

Comments on *Changes in Quality of Care after Hospital Mergers and Acquisitions*¹
By Sean May, Monica Noether, and Ben Stearns²

In their recent paper, Beaulieu et al. attempt to estimate the effects of hospital acquisitions on measures of hospital quality at the acquired hospitals. To do so, the authors use four measures of hospital quality and compare the changes in these measures at acquired hospitals relative to changes at a set of non-acquired “control” hospitals. The four quality measures used in the study include a measure of patient experience (a composite score reflecting patients’ satisfaction with their hospital experience, *e.g.*, whether they would recommend the hospital), a clinical process measure (a composite score reflecting *how* care is provided in the hospital, *e.g.*, how many heart attack patients were given aspirin when discharged), and two clinical outcome measures reflecting hospital-wide readmission rates and mortality rates.

The authors conclude that acquired hospitals (relative to a comparison group of non-acquired hospitals) experienced relative declines in patient experience measures, no relative changes in 30-day readmission or mortality rates, and relative improvement in clinical process measures. However, they note that improvements in clinical process measures could not be attributed definitively to the acquisitions because these measures began to improve prior to the acquisitions.

Beyond the ambiguity resulting from the inconsistencies in the authors’ findings, we believe that important limitations in their analyses caution against relying on their research.

The Authors Do Not Study Competition Among Hospitals

Before we discuss the analyses that the authors conducted, and the flaws therein, we first address what they *did not* do: the authors did not study the effects of hospital competition on quality. That is, none of the analyses undertaken in the paper directly measures how competition among hospitals affects hospital quality.

Rather, the authors attempted to measure how hospital acquisitions might affect quality. In order to use their analyses of hospital acquisitions to draw conclusions about the effects of hospital competition on quality, the authors would have to measure changes in the underlying competitive conditions in the local markets in which the acquisitions occurred. But the authors do not do this. Consequently, their study is uninformative about how changes in local hospital market structure might affect the quality of care provided to patients.

¹ Nancy D. Beaulieu, et al., *Changes in Quality of Care after Hospital Mergers and Acquisitions*. *New England Journal of Medicine* 382(1), January 2020: 51-59.

² The authors are economists at Charles River Associates. 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 organizations with which the authors are affiliated. Financial support was provided by the American Hospital Association.

This aside, if reductions in hospital competition lead to declines in hospital quality, quality at rival hospitals close to the acquired hospital should also decline.³ While the primary results of the study do not address this question—the authors “excluded local competitors [...] from the control group to reduce potential bias from effects of diminished local competition for patients”—the analysis is contained in the paper’s supplementary appendix.

In that analysis, the authors find no evidence that acquisitions lead to a decrease in the quality of nearby rival hospitals. Rather, rival hospitals performed slightly better than comparison hospitals for the composite patient experience and mortality rate outcome measures, but not by a statistically significant amount. For the clinical process composite and readmission rate outcomes, rival hospitals performed slightly worse, but, again, not by a statistically significant amount. That is, nothing in the authors’ results suggests that merger-induced increases in hospital concentration (or decreases in competition) are associated with declines in hospital quality of care.⁴

Despite this, the authors characterize their results as being consistent with “[p]revious studies [that] have generally shown that hospitalized patients have better outcomes in more competitive markets than in less competitive markets” and “consistent with a recent finding that increased concentration of the hospital market has been associated with worsening patient experiences.”⁵ Neither statement is supported by the authors’ analyses.

Data Restrictions Contribute to Imprecise Findings

The authors state that their results “provide no evidence of quality improvement attributable to changes in ownership.”⁶ However, their estimates of the effect of acquisitions on mortality rates and readmission rates are so imprecise that they cannot rule out the possibility that quality *improved* at the acquired hospitals. Put another way, the confidence intervals on their estimates are so wide that the authors cannot rule out that acquisitions did, in fact, cause mortality rates and readmission rates to decline (*i.e.*, an improvement in clinical quality) at the acquired hospitals relative to control hospitals.

Based on the authors’ estimates, mortality rates at the acquired hospitals might have improved by as much as 0.14 percentage points relative to control hospitals, from an average pre-acquisition mortality rate at the acquired hospitals of approximately 7 percent. Readmission rates at the acquired hospitals might have improved by as much as 0.34 percentage points, from an average pre-acquisition readmission rate at the acquired hospitals of approximately 17 percent.

³ If hospital consolidation leads to reduced competition and subsequently lower quality, that should be evident in the performance of all hospitals in the market (*i.e.*, a reduction in competition caused by an acquisition affects all hospitals in the market, not only the acquired hospital). See Leemore Dafny, Estimation and Identification of Merger Effects: An Application to Hospital Mergers. *The Journal of Law and Economics* 52, August 2009: 523-550.

⁴ Beaulieu et al. (2020), Table S14.

⁵ *Id.*, pp. 52, 56.

⁶ *Id.*, p. 56.

The imprecision of the authors' estimates is, in part, related to the fact that the authors study the effects of only about one third of the hospital acquisitions that they document in their data. In their supplementary appendix, the authors note that their research identified "547 deals consummated during our study period 2007-2016 involving 716 acquired hospitals."⁷ However, the authors limit their analysis to acquisitions consummated between 2009-2013 to allow them to study multi-year pre- and post-acquisition trends at the acquired and control hospitals. While this study design allows the authors to track these trends, an implication of their decision is that—after imposing this and other restrictions—the authors include in their study only 246 of the 716 hospital acquisitions they identified. This substantial reduction in the set of acquisitions studied makes their estimates of the effects of hospital acquisitions less precise.

In addition to excluding hospital acquisitions that occurred before 2009 or after 2013, the authors also exclude hospital acquisitions in which the acquired hospital was subsequently operated on the same license as a hospital in the acquiring system. While these types of acquisitions comprise a minority of transactions, previous research has found that these single-license transactions—which typically involve proximate hospitals—result in larger cost savings than transactions in which the acquired hospital maintains its own license.⁸ In the realm of hospital quality, operation of the acquired hospital on the same license may allow for a more complete integration of clinical protocols, EMR systems, and other quality-enhancing tools and processes. As such, by excluding these transactions, the authors may be excluding the acquisitions that were most likely to result in quality improvements.

The importance of sample size (*e.g.*, including as many hospital transactions as possible in the study) is evident in our own work on the quality effects of hospital transactions. Our work followed a broadly similar design to Beaulieu et al.: we examined all hospital acquisitions nationwide over a set time period and compared changes in quality at acquired hospitals with changes in quality at a group of control hospitals using risk-adjusted mortality rates and readmission rates published by the Centers for Medicare and Medicaid Services (CMS). In our first study, we analyzed hospital acquisitions between 2009 and 2014 and found statistically insignificant effects of hospital acquisition on mortality rates and readmission rates at the acquired hospitals.⁹ When we added data for the period between 2015-2017, however, we found statistically significant improvements in mortality rates and readmission rates at acquired hospitals.¹⁰

⁷ *Id.*, Supplementary Appendix at 3.

⁸ David Dranove and Richard Lindrooth. Hospital consolidation and costs: another look at the evidence. *Journal of Health Economics* 22(6), 2003: 983-997.

⁹ Monica Noether and Sean May. Hospital Merger Benefits: Views from Hospital Leaders and Econometric Analysis, January 2017.

¹⁰ Monica Noether, Sean May, and Ben Stearns. Hospital Merger Benefits: Views from Hospital Leaders and Econometric Analysis – An Update, September 2019.

The Authors' Ad Hoc Risk Adjustment Method Has Not Been Validated

While the authors use publicly available data from Medicare Hospital Compare to assess hospital performance on clinical-process and patient-experience measures of quality, they take a different approach for their outcome measures of readmission and mortality rates. Rather than using risk-adjusted, condition-specific mortality and readmission rates developed by CMS, the authors create their own “all-cause” risk-adjusted measures of readmission and mortality rates. The measures they create differ in meaningful ways from those developed by CMS and have not been validated against the “gold-standard” rates based on a review of patients’ medical records.

That the authors eschew the CMS outcome measures is surprising because the Medicare Hospital Compare data—used by the authors to obtain their clinical-process and patient-experience measures—also contain risk-adjusted mortality rates and readmission rates for three conditions: heart attack, heart failure, and pneumonia. These three CMS measures were developed by a team of clinical and statistical experts at Yale University under contract to CMS.¹¹ As described by these researchers, these measures “incorporate the more than 15,000 ICD-9-CM codes into a clinically coherent framework reflecting condition-specific risk-adjustment methodologies.”¹² Additionally, the three measures were “developed and validated in different populations—including, when available, against ‘gold standard’ medical chart-based models—to assess whether the claims results are a reasonable surrogate for the results from models using higher quality data.”¹³ In contrast, Beaulieu et al. do not appear to have validated their ad hoc risk-adjusted measures against risk-adjusted rates based on clinical data, nor do they appear to have estimated and validated their risk-adjusted measures in different populations.

More importantly, as noted by the CMS/Yale researchers, correctly risk-adjusting hospital-wide mortality or readmission rates can be complicated by several considerations, including “inadequate exclusion of patients for whom survival is not the primary goal, such as hospice and palliative care patients; inadequate risk adjustment for disease severity; failure to satisfactorily distinguish between conditions present on admission and events occurring after admission; and concerns of adequately addressing imbalances in both case mix and capability (*e.g.*, coronary artery bypass graft surgery performed or not) across hospitals.”¹⁴

While CMS/Yale researchers are developing a hospital-wide mortality measure, the risk-adjustment model they propose differs fundamentally from the one used by the authors. Specifically, the CMS/Yale researchers note that “[i]t is unlikely that the effect of risk variables

¹¹ CMS.gov, Hospital Inpatient Measures, <https://www.qualitynet.org/inpatient/measures>.

¹² Qualitynet.org, Risk-Adjustment Models for AMI and HF 30-Day Mortality (01/23/07), https://www.qualitynet.org/files/5d0d389c764be766b0102983?filename=Yale_AMI-HF_Report_7-13-05%2C0.pdf, p 1.

¹³ *Id.*, pp 1-2.

¹⁴ CMS, Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure: Draft Measure Methodology for Interim Public Comment, October 2016, https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/Downloads/Hospital-Wide_All-Condition_All-Procedure_Risk-Standardized-Mortality-Measure_Public-Comment.pdf.

(such as diabetes) would be homogeneous across all discharge condition categories. Therefore, we chose to group our cohort into clinically-related, service-line divisions where risk factors would likely be less heterogeneous, and then estimate separate regression models within each division.”¹⁵ In contrast, Beaulieu et al. estimate a single measure across all conditions and assume the risk variables in their model have the same relationship to expected mortality regardless of the patients’ underlying condition.¹⁶

Potential shortcomings of the authors’ ad hoc risk-adjustment method are suggested by the divergence of their findings regarding changes in process and outcome measures at acquired hospitals. Specifically, the authors find evidence that process measures of quality improved at acquired hospitals relative to control hospitals (although they dispute whether these improvements were attributable to the acquisition). However, the authors find no evidence that these improvements in how care was delivered at the acquired hospitals ultimately led to reductions in mortality or readmission rates. That is, while the authors may have found that acquired hospitals did better in providing aspirin to their heart attack patients, they find no evidence that adhering to such well-established care protocols improved the health of heart attack patients. But such a finding makes no sense given the well-known health literature that documents a relationship between processes and outcomes in health care.¹⁷

Because the authors have not validated the risk-adjustment methods used for their hospital-wide mortality and readmission rates, these methods differ in meaningful ways from those used by CMS, we conclude that it is not possible to draw any inferences regarding the relationship between hospital acquisitions and mortality or readmission rates based on the Beaulieu et al. study.

The Control Hospitals Differ From The Acquired Hospitals

As the authors explain, “the key assumption of [their] difference-in-differences analysis [is] that the pretransaction difference between control hospitals and acquired hospitals would have remained constant in the absence of the acquisitions.”¹⁸ However, in testing that assumption, the authors find that the clinical-process measures of the acquired hospitals changed differentially relative to comparison hospitals *prior* to acquisition.¹⁹ From this, the authors conclude that it is not possible to draw inferences regarding the effects of acquisition on clinical-process measures because their key assumption has been violated.

In addition to the pre-acquisition trend in clinical-process measures, Figure 1 of Beaulieu et al. shows a decline in patient-experience measures from two years before the acquisition (time $t-2$)

¹⁵ *Id.*, p. 24.

¹⁶ The same discussion applies equally to the measure of hospital-wide readmission rates developed by the CMS/Yale researchers and the measure used in Beaulieu et al.

¹⁷ Avedis Donabedian. Evaluating the Quality of Medical Care. *The Milbank Memorial Fund Quarterly* 44(3), 1966:166-203.

¹⁸ Beaulieu et al. (2020), p. 54.

¹⁹ *Id.*, Fig. 1 and Tables S4 and S5.

to four years after the acquisition (time $t+4$). If that decline were statistically significant, the existence of that pre-acquisition trend at acquired hospitals would also call into question the inferences the authors draw regarding the effect of acquisitions on patient-experience measures.

Both these apparent preexisting trends—in the clinical-process measures and the patient-experience measures—raise questions about the similarity of the control and treatment hospitals and whether the difference-in-differences framework used by the authors is isolating the effect of the hospital acquisition. This concern is not just limited to these two measures. The presence of the differential changes between the acquired and control hospitals for two of their four quality measures suggests that there may be differential changes in other factors that are related to quality.

It seems unlikely, for example, that a hospital would solely target improvements in its process measures of care without also undertaking broader changes designed to improve how care is delivered in the hospital. Given the likely broader scope of hospital-led efforts intended to improve the quality of care, the existence of differential changes in any quality measure (or anything that affects quality) at the acquired and control hospitals prior to the acquisitions suggests that the authors may not be isolating the causal effects of hospital acquisitions.

Hospital Experience Measures Are Flawed

The authors also examine trends in a composite measure of various patient experience indicators that are part of the Hospital Consumer Assessment of Healthcare Providers (HCAHPS), which CMS mandates that all Medicare-certified hospitals collect and report. They note a statistically significant decline in this measure that is equivalent to a reduction from the 50th percentile to the 41st percentile of performance, with the decline being largest for hospitals whose acquirers had low baseline performance on patient-experience measures. In addition to the broader concerns with the authors' methods that we described above, there are several reasons to believe that patient-experience measures of quality may be misleading, particularly when they conflict with information on clinical quality, as is the case in this study.

As one review of the literature on patient satisfaction measurement has noted, a patient's perception of his/her experience is inherently subjective. Importantly, it can result not only from the provision of medically appropriate care that actually improves outcomes, but also from medical interventions that patients demand but may have no effect, or even a negative effect, on health status (*e.g.*, over-prescription of ineffective antibiotics) or from amenities (*e.g.*, convenient parking and designer hospital gowns) that have no effect on outcomes and are costly to provide.²⁰ As a result, patients' responses to questions about their experiences at hospitals may reflect factors unrelated to the quality of clinical care. Because of this, analyses of patient-experience measures of quality should be interpreted with caution.

²⁰ Alexandra Junewicz and Stuart Youngner. Patient-Satisfaction Surveys on a Scale of 0 to 10: Improving Health Care, or Leading it Astray? *Hastings Center Report*. May-June 2015. p. 43.

Furthermore, while all hospitals are mandated to survey a random sample of their patients within two days and six weeks following patient discharge, response rates are variable, low, and have been falling since CMS began reporting the data.²¹ At least one study has found that hospitals with higher response rates tend to have higher scores.²² Moreover, hospitals are allowed to collect information in a number of ways: by phone, in writing, on line, or through a combined approach. They can also perform the data collection themselves or use a third-party vendor. While some adjustments are made to control for these methodological differences, it may not be possible to take into account all of the meaningful variations.

There is also evidence that socioeconomic, ethnic, and other demographic characteristics, as well as general expectations regarding the level of care received, can affect patients' perceptions of care. For example, a variety of studies have shown that lower socioeconomic status is associated with lower satisfaction, while age may be positively correlated with satisfaction.²³ Since the socioeconomic and demographic composition of hospitals varies substantially based on the service areas from which they draw and over time, such differences can undermine the validity of cross-hospital and temporal comparisons of such measures.

Several studies have found that the focus on patient experience in hospital choice (e.g., the availability of the HCAHPS scores on Medicare's Hospital Compare website) and its incorporation into Medicare reimbursement have led hospitals to "teach to the test." One study found when nurses are coached to inform patients that they are "closing the door and turning the lights out to keep the hospital quiet at night" rather than just performing the actions, patient responses improve on the HCAHPS question about whether the hospital is quiet.²⁴ That is, two hospitals may be equally quiet (or noisy), but the one whose nurses have been trained to inform patients that they are taking active steps to reduce noise receive higher scores.

²¹ In 2007, the nationwide rate averaged 34 percent, while by 2018, it had dropped to 26 percent. Summary of HCAHPS Survey Results, January 2018 to December 2018 Discharges, <https://hcahpsonline.org/globalassets/hcahps/summary-analyses/summary-results/october-2019-public-report-january-2018--december-2018-discharges.pdf> and Summary of HCAHPS Survey Results* October 2006 to June 2007 Discharges, <https://hcahpsonline.org/globalassets/hcahps/summary-analyses/summary-results/march-2008-public-report-october-2006--june-2007-discharges.pdf>. See, also, Hope Brown, Does Response Rate Impact HCAHPS Scores? The Beryl Institute. August 27, 2018.

²² California Hospital Foundation. Analysis Finds HCAHPS Response Rates Matter. July 19, 2017. https://www.calhospital.org/cha-news-article/analysis-finds-hcahps-response-rates-matter_ Indeed, CMS itself notes "the importance of a hospital's HCAHPS response rate." HCAHPS, "Hospital CHAPS Podcast Series – Transcript: Improving Response Rates of HCAHPS Hospitals." March 2018. <https://hcahpsonline.org/globalassets/hcahps/podcasts/improving-rr-podcast-script.pdf>

²³ Nicholas Arpey, Anne Gaglioti and Marcy Rosenbaum. How Socioeconomic Status Affects Patient Perceptions of Health Care: A Qualitative Study. *Journal of Primary Care and Community Health* 8(3). 2017: 169-175. C. Carolyn Thiedke. What Do We Really Know about Patient Satisfaction? *Family Practice Management*. January 2007: 33-36. Gay Becker and Edwina Newsom. Socioeconomic Status and Dissatisfaction with Health Care Among Chronically Ill African Americans. *American Journal of Public Health* 93, May 2003: 742-748.

²⁴ Junewicz and Youngner, p. 48.

Finally, there is evidence that focusing on patient experience can result in lower quality care. One study found that patients in the highest quartile of experience, as measured by the related Consumer Assessment of Health Plans Survey (CAHPS), had lower emergency department usage, but a higher probability of inpatient admission, greater prescription drug expenditures in the succeeding two years, and higher mortality rates in the succeeding four years (all after adjusting for various patient and insurance coverage characteristics).²⁵ Another study found that patients with musculoskeletal conditions who were prescribed opioids to treat their pain were 32 percent more likely to report being highly satisfied with their care, *i.e.*, being in the top quartile of respondents to the CAHPS survey, particularly when they were moderate or high users of opioids (rather than low or non-users).²⁶

All of these factors that affect how patients rate experience and how hospitals and clinicians respond to being evaluated on such subjective and potentially manipulatable measures, should cause substantial skepticism in the use of patient experience measures to evaluate changes in hospital quality.

²⁵ James Fenton et al., The Cost of Satisfaction: A National Study of Patient Satisfaction, Health Care Utilization, Expenditures and Mortality. *Archives of Internal Medicine* 172(5), March 12, 2012.

²⁶ Brian Sites, et al., Prescription Opioid Use and Satisfaction with Care among Adults with Musculoskeletal Conditions. *Annals of Family Medicine* 16(1), January/February 2018.