Sources:

[1] Total Medicare and Medicaid inpatient days: AHA's 2014 Annual Survey.

[2] Other measures: American Hospital Directory. (Available at <https://ahd.com>.)

Of the 20 systems represented in our interviews, 19 are not-for-profit and one is for-profit. Of the 19 not-for-profit systems, 16 are secular and three have a religious affiliation. While most of the systems are located in a single state, the systems represented in our interviews collectively span the United States, representing 36 different states. Finally, nearly half the systems offer their own health plans, which range in size from 50,000 to 700,000 members. An additional two systems are involved in joint ventures that offer health plans.

A substantial majority (18 of 20) of the interviews were held in person by the study authors; two were conducted by phone.⁴² In most cases, the interviews involved discussions with the hospital system Chief Executive Officers; in some cases, other senior leaders, including Chief Financial Officers and Directors of Strategic Planning also participated. Six of the interviews were held as two groups of three hospital systems each; the remainder were conducted as discussions with individual hospital systems.

As the list of topics (Appendix 2) reflects, the interviews included discussions concerning the hospital leaders' experiences with mergers and looser affiliations that they had undertaken in recent years. They focused both on cost savings as well as quality benefits that were achieved. In addition, hospital leaders discussed the extent to which their experiences with looser affiliations (short of mergers) accomplished the same benefits. In these discussions, we defined "mergers and acquisitions" as full asset combinations, or other financial arrangements that involve sufficient financial integration to permit joint negotiation with MCOs. In this section of the report, we use the term "merger" to connote these types of transactions that involve substantial or complete financial integration, regardless of whether they involve one hospital or system acquiring another or they represent "mergers of equals," and whether the combined hospitals operate on a single license or maintain separate licenses.

APPENDIX 2

BENEFITS TO CONSUMERS OF HOSPITAL MERGERS

Questions for Hospital Leader Interviews

1. Have you undertaken any mergers with, acquisitions of, or looser affiliations with other hospitals in the last five years? If so, please describe.
2. What are your primary motivations for mergers or acquisitions with/of other hospitals?, e.g.:
 - Increased need for scale related to enhanced IT infrastructure requirements, or requirement to spread fixed administrative/support costs over larger patient volumes;
 - Scale and scope expansion in order to undertake population health initiatives and risk sharing and to respond to other health reforms;
 - Investment demands for replacement of aging facilities or addressing capacity constraints, and associated difficulties in obtaining access to capital;
 - Better ability to use existing space to allocate patients across several campuses (e.g., where one hospital is at capacity while the other has excess beds);
 - Clinical service consolidations to take advantage of volume-related quality improvement and operating cost reductions;
 - Ability to adopt best practices by combining two clinical staffs;
 - Development of “hub and spoke” approaches to care delivery across a broad geography by a coordinated approach to enhance access to specialty services in the most appropriate settings while allowing primary care to be delivered close to patients’ homes;
 - Reduction in supply chain costs or other non-labor operating expenses;
 - Reductions in labor costs;
 - Other (please describe).
3. For any of these motivating factors that have factored into your decision-making, discuss:
 - Whether, why, and how the goal can be more effectively accomplished through a complete merger or acquisition rather than through a looser affiliation;
 - Provide specific examples of your attempts to accomplish the objectives cited above through looser affiliations or unilateral activities rather than complete mergers;
 - Were you successful in these attempts to accomplish these objectives through affiliations looser than complete merger? What difficulties, if any, did you encounter?
4. If you have participated in mergers (or looser affiliations), please address the following (preferably with data and metrics):
 - Have operating costs been reduced—and if so, in what areas and by how much?
 - Has quality improved—and if so, in what areas and measured how?
 - What new programs, if any, have been initiated?
 - What clinical consolidations have occurred?
 - Have any capital costs been avoided—and if so, did this avoidance result in any service reductions, or were they made feasible by prior excess capacity?
 - Have you invested in the hospitals’ IT infrastructure?
 - Have you entered into risk-sharing arrangements with insurers?
5. Which of these savings or quality improvements could or could not have been accomplished from a looser affiliation?

APPENDIX 3

The table below provides summary measures of the variables included in our analyses. There are fewer hospital-year records for the quality measures because these measures are occasionally missing in the CMS Hospital Compare database for some hospitals.

Summary of Cost, Revenue, Quality Measures, and Hospital Characteristics					
	Count	Mean	St. Dev.	Min	Max
Net Patient Revenue (\$)	13,968	239,592,772	305,291,164	1,940,501	6,414,278,253
Cost (\$)	13,968	239,038,369	307,830,073	2,603,336	4,527,231,186
Readmission Rate (AMI)	10,561	0.192	0.016	0.142	0.274
Readmission Rate (HF)	13,614	0.241	0.022	0.166	0.338
Readmission Rate (PN)	13,662	0.181	0.016	0.130	0.276
Mortality Rate (AMI)	11,626	0.156	0.017	0.094	0.249
Mortality Rate (HF)	13,578	0.115	0.016	0.064	0.181
Mortality Rate (PN)	13,660	0.118	0.018	0.067	0.216
For Profit	13,968	0.17	0.37	0	1
Teaching	13,968	0.09	0.29	0	1
Rural	13,968	0.20	0.40	0	1
Wage Index	13,968	0.98	0.16	0.71	1.75
% Medicare Days	13,968	0.51	0.15	0.00	1.00
% Medicaid Days	13,968	0.19	0.14	0.00	1.00
Inpatient Admissions	13,968	11,017	10,970	9	146,388
% OP Revenue	13,968	0.52	0.15	0.02	1.00
CMI	13,968	1.46	0.29	0.56	3.62

METHODOLOGY

We adopt a “difference-in-differences” methodology, following the empirical approach adopted by many previous studies. Using this approach, we compare changes in cost, revenue, and quality at merging hospitals to changes in those same measures at similar control hospitals not involved in a merger. In so doing, we assume that absent the merger (after controlling for other factors included in our model), cost, revenue, and quality would have changed at the merging hospitals in the same way that those measures did at the benchmark non-merging hospitals. In our analyses, we study the effect of the merger only on the target hospital of the deal, not on the acquiring hospital or hospital system. To the extent that the acquiring hospital or hospital system also benefits from the merger, our estimates are biased towards finding no effect. We assume that any effect of the merger on the acquired hospital is realized in the first full year after the transaction is closed.

Our analyses also include controls for other factors that may affect hospitals’ costs, revenues, or quality. Following the

previous literature, we control for whether the hospital is for-profit, whether the hospital is a teaching hospital, and whether the hospital is located in a rural area. To control for geographic variation in hospitals’ labor costs, we include the logarithm of the wage index that is used in determining Medicare fee-for-service reimbursement rates for hospitals. Differences in the payor mix at a hospital are controlled for using the logarithms of the percentage of inpatient days accounted for by Medicare beneficiaries and of the percentage of inpatient days accounted for by Medicaid beneficiaries. To account for variations of hospital size, we include the logarithm of the number of inpatient admissions at the hospital. Finally, to control for differences in hospitals’ service mix and the cost of services provided by the hospital, we include the logarithm of the fraction of the hospital’s revenue attributable to outpatient services and the logarithm of the hospital’s CMI.

In our analyses, changes in the merging hospitals’ costs, revenue, or quality are measured relative to non-merging hospitals in the same Hospital Referral Region in the same year.⁴³

APPENDIX 4

Summary of Cost, Revenue, Quality Measures, and Hospital Characteristics					
VARIABLES	(1) log: Revenue	(2) log: Expense	(3) Readmission Composite	(4) Mortality Composite	(5) Outcome Composite
Post Merger	-0.0393*** (0.0125)	-0.0249** (0.0118)	-0.0429* (0.0241)	-0.000781 (0.0269)	-0.0219 (0.0181)
For Profit Hospital	0.0768*** (0.00737)	-0.0119* (0.00696)	0.184*** (0.0142)	0.0812*** (0.0159)	0.133*** (0.0106)
Teaching Hospital	0.150*** (0.00983)	0.238*** (0.00928)	0.313*** (0.0190)	-0.138*** (0.0212)	0.0874*** (0.0142)
Rural Hospital	-0.00764 (0.00745)	0.00812 (0.00704)	0.0269* (0.0144)	-0.0279* (0.0161)	-0.000496 (0.0108)
log: Wage Index	0.491*** (0.0526)	0.372*** (0.0497)	-0.196* (0.102)	-0.411*** (0.113)	-0.304*** (0.0760)
log: % Medicare Days	-0.122*** (0.00706)	-0.134*** (0.00666)	0.00816 (0.0136)	0.0264* (0.0152)	0.0173* (0.0102)
log: % Medicaid Days	-0.0388*** (0.00424)	-0.0149*** (0.00401)	0.0444*** (0.00819)	0.104*** (0.00914)	0.0740*** (0.00613)
log: IP Admissions	-0.00940** (0.00418)	-0.0279*** (0.00395)	-0.0116 (0.00807)	-0.0170* (0.00901)	-0.0143** (0.00604)
log: % OP Revenue	-0.221*** (0.0124)	-0.215*** (0.0117)	-0.261*** (0.0239)	0.141*** (0.0267)	-0.0599*** (0.0179)
log: CMI	1.077*** (0.0205)	0.956*** (0.0194)	-0.820*** (0.0396)	-0.212*** (0.0442)	-0.516*** (0.0297)
Constant	8.464*** (0.0374)	8.698*** (0.0354)	0.351*** (0.0723)	0.528*** (0.0807)	0.440*** (0.0541)
Observations	13,968	13,969	13,972	13,972	13,972
R-squared	0.629	0.624	0.527	0.297	0.370
HRR Code FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

ENDNOTES

1. Federal Trade Commission, Statement of the Federal Trade Commission, *In the Matter of Cabell Huntington Hospital, Inc.*, Docket No. 9366. July 6, 2016, p.2. (Available at https://www.ftc.gov/system/files/documents/public_statements/969783/160706cabellcommstmt.pdf.)
2. We use the term “merger-specificity” to connote results that can only be achieved through merger, and not unilaterally or through other types of affiliations or actions. This meaning is consistent with the antitrust agencies’ typical interpretation of the Horizontal Merger Guidelines. U.S. Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines*. August 19, 2010, §10. (Available at <https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf>.)
3. American Hospital Association, *Trendwatch Chartbook 2016*, Table 3.1: Trends in Inpatient Utilization in Community Hospitals, 1994-2014. (Available at <http://www.aha.org/research/reports/tw/chartbook/2016/table3-1.pdf>.)
4. Hwang, Wenke, Jongwha Chang, Michelle La Clair, and Harold Paz, “Effects of Integrated Delivery System on Cost and Quality,” *The American Journal of Managed Care* (2013): e176. (Available at <http://www.ajmc.com/journals/issue/2013/2013-1-vol19-n5/Effects-of-Integrated-Delivery-System-on-Cost-and-Quality>) Specifically, out of 21 peer reviewed studies that were analyzed, “19 showed improvement in quality of care with respect to clinical effectiveness, lengths of stay, medication errors, and number of office visits.” (*Id.* at e177). Similarly three of four non-peer reviewed studies found similar results. Only five peer reviewed studies attempted to measure the effect of integrated delivery systems on cost by assessing utilization of services. Based on this measure, four of five found an association with a lower cost of care.
5. Moody’s Investor Service, “Announcement: Moody’s Outlook for US Not for Profit Healthcare Remains Negative,” December 2, 2014. (Available at https://www.moody.com/research/Moodys-Outlook-for-US-Not-for-Profit-Healthcare-Remains-Negative-PR_314203.) Moody’s rating model gives a weight of 25 percent on a hospital (system)’s total revenue. Moody’s Investor Service, “Rating Methodology: Not-for-Profit Healthcare Rating Methodology,” March 5, 2012, p. 4. (Available at http://www.calhospital.org/sites/main/files/file-attachments/moodys_not_for_profit_healthcare_rating_methodology_2012_moodys.pdf.)
6. Brimmer, Kelsey, “Inside Hospital Credit Ratings: Ratings Experts Explain how Credit Ratings are Determined,” *HealthcareFinance*, January 3, 2014. (Available at <http://www.healthcarefinancenews.com/news/experts-discuss-hospital-ratings-outlook>.)
7. Gawande, Atul, “Big Med,” *The New Yorker*, August 13, 2012. (Available at <http://www.newyorker.com/magazine/2012/08/13/big-med>.)
8. This is the premise of any case rate system, such as Medicare’s DRG-based prospective payment system. However, most of those systems eliminate some of the risk associated with unusually high cost patients through specified additional “outlier” payments for these cases.
9. The FTC (along with the Department of Justice) does not officially sanction entities as “Clinically Integrated Networks” but it does issue Advisory Opinions in response to requests for its views about the competitive implications of particular proposed affiliations of otherwise competing providers for the purposes of clinical integration and associated joint negotiations with payors. It evaluates joint ventures such as Clinically Integrated Networks that incorporate substantial clinical integration and/or share financial risk under a “rule of reason” approach and acknowledge that “the setting of price would be integral to the network’s use of [joint price setting].” U.S. Department of Justice and Federal Trade Commission, “Statements of Antitrust Enforcement in Healthcare,” August, 1996. (Available at <https://www.justice.gov/atr/statements-antitrust-enforcement-policy-health-care>) See, also the agencies’ “Statement of Antitrust Enforcement Policy Regarding Accountable Care Organizations Participating in the Medicare Shared Savings Program; Notice,” Federal Register. October 11, 2011.) See, e.g., Letter from Markus H. Meier, Assistant Director, Health Care Division, Bureau of Competition, to Michael E. Joseph, Esq., McAfee & Taft, Concerning Norman PHO’s Proposal to Create a “Clinically Integrated” Network, dated February 13, 2013. (Available at https://www.ftc.gov/sites/default/files/documents/advisory-opinions/norman-physician-hospital-organization/130213normanphoadvtr_0.pdf.)
10. Many believe that the antitrust hurdles to obtaining approval for CINs can be similar to those required for full mergers. Moreover, the opinions are conditional, based on facts presented to the FTC at the time, and they can be withdrawn if the FTC believes that circumstances change significantly.
11. For example, in its recent Post-Remand Brief in its challenge to Advocate Health Care Network’s proposed acquisition of NorthShore University HealthSystem, the FTC noted: “Defendants have not shown that these savings can only be obtained through the merger and have not provided any independently verifiable evidence of either the existence or magnitude of any merger-specific savings.” *Federal Trade Commission and State of Illinois v. Advocate Health Care Network, Advocate Health and Hospitals Corporation, and NorthShore University HealthSystem*, Case No. 15-cv-11473. Plaintiffs’ Post-Remand Brief in Support Plaintiffs’ Motion for Preliminary Injunction. December 14, 2016. (Available at https://www.ftc.gov/system/files/documents/cases/ecf_no_562_plaintiffs_post_remand_brief.pdf.)
12. The FTC and Attorney General brought the case to challenge the horizontal combination of physicians, rather than addressing the vertical combination of physicians by the hospital system.
13. *Saint Alphonsus Medical Center – Nampa, Inc., Treasure Valley Hospital, Limited Partnership, Saint Alphonsus Health System, Inc., and Saint Alphonsus Regional Medical Center, Inc. v. St. Luke’s Health System, Ltd.* Case no. 1:12-CV-560-BLW. Federal Trade Commission; *State of Idaho v. St. Luke’s Health System, Ltd.*; *Saltzer Medical Group, P.A.* Case No. 1:13-CV-00116-BLW. Memorandum Decision and Order. January 24, 2014. (Available at <https://www.ftc.gov/sites/default/files/documents/cases/140124stlukesmemodo.pdf>.)
14. *Federal Trade Commission and Commonwealth of Pennsylvania v. Penn State Hershey Medical Center and PinnacleHealth System*. Civil Action No.: 1:15-cv-2362. Memorandum Opinion and Order, May 9, 2016. (Available at: <http://www.pamdc.uscourts.gov/sites/default/files/opinions/15v2362.pdf>.)
15. *Federal Trade Commission; Commonwealth of Pennsylvania v. Penn State Hershey Medical Center; PinnacleHealth System. United States Court of Appeals for the Third Circuit*. No. 16-2365, Opinion. September 27, 2016 (hereafter, Third Circuit Hershey-Pinnacle Opinion). (Available at: <https://www.ftc.gov/system/files/documents/cases/160927pinnacledecision.pdf>.)
16. Butcher, Lois, “3 Ways Hospitals Can Collaborate Without Merging,” *Hospitals and Health Networks Magazine*, July 19, 2016. (Available at <http://www.hhnmag.com/articles/7315-ways-hospitals-can-collaborate-without-merging>.) Similarly, the Health Care Advisory Board found that Regional Collaboratives suffer because a “lack of formal legal or financial integration limits ability to hold partners accountable [and] loose nature of affiliation enables partners to easily dissolve partnership.” Health Care Advisory Board, “The Field Guide to Hospital Partnership and Affiliation Models.” (Available at https://www.advisory.com/-/media/Advisory-com/Research/HCAB/Resources/2014/29199_HCAB_Affiliations_IG.pdf.)
17. U.S. Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines*, August 19, 2010, §11. (Available at <https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf>.)
18. Even though the majority of acquiring hospitals are not-for-profit, they must still comply with bond covenants and outside auditors and generate enough cash to subsidize care that it is delivered with little or no payment to many patients.
19. Coase, Ronald, “The Theory of the Firm,” 4 *Economica* (1937): 386-405. (Available at <http://www.colorado.edu/ibs/es/alston/econ4504/readings/The%20Nature%20of%20the%20Firm%20by%20Coase.pdf>.)
20. See Tirole, Jean, *The Theory of Industrial Organization*, (MIT Press, 1988): 21-34 or Carlton, Dennis and Jeffrey Perloff, *Modern Industrial Organization*, (HarperCollins College Publishers, 1994):17-24 for summaries of this literature. As discussed in the next section, while some economic studies of hospital markets find a positive correlation between concentration and prices, these studies do not compare directly the effects of looser affiliations with those of mergers on costs and quality.
21. The Centers for Medicare & Medicaid Services (CMS) accredits hospitals that provide services to Medicare and Medicaid beneficiaries. Under CMS’s regulations, it is possible to combine multiple inpatient or outpatient locations under a single CMS license if certain conditions are met (e.g., the “main” and satellite locations are within 35 miles or share a common set of patients, the locations share administration and supervision, the locations are financially and clinically integrated, and so on). (See 42 CFR 413.65.)
22. All of the quantitative measures described in this section are calculated relative to a comparable group of hospitals. That is, for example, a “2.5 percent reduction in operating expense per admission” implies that operating expenses per admission at the acquired hospitals increased 2.5 percent less than operating expense per admission at comparison hospitals. The statement does not, however, necessarily imply that operating expense per admission at the acquired hospitals went down in absolute terms.
23. These studies generally assess a measure of net patient revenue per adjusted discharge, which, for the sake of simplicity, we refer to as “revenue.” Net patient revenue includes both inpatient and outpatient revenue, as well as revenue from commercial MCOs, Medicare, Medicaid, and self-pay patients. The revenue is normalized by “adjusted admissions”, which are inpatient discharges scaled to account for the outpatient services provided by the hospital. A separate strand of literature,

- which we do not discuss here, examines the effect of hospital mergers on the prices negotiated between commercial MCOs and hospitals for inpatient services, using data that are not publicly available.
24. Connor, Robert A., Roger D. Feldman, and Bryan E. Dowd, "The Effects of Market Concentration and Horizontal Mergers on Hospital Costs and Prices," *International Journal of the Economics of Business* 5, no. 2 (1998): 159-180.
 25. Alexander, Jeffrey A., Michael T. Halpern, and Shoou-Yih D. Lee, "The Short-Term Effects of Merger on Hospital Operations," *Health Services Research* 30, no. 6 (1996): 827-847. (Available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1070095/>.)
 26. Spang, Heather Radach, Gloria J. Bazzoli, and Richard J. Arnould, "Hospital Mergers And Savings For Consumers: Exploring New Evidence," *Health Affairs* 20, no. 4 (2001): 150-158, doi: 10.1377/hlthaff.20.4.150. (Available at <http://content.healthaffairs.org/content/20/4/150.full>.)
 27. Dranove, David and Richard Lindrooth, "Hospital consolidation and costs: another look at the evidence," *Journal of Health Economics* 22, no. 6 (2003): 983-997.
 28. Ho, Vivian and Barton H. Hamilton, "Hospital mergers and acquisitions: does market consolidation harm patients?" *Journal of Health Economics* 19, no. 5, (2000): 767-791.
 29. Kessler, Daniel P. and Jeffrey J. Geppert, "The Effects of Competition on Variation in the Quality and Cost of Medical Care," *NBER Working Paper No. 11226* (2005).
 30. Capps, Cory S., "The Quality Effects of Hospital Mergers," Economic Analysis Group Discussion Paper 05-6 (2005).
 31. Only two measures of hospital quality are significant, but the significance depends on what control groups are used.
 32. Irving Levin Associates. (Available at www.HealthcareMandA.com.)
 33. We exclude critical access hospitals, which are generally small, geographically isolated, hospitals.
 34. Similarly, we do not eliminate acquiring hospitals from the comparison group.
 35. Using data reported to the AHA in its 2014 Annual Survey, the number of adjusted admissions is calculated by taking the number of inpatient admissions and adding to that value a number of imputed "outpatient admissions" based on the relative magnitudes of inpatient and outpatient revenue reported at the hospital (i.e., outpatient revenue is converted to an equivalent number of inpatient admissions).
 36. See, e.g., Connor et al. (1998), Spang et al. (2001), and Alexander et al. (1996).
 37. See, e.g., Connor et al. (1998) and Spang et al. (2001).
 38. To construct these composite indices, we normalize each component of the index by calculating the difference between each hospital's rate and the average rate of all hospitals, and then divide this difference by a measure of the dispersion of the rate. (In more technical terms, we transform each component to have a mean of zero and a standard deviation of one.) The composite outcome index is calculated as the simple average of these normalized components.
 39. See The Dartmouth Atlas of Health Care. (Available at <http://www.dartmouthatlas.org>.)
 40. Although these estimates suggest that mergers are associated with larger decreases in revenue than in costs, the precision of the estimates is such that the magnitudes of the reduction in costs and revenue are not statistically significantly different from each other.
 41. See, e.g., Cooper, Zack et al. "The Price Ain't Right? Hospital Prices and Health Spending on the Privately Insured," Health Care Pricing Project (2015). (Available at http://www.healthcarepricingproject.org/sites/default/files/pricing_variation_manuscript_0.pdf); Dafny, Leemore, Kate Ho, and Robin S. Lee, "The Price Effects of Cross-Market Hospital Mergers," *NBER Working Paper No. 22106* (2016). (Available at <http://www.nber.org/papers/w22106>); and Gaynor, Martin and Robert Town, "The impact of hospital consolidation – Update," *The Synthesis Project* (2012). (Available at http://www.rwjf.org/content/dam/farm/reports/issue_briefs/2012/rwjf73261.)
 42. We also interviewed one system's representative to a health care collaborative by phone but met with its leaders in person.
 43. In more technical terms, our analysis includes both Hospital Referral Region and year fixed effects.

ABOUT THE AUTHORS

Dr. Noether and Dr. May are vice presidents at Charles River Associates. The authors acknowledge that the American Hospital Association provided financial support for this research project. The conclusions set forth herein are based on independent research and publicly available material. The views expressed herein are the views and opinions of the authors and do not reflect or represent the views of Charles River Associates or any of the organizations with which the authors are affiliated.