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Hospital M&A: The Effects on Quality, Cost, and Revenue

ALLIE MOLLO
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Reviewed and approved* by the following:

Stefan Lewellen
Assistant Professor of Finance
Thesis Supervisor

Brian Davis
Associate Clinical Professor
Honors Adviser

* Electronic approvals are on file.

ABSTRACT

This paper examines the effects of mergers and acquisitions (M&A) on target hospitals' quality of care, costs, and revenue comparative to non-target hospitals. I find that quality of care is moderately improved and both patient-associated cost and revenue are modestly reduced in target hospitals following deal activity. My results contrast with much of the literature on hospital M&A but are consistent with Sheen (2014)'s finding that M&A transactions lead to higher product quality and reduced prices.

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Chapter 1

Introduction

Over the past decade, hospital merger and acquisition (M&A) activity has accelerated as more hospitals have sought to leverage resources and efficiencies provided by synergistic deals (Knapp et al., 2017). This activity can be witnessed geographically across the country as hospital systems have continued to replace single hospital providers (Gaynor, 2012). Post-pandemic, it is unknown how deal activity will be impacted in the short-term as hospitals consider M&A projects as a potential strategic approach to lead economic and operational recovery. In addition, it is unclear how lawmakers will continue to regulate consolidation within the industry as regions become increasingly dominated by large hospital systems, leading to decreased competition.

This study contributes to the existing literature by providing evidence as to how mergers and acquisitions impact target hospitals and the communities they serve. Specifically, I examine the impacts of hospital M&A activity on quality, cost, and revenue in target hospitals relative to non-target hospitals located in the same state.

In Chapter 2, I examine the existing literature on hospital M&A and the general finance literature on M&A. Based on these literatures, I hypothesize that target firms' quality-of-care improve following deal activity, while patient-associated costs and revenues decrease.

To test this hypothesis, I combined data on hospital mergers with patient care, revenue, and cost data from Medicare's Center for Medicare and Medicaid Studies (CMS). I then estimated a stacked difference-in-differences regression model to examine whether statistically significant relationships exist in patient care or operating performance between target hospitals

relative to non-target hospitals in the same state. The hypothesis, data, and methodology are discussed in detail within Chapter 3.

I find that quality of care is moderately improved and both cost and revenue are modestly reduced in target hospitals following deal activity when compared to non-target in-state firms. Given the existing literature on hospital transactions, this study is the first to find a positive relationship between merger activity and quality of care in hospitals. Possible explanations for these results may relate to the overall efficiencies generally provided by M&A activity as well as the increasing selectivity of acquirers in methodically evaluating potential target hospitals. The output of the individual regression models used to estimate these results, as well as potential explanations for my results, are provided in Chapter 4.

As hospitals continue to consider consolidation, the evidence provided by this study supports the betterment of target hospitals and their respective communities following deal activity. The study's contributions to the literature, in addition to potential next steps for researchers and policymakers, are discussed in Chapter 5.

Chapter 2

Background

The existing literature on the consolidation of the United States hospital market suggests the impacts of hospital M&A activity on quality-of-care, patient-associated cost, and revenue are understood to varying degrees. However, the evidence provided by the existing literature on the effects of hospital M&A specifically are somewhat different than the suggestions of academic research on other markets and industries.

Existing Studies of Hospital M&A

With respect to quality-of-care, the evidence is mixed and generally suggests quality is unchanged as a result of M&A activity (Beaulieu et al., 2020; Noether and May, 2017; Ho and Hamilton, 2000). A study was recently published by the New England Journal of Medicine (NEJM) to investigate the effects on quality of care following hospital M&A. Through the use of Medicare claims data from 2007 to 2016, the study examined if these outcome measures had significantly changed following hospital acquisitions that occurred from 2009 through 2013 by conducting difference-in-differences regression analysis. The study used a set of outcome measures for 2 or 3 years before and 3 or 4 years after the transaction, and a control group that included all other hospitals that met the following specifications: were not acquired in 2007 through 2016, were not potential local competitors (hospitals within a 5-mile radius) and were not in-state acquirers. These hospitals were not included to reduce potential bias from the effects of diminished local competition as a result of hospital consolidation.

The study found that acquisitions are not associated with significant differential changes in 30-day readmission or mortality rates by the third-post transaction year. The study also concluded that despite excluding local competitors and in-state acquirers from the control group, transaction effects were not observed by these groups. However, one possible concern with the paper is that the outcome scores used were collected prior to the year they were published. In other words, scores used to evaluate 30-day readmission and mortality rates in the years following consolidation despite being published after the occurrence of deal activity, were collected prior to, and thus are miscategorized as post-deal outcome scores. As a result, using published annual data in the post-deal group (as the primary time variable in the study) may be problematic.

The findings of a study published in the year 2000 by the Journal of Health Economics are similar (Ho and Hamilton, 2000). The study concluded that mergers and acquisitions possibly damage quality. The study analyzed M&A deals in California between 1992 and 1995 particularly through inpatient mortality for heart attack and stroke patients, 90-day readmission for heart attack patients, and discharge within 48 hours for normal newborn babies. No measurable impact was found on inpatient mortality as a result of M&A, however, readmission rates and early discharge variables worsened in some cases.

The results of a study conducted by Charles River Associates for the American Hospital Association (AHA) are not similar to those described above (Noether and May, 2017). The study used interviews as well as quantitative analysis to assess the effects of hospital consolidation on patient-associated cost and revenue in addition to quality-of-care in United States target hospitals.

Through interviews, leaders of 20 diverse hospital systems articulated scale and breadth of services as a direct benefit of M&A. System leaders also cited savings and quality benefits as most commonly accomplished from the standardization of clinical care patterns following deal activity. Standardization was found to eliminate unnecessary and unproductive utilization while also preventing avoidable adverse events in target hospitals post-deal.

The quantitative analysis component of this study applied a difference-in-differences methodology to evaluate quality, cost, and revenue in target hospitals while controlling for other factors that may affect hospitals' costs and revenues specifically. Results of the quantitative analysis suggest small improvements were made in patient care quality following hospital transactions; however, these small improvements were not statistically significant. The study used individual outcomes measures available by the Centers for Medicare and Medicaid Services to then create a composite index to evaluate general changes to mortality and readmission to analyze hospital deals that occurred from 2009 to 2014. The study suggested this area would be well served by additional research as their results were consistent with previous research in finding a statistically insignificant relationship between deal activity and quality-of-care following consolidation.

In the quantitative analysis component of the study, CMS's Healthcare Cost Report Information System (HCRIS) data was also used to evaluate target firms' cost and revenue. The study normalized the cost and revenue data by dividing their output by the number of adjusted admissions to the hospital. The study's findings show target hospitals experience cost savings following M&A activity. More specifically, the empirical study's results imply $5.8 million of annual merger-related savings is experienced at each target hospital following deal activity. Also, annual operating expenses are reduced by 2.5 percent in acquired hospitals. The study also found

that net patient revenue per admission is reduced following transaction activity compared to non-target hospitals.

Multiple studies have also shown target hospitals' annual patient-associated costs are reduced following M&A activity (Schmitt, 2017; Harrison, 2011). These studies credit economies of scale with providing these cost savings for target hospitals. One of the studies in reference, when analyzing the years following the acquisitions, found average realized cost savings to be between 4 and 7 percent (Schmitt, 2017).

However, evidence is mixed with respect to the effect of deal activity on hospital revenue. One recent study examined rural target hospitals specifically and found inpatient charges decreased whereas outpatient charges increased (Williams et al., 2020). The difference in geographical scope of the papers makes comparison difficult; however, it does provide additional context on the directional shift of revenue.

Overall, the existing literature on hospital mergers finds quality-of-care to be unchanged and hospital costs to decrease in target hospitals following deal activity compared to non-target hospitals. As aforementioned, research results are varied with respect to hospital revenue due to variance in methodology used to evaluate this factor. Overall, this suggests: deal activity is unrelated to the care patients receive in target hospitals, target hospitals' costs are reduced due to the optimization and economies of scale of services, and the impacts to revenue are still inconclusively evaluated across hospital M&A literature.

Financial Literature

My study also relates to the general literature on the product market effects and financial effects of mergers as hospitals deals are an application of M&A. Thus, evaluating the financial and quality impacts of deal activity suggested by academics across industries provides additional insight on the general applicable theory of M&A to hospital consolidation.

For example, Sheen (2014) finds that M&A activity generally improves product pricing and quality after transactions in the longer-term. The study finds that when two competitors merge, their products focalize in quality, along with a price reduction relative to competitors. In more developed industries, these benefits can typically be fully appreciated within two to three years. More generally, Sheen finds that merger activity creates operational efficiencies and lower costs.

Sheen's findings on the effects of M&A on target firms are supported widely across the existing finance literature. A study on conglomerate firms published in The Journal of Finance found the majority of conglomerate firms to experience optimal growth across industry segments as it relates to industry factors and productivity through the use of plant-level data (Maksimovic et al., 2002). Also, a study on post-merger restructuring from the Journal of Financial Economics suggests acquirers restructure targets as a mechanism to capture their respective competitive advantage (Maksimovic et al., 2011). Targets that were retained following consolidation saw an increase in productivity whereas acquired targets who were sold off did not. Another study, which examined the impacts of acquisitions on productivity and profitability in the Japanese cotton spinning industry, saw an increase in target firms' productivity and profitability levels when acquired by more profitable firms (Braguinsky et al., 2014). The study credited acquiring owners/managers with superior demand management abilities as a potential reason for the

increase in both productivity and profitability in target firms. Collectively, these studies suggest M&A activity across industries can result in improved quality and profitability for targets.

My study relates to these studies in a number of ways. For example, consistent with Sheen (2014), I find that product quality (patient care) improves while revenues actually decline, suggesting either a price reduction or a reduction in unnecessary procedures. Additionally, Sheen (2014) finds merger activity precipitates lower costs which is shown in this study as a result of hospital M&A. Also, an increase in productivity in a hospital setting can be examined through improvements to product quality (patient care). Thus, evidence suggested by several of the aforementioned studies readily support the finding of this study that target hospitals firms experience improvements to quality-of-care and a reduction in revenue, which may be attributed to a reduction in price or unnecessary procedures following consolidation (Maksimovic et al., 2002; Maksimovic et al., 2011; Braguinsky et al., 2014).

However, the evidence presented by existing studies of hospital M&A is somewhat misaligned with financial literature. As aforementioned, evidence suggested by studies of hospital M&A suggest quality-of-care is unchanged by deal activity. This notion differs from the findings of financial literature which consistently suggests firms are more profitable and efficient following merger activity. The difference in findings may be attributed to several factors such as the data used to evaluate quality-of-care in this study and the general improvement of quality-of-care across target and non-target firms.

One goal of this study is to better understand why the existing literature has arrived at different results despite the examination of several questions related to consolidation. Thus, this study's examination of target hospitals after consolidation contributes to the existing hospital M&A literature by suggesting quality-of-care is improved post-deal while costs and revenue are

reduced. In other words, this study provides counter evidence to existing hospital M&A findings in its suggestion that consolidation provides benefits to both the target and its patients specifically through quality-of-care, cost, and revenue.

This research provides new evidence to display the alignment between existing studies of hospital M&A and financial literature. Although this study examines a similar question as the aforementioned hospital M&A literature, the methodology applied to evaluate the mixed evidence suggested by hospital consolidation research contributes to the field of research.

Chapter 3

Hypothesis, Data & Methodology

This section will explain the study's hypothesis, chosen data sets, and the methodology that was used within the analysis. The section will first define its hypothesis, then the sources and application of the data used in the study, and how changes were made to prepare the data for further analysis.

As previously mentioned, the existing financial literature suggests M&A activity provides enhanced efficiency and profitability across target firms, despite the mixed evidence provided by the hospital M&A literature. Given the findings of the existing literature across hospital M&A and finance, I hypothesize that target firms' quality-of-care improve following consolidation, and patient-associated costs and revenues decrease. Thus, this study seeks to examine the relationship between the effects of hospital consolidations relative to the consistent evidence provided by financial literature on the impacts of M&A activity to provide additional research in a topic area where findings are currently mixed.

To test this hypothesis, the study required data related to hospital deals, patient care outcomes, patient-associated cost, and revenue. Patient care, patient-associated cost, and revenue data were identified and collected prior to and following a deal in order to determine whether or not a significant change had occurred in target hospitals as a result of the transaction activity.

Empirical Strategy

To examine if significant changes to patient care outcomes following hospital deal transactions occurred, I first gathered hospital merger and acquisition data from a dataset

provided by Cooper et al., 2015 that lists all hospital M&A targets and acquirers from 2000 to 2014. For each hospital, in each year, there are variables indicating whether the hospital was either acquired or was an acquirer in that year. Deals were assumed to be completed on the closing date unless such date was not available, in which case the announcement date was used.

Once merger and acquisition data was identified, the study then utilized Medicare claims and Hospital Compare data to map patient care outcome measures to each hospital and its status as a target or acquirer. To measure significant changes to patient care outcomes as a result of hospital deal activity, data was used during the pre- and post-deal phases. Importantly, data was coded as being pre-deal or post-deal based on when it was *collected*, not when it was reported. For each measure, Medicare typically collects data over a three-year period and then reports the data the following year. The chart below reports the collection periods for the Medicare data used in the study.

Table 3-1: Mortality & Readmission Measure Collection Timeline

Year	Report Date	Collection Start Date	Collection End Date
2012	Oct-12	7/1/08	6/30/11
2013	Oct-13	7/1/09	6/30/12
2014	Dec-14	7/1/10	6/30/13
2015	Dec-15	7/1/11	6/30/14
2016	Dec-16	7/1/12	6/30/15
2017	Oct-17	7/1/13	6/30/16
2018	Oct-18	7/1/14	6/30/17
2019	Oct-19	7/1/15	6/30/18
2020	Jul-20	7/1/16	6/30/19

The years of existent overlapping data between the merger and acquisition and patient care data were identified as 2012 to 2020. Although hospital merger and acquisition data was

available from 2000 to 2014, a lack of available patient care outcome data prior to 2012 in csv format prevented any previous years' merger and acquisition data from being utilized in the study.

Thus, the study involved hospital deals that occurred exclusively during the years 2012, 2013, 2014. More specifically, the study examined whether hospitals identified as a target in 2012, 2013, and 2014 experienced significant changes to their patient care outcomes following a deal's occurrence while controlling for various fixed effects. To evaluate if significant changes occurred to these measures as a result of M&A activity, pre- and post-deal periods were determined for each target hospital in those respective years. The pre-period was established by using all data that has a collection end date of exactly one year before the transaction, and the post-deal period consists of all data that has a collection end date of exactly one year after the deal.

The study required the use of a series of consistent patient care outcome measures in order to analyze any significant changes over the pre- and post-deal periods. The study used six outcome measures described in detail in the table below from the Centers for Medicare & Medicaid Services Measures Inventory Tool ("Measure Inventory Page"). These six measures were chosen as they were the only patient care outcome measures available in each year prior to and following hospital mergers and acquisitions in 2012, 2013, and 2014.

Table 3-2: CMS Measure Description

Measure ID	Measure Name	Measure Description
MORT_30_AMI	Hospital 30-day, All-Cause, Risk-Standardized Mortality Rate Following Acute Myocardial Infarction (AMI) Hospitalization	This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal diagnosis of acute myocardial infarction (AMI) non-federal hospitals.
MORT_30_HF	Hospital 30-day, All-Cause, Risk-Standardized Mortality Rate Following Heart Failure (HF) Hospitalization	The measure estimates a hospital 30-day risk-standardized mortality rate (RSMR). Mortality is defined as death for any cause within 30 days after the date of admission of the index admission, for patients 18 and older discharged from the hospital with a principal diagnosis of heart failure (HF).
MORT_30_PN	Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate Following Pneumonia Hospitalization	This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal discharge diagnosis of pneumonia, including aspiration pneumonia or a principal discharge diagnosis of sepsis (not severe sepsis) with a secondary discharge diagnosis of pneumonia (including aspiration pneumonia) coded as present on admission (POA).
READM_30_AMI	Acute myocardial infarction (AMI) 30-day Readmission Rate	This measure estimates a hospital-level, 30-day risk-standardized readmission rate (RSRR) for patients discharged from the hospital with a principal diagnosis of acute myocardial infarction (AMI).
READM_30_HF	Heart failure (HF) 30-day Readmission Rate	This measure estimates a hospital-level, 30-day RSRR for patients discharged from the hospital with a principal diagnosis of HF.
READM_30_PN	Pneumonia (PN) 30-day Readmission Rate	The measure estimates a hospital-level 30-day, all-cause RSRR for patients discharged from the hospital with either a principal discharge diagnosis of pneumonia, including aspiration pneumonia or a principal discharge diagnosis of sepsis (not severe sepsis) with a secondary diagnosis of pneumonia (including aspiration pneumonia) coded as present on admission (POA) and no secondary discharge diagnosis of severe sepsis coded as POA.

These six outcome measures used to evaluate patient care can be broken down into two categories: mortality and readmission rates. Mortality measures were used in this study to measure patient care outcomes as the risk of mortality is commonly increased when there are lapses in quality of care. The CMS' mortality measures assess death from any cause within 30 days of hospitalization, regardless of whether the patient dies while still in the hospital or after discharge from the hospital ("Mortality Measures"). The standardization period of 30 days was used to place an emphasis on transitions in care and suitability of a patient for discharge while preventing variation in length of hospital stays from having an undue influence on mortality rates. The mortality measure is often referred to by the CMS as the 30-day risk-standardized mortality rate (RSMR).

Readmission measures assess unplanned readmissions for any reason within 30 days of discharge from a hospital stay. The CMS 30-day risk standardized readmission measures assess a wide set of healthcare activities that affect patients' health and well-being ("Readmission Measures"). Outcomes are better when a patient receives high-quality care during their hospitalizations and their transition to the outpatient setting. Patients may have been readmitted to the same or to a different hospital. Planned readmissions are removed from the outcome measure. The readmission measure is often referred to as the 30-day risk-standardized readmission rate (RSRR).

The measure outcomes provided by the CMS are risk-adjusted and standardized. To ensure accurate assessment of each hospital, the measures use statistical models to adjust for key differences in patient risk factors that are clinically relevant and have strong relationships with the outcome. This may include but is not limited to age and patient comorbidities. These risk

factors are obtained for each patient from Medicare claims extending 12 months prior to and including the index admission. The statistical models adjust for patient differences based on the clinical status of the patient at the time of admission, not complications that arise during the course of the index admission. The common formula for calculating a risk-adjusted rate for a clinician is the following ("Measure Management System"):

Risk-adjusted rate = (observed rate / expected rate) * reference population rate

A hospital's "score" is represented by their RSMR or RSRR for a particular mortality or readmission measure. A greater RSMR or RSRR indicates a worse outcome. Hospital's rates of mortality and readmission are compared to the national rate to determine if a hospital's performance is better than the national rate (lower), no different than the national rate, or worse than the national rate (higher). The performance category is not a simple comparison of a hospital's RSMR/RSRR to the national observed rate whereby if the hospital's rate is lower than the national observed rate. Instead, CMS categorizes a hospital's performance on the measures based on how the hospital's 95% interval estimate on a particular measure compares to the national observed rate for that measure. The interval estimate represents the range of probable values of the RSMR/RSRR; a 95% interval estimate indicates that there is 95% probability that the true value of the rate lies between the lower limit and the upper limit of the interval.

Each of the annual measures within the two data categories, mortality and readmission, were used to compute a composite score. This was used to provide an overall output of mortality outcomes using each of the three individual measures. Each measure was standardized across all hospitals in the United States each year to enhance the consistency of the overall composite

measure. Through standardization, the mean or median of all annual measures was set equal to zero and the standard deviation was set equal to one. STATA was used to combine the mergers and acquisitions dataset with the Medicare dataset detailed above once the standardization was completed.

In addition to patient care outcome data, the study also examined how hospital costs and revenues are affected by M&A activity. To examine if there is a causal relationship between these, two datasets were used. The first dataset uses cost and revenue report data files from the Hospital 2522-2010 and 2522-1996 form ("Cost Reports"). These reports are made available by CMS's Healthcare Cost Report Information System (HCRIS). The HCRIS annual database contains annual cost and revenue reports for all hospitals that participate in the Medicare program.

The file structure has changed over the years. Hospital cost reports beginning before May 1st, 2010 were reported on the old 2522-1996 form; however, all reports beginning on or after this date were reported using the 2522-2010 form. The data used in the study was from fiscal years 2008 to 2020 to align with the pre- and post-periods used in the patient care outcome data.

Three fields from these annual reporting forms were used in the analysis: total costs, outpatient charges, and inpatient charges. These fields can be found on Worksheet C Part 1, line 200.00 and columns 5.00, 6.00, and 7.00. Each field for a respective hospital includes a subtotal of the following cost centers: inpatient routine cost centers, ancillary service cost centers, outpatient service cost centers, other reimbursable cost centers, and special purpose cost centers ("The Provider Reimbursement Manual - Part 2."). Each of these cost centers involves patient care specifically and does not include general service cost centers such as administrative &

general, cafeteria, nursing school, etc. A more detailed description of each of these individual cost centers is included in the appendix.

The dataset also provided data on each hospital's annual outpatient and inpatient charges. In other words, these fields examine the gross patient revenue to both outpatients and inpatients. More specifically, the fields for each hospital's outpatient and inpatient gross patient charges includes charges for charity care patients, and where applicable, standard customary charges for items reimbursed on a fee schedule such as DME, oxygen, prosthetics, and orthotics. These total charges are for provider services only.

Due to a lack of data availability, the data used to evaluate patient-associated revenue were not adjusted to reflect the number of annual hospital admissions. In other words, these fields reflect total hospital-level annual patient-associated revenue which may be affected by changes to the number of procedures or patients a hospital may complete or treat irrespective of the revenue per patient episode. However, the empirical tests that utilize this data contain hospital fixed effects that should largely absorb persistent hospital characteristics such as hospital size or patient demographics.

Both the total cost and respective charges measures are summations used to evaluate whether these cost centers significantly changed following an acquisition. These values can be used as general indicators to show if overall patient-related costs and charges significantly increased or decreased as a result of a deal in target hospitals. The dataset used in the study uses a roll-up of values, and thus does not indicate which specific cost centers were primarily indicative of overall trends.

The second dataset evaluates patient-associated hospital costs by examining significant changes to annual Medicare spending per beneficiary (MSPB) on a hospital facility-level

following an acquisition. The clinician measure MSPB assesses the cost to Medicare as a result of services performed by an individual clinician during an MSPB episode ("Medicare Spending Per Beneficiary (MSPB) Measure Methodology").

More specifically, the MSPB measure captures whether Medicare spends more, less, or about the same for an episode of care at a specific hospital in comparison to all hospitals in the United States. Medicare Part A and Part B payments are included in an MSPB episode for services provided 3 days prior to, during, and 30 days following a patient's inpatient stay. This measure also takes into account internal patient factors such as patient age and health status, also known as risk adjustment, and geographic payment differences called payment-standardization.

Although this measure provides an overall comparison of a hospital's Medicare spending relative to the national average, it is used in this study to determine whether spending patterns change following acquisitions. In other words, although no specific dollar values are used in this measure to display Medicare spending for a specific episode, an overall significant change in MSPB would provide context to show if a hospitals MSPB was affected following treatment.

Regression Analysis

A stacked difference-in-differences regression model was used to evaluate changes in patient care quality measures at target hospitals before and after M&A activity in comparison to changes in identified control hospitals. In particular, for each merger event, the control group was defined as all hospitals in the same state as the target firm that were not themselves an M&A target in the event year. Data for each event was then stacked on top of each other in "event

time," such that one pre-merger and one post-merger observation was included for each type of firm (treated and control) for each event.

The advantage of the "stacked" difference-in-differences design over traditional panel data difference-in-differences designs is that the control group definition and the number of pre-event and post-event periods are kept standard across all events, thus creating a series of near-identical "experiments" that are simply stacked on top of each other to create the final dataset. In contrast, in a typical panel data setting with staggered treatment adoption, the number of pre-event and post-event observations will likely vary across events, and even with stringent fixed effects (such as geography × time fixed effects), multiple treated firms that share (say) the same geography-time classification will essentially be grouped together as a single event. The main regression specification is:

$$y_{imst} = \alpha + \beta\, Post_{mst} + \gamma Target_{ims} + \delta Post \times Target_{imst} + \eta_i + \nu_m + \theta_t + \varepsilon_{imst},$$

where *y* indicates an outcome variable (such as a patient care composite or individual measure), *Post* is an indicator variable taking the value of one in the post-event period and taking a value of zero otherwise, *Target* is an indicator variable that takes the value of one if the firm was acquired and takes the value of zero otherwise, *Post* × *Target* is an interaction term, *i* indexes hospitals, *m* indexes merger events, *s* indexes states, and *t* indexes event time (that is, years before or after the merger).

In addition, the baseline regression contains fixed effects for each hospital, each year, and each event period.[1] In effect, the regression compares a hospital that was just acquired to other hospitals in the same state at the same point in time, controlling for any time-invariant differences across hospitals, any systematic events affecting all hospitals at a given point in time, and any systematic differences between the pre-event and post-event periods across all merger events in the sample. Since treatment occurs at the hospital level, standard errors are clustered by hospital and by year.[2]

We also report results for a more stringent specification that includes *event*-level (i.e., individual merger) fixed effects and clusters standard errors by event. These tests effectively control for any factors that might lead to systematic differences between the various merger events in our sample. In these specifications, for the result to be driven by some characteristic other than the merger event itself, it would have to be the case that treated hospitals systematically improve patient care relative to control hospitals in the same state *just after the acquisition* (but not before) for reasons unrelated to the acquisition itself.

Our baseline data set consists of an unbalanced panel of non-unique hospital-measure-year observations.[3] In many cases, data from the pre-merger period is not available for a given merger because CMS data is only available in research-friendly formats from 2012 onward. We kept such events in the baseline dataset because, intuitively, there is no reason why CMS's decision to change reporting formats in 2012 should be correlated with any hospital merger

[1] Since only one pre-event and one post-event observation are included for each treatment and control hospital, this fixed effect is essentially a *Post* fixed effect and causes the *Post* variable to be absorbed in the regression specification.

[2] The process of clustering standard errors helps to correct for any serial correlation across residuals at the level of a hospital or a given year.

[3] Because we employ a stacked approach, the same hospital-measure-year observation may appear multiple times within the dataset if that observation represents part of the control group for more than one treatment event.

events, and hence, there is no reason to expect selection bias in the corresponding results. Nonetheless, we also report results for a (much smaller) balanced panel that restricts the sample to only include events that have valid pre- and post-merger data.

Chapter 4

Results

The study's regression analysis results are consistent with the original hypothesis. There is modest evidence to support that hospital M&A activity improves patient care outcomes while decreasing total patient-associated hospital costs and revenue. In other words, the study's results indicate that hospital consolidation enhances efficiency and product quality (patient care). This can be viewed by analyzing the application of two samples across two regression models. The study's regression outputs using the composite Medicare measures are presented in the tables below.

Table 4-1: Unbalanced Panel, Baseline Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Standardized Mean Mortality Measure	Standardized Mean Readmission Measure	Standardized Median Mortality Measure	Standardized Median Readmission Measure	MSPB Measure	Total Cost Measure	Outpatient Charges Measure	Inpatient Charges Measure
Target	-0.0129	0.0728*	0.00997	0.0918**	0.00215	0.0529	0.0576	0.0568*
	(0.0350)	(0.0351)	(0.0533)	(0.0362)	(0.00202)	(0.0359)	(0.0339)	(0.0274)
Target x Post	**0.0371**	**-0.117****	**-0.00278**	**-0.152****	**-0.00233**	**-0.0608**	**-0.0915***	**-0.0738***
	(0.0489)	(0.0475)	(0.0654)	(0.0444)	(0.00343)	(0.130)	(0.0474)	(0.0326)
Fixed Effects	Hospital Year	Hospital Year	Hospital Year	Hospital Year	Hospital Year	Hospital Year	Hospital Year	Hospital Year
Clustering	Event-time Hospital, Year	Event-time Hospital, Year	Event-time Hospital, Year	Event-time Hospital, Year	Event-time Hospital, Year	Event-time Hospital, Year	Event-time Hospital, Year	Event-time Hospital, Year
Observations	57,369	57,383	57,369	57,383	40,376	51,769	55,296	55,234
R-squared	0.705	0.717	0.666	0.678	0.909	0.956	0.970	0.935

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4-2: Unbalanced Panel, Event FE Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Standardized Mean Mortality Measure	Standardized Mean Readmission Measure	Standardized Median Mortality Measure	Standardized Median Readmission Measure	MSPB Measure	Total Cost Measure	Outpatient Charges Measure	Inpatient Charges Measure
Target	-0.0193	0.0561	0.00366	0.0757	0.00139	0.0540***	0.0552***	0.0511**
	(0.0394)	(0.0435)	(0.0431)	(0.0489)	(0.00261)	(0.0164)	(0.0190)	(0.0207)
Target x Post	**0.0455**	**-0.0944***	**0.00526**	**-0.131****	**-0.00117**	**-0.0645*****	**-0.0904*****	**-0.0738*****
	(0.0444)	(0.0488)	(0.0487)	(0.0546)	(0.00285)	(0.0233)	(0.0287)	(0.0269)
Fixed Effects	Hospital	Hospital	Hospital	Hospital	Hospital	Hospital	Hospital	Hospital
	Event	Event	Event	Event	Event	Event	Event	Event
	Event-time	Event-time	Event-time	Event-time	Event-time	Event-time	Event-time	Event-time
Clustering	Event	Event	Event	Event	Event	Event	Event	Event
Observations	57,369	57,383	57,369	57,383	40,376	51,769	55,296	55,234
R-squared	0.708	0.725	0.671	0.686	0.914	0.958	0.971	0.942

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4-3: Balanced Panel, Baseline Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Standardized Mean Mortality Measure	Standardized Mean Readmission Measure	Standardized Median Mortality Measure	Standardized Median Readmission Measure	MSPB Measure	Total Cost Measure	Outpatient Charges Measure	Inpatient Charges Measure
Target	0.000935	0.0577	0.0250	0.0640	0.00177	0.0590**	0.0570*	0.0563*
	(0.0375)	(0.0393)	(0.0547)	(0.0444)	(0.00228)	(0.0180)	(0.0263)	(0.0258)
Target x Post	**0.0343**	**-0.116**	**-0.00268**	**-0.140***	**-0.00257**	**-0.0391**	**-0.0462**	**-0.0432**
	(0.0591)	(0.0664)	(0.0761)	(0.0690)	(0.00424)	(0.0266)	(0.0338)	(0.0382)
Fixed Effects	Hospital	Hospital	Hospital	Hospital	Hospital	Hospital	Hospital	Hospital
	Year	Year	Year	Year	Year	Year	Year	Year
	Event-time	Event-time	Event-time	Event-time	Event-time	Event-time	Event-time	Event-time
Clustering	Hospital, Year	Hospital, Year	Hospital, Year	Hospital, Year	Hospital, Year	Hospital, Year	Hospital, Year	Hospital, Year
Observations	33,345	33,348	33,345	33,348	25,726	30,593	32,767	32,729
R-squared	0.706	0.721	0.668	0.685	0.910	0.984	0.990	0.985

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4-4: Balanced Panel, Event FE Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	Standardized Mean Mortality Measure	Standardized Mean Readmission Measure	Standardized Median Mortality Measure	Standardized Median Readmission Measure	MSPB Measure	Total Cost Measure	Outpatient Charges Measure	Inpatient Charges Measure
Target	-0.000640	0.0600	0.0234	0.0661	0.00173	0.0594***	0.0570***	0.0553***
	(0.0359)	(0.0388)	(0.0399)	(0.0440)	(0.00237)	(0.0172)	(0.0197)	(0.0206)
Target x Post	**0.0378**	**-0.119**	**0.000822**	**-0.143***	**-0.00231**	**-0.0396**	**-0.0455**	**-0.0408**
	(0.0695)	(0.0730)	(0.0767)	(0.0794)	(0.00367)	(0.0267)	(0.0305)	(0.0330)
Fixed Effects	Hospital Event Event-time	Hospital Event Event-time	Hospital Event Event-time	Hospital Event Event-time	Hospital Event Event-time	Hospital Event Event-time	Hospital Event Event-time	Hospital Event Event-time
Clustering	Event	Event	Event	Event	Event	Event	Event	Event
Observations	33,345	33,348	33,345	33,348	25,726	30,593	32,767	32,729
R-squared	0.706	0.721	0.668	0.686	0.910	0.984	0.990	0.985

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The first sample is applied in the two regression outputs presented in Table 4-1 and Table 4-2. The sample used in both aforementioned tables includes hospitals in the control group that did not have both pre- and post-deal Medicare data available, which is referred to as an unbalanced panel.

Table 4-1 represents the baseline regression output. This regression model does not include event fixed effects. According to the output presented, hospitals in 2012, 2013, and 2014 experienced a moderately significant decline in readmission rates in addition to outpatient and inpatient charges following M&A activity. More specifically, the mergers on average led to a 0.152-standard deviation decrease in the Standardized Median Readmission Measure. In addition, the mergers on average led outpatient and inpatient charges respectively to decrease by 9.15% and 7.38%. This supports the notion that patient care outcomes improve after M&A activity occurs. Additionally, the revenue associated with both total outpatients and inpatients declined significantly following M&A activity.

The results shown in Table 4-1 are further reinforced by Table 4-2. This regression model uses the same sample of data shown in Table 4-1, which includes hospitals that did not have both pre- and post-deal Medicare data available, while also controlling for event fixed effects. This regression model provides the most econometrically stringent results in the study due to the use of event fixed events, which should capture any factors affecting hospitals in the same state during the period around each hospital merger.

Table 4-2 shows that identified target hospitals in 2012, 2013, and 2014 experienced a significant reduction in both annual readmission rates as well as total costs, outpatient charges, and inpatient charges. Based on the panel, the mergers on average led to a 0.131-standard deviation decrease in the score. Also, total cost decreased by about 6.45%, while outpatient charges and inpatient charges decreased by 9.04% and 7.38%, respectively.

These results provide modest support for the notion that hospital M&A leads to improved patient care outcomes, decreased total patient-associated hospital costs, and charges to outpatients and inpatients. However, the improvements to patient care outcomes can only be viewed with respect to the readmission measure as there is no statistical evidence shown to support significant improvements to annual mortality rates across target hospitals following M&A activity. Thus, as displayed by the results shown below in Table 4-2, hospital M&A activity provides positive effects to both the target hospital and the patients they support.

Table 4-3 and Table 4-4, however, use a balanced sample in the control group to exclusively evaluate hospitals with pre- and post-deal Medicare data available. This sample provides enhanced comparison for treatment and control hospitals with the presence of a balanced control group. However, as previously mentioned, this sample has 65% less observations than the unbalanced sample shown in Table 4-1 and Table 4-2. Thus, although the

sample used in the following table may be viewed as an enhanced comparison, the lack of observations significantly reduces the statistical power of the regression output.

Table 4-3 shows the balanced sample applied to the baseline regression model that does not contain event fixed effects. The output provides modest statistical evidence that annual hospital readmission rates decreased following M&A activity in target hospitals. The results displayed in Table 4-3 suggests the mergers on average led to a 0.14-standard deviation decrease in the Standardized Median Readmission Measure.

The model shown in Table 4-4 uses the event fixed effects on the balanced sample, and also provides modest statistical evidence for a decrease in annual hospital readmission rates following M&A activity. Specifically, the output suggests M&A activity leads to a 0.144-standard deviation decrease in the Standardized Median Readmission Measure. Changes to all other variables were insignificant in both balanced regression outputs.

This is likely attributed to the lack of observations used in the test; the magnitudes are similar to the results shown for each variable in Table 4-1 and Table 4-2, especially the Standardized Median Readmission Measure. Thus, despite having much lower statistical power, the similar magnitude shown in the regression output suggests these outputs also present compelling results to support the tests displayed in Table 4-1 and Table 4-2. Overall, this output supports the hypothesis with relation to a general improvement in patient care and a reduction in total hospital patient-associated costs and revenues following M&A activity.

To isolate the statistically significant results presented consistently across each regression panel for the Standardized Median Readmission Measure variable, additional tests were conducted to evaluate each of the individual readmission measures that comprise the composite variable (READM_30_AMI, READM_30_HF, and READM_30_PN). These results provide

context to suggest what the significant reduction in the readmission variable across each panel may be attributed to. To provide this context, the two regression models, baseline and event fixed effect, were applied to the unbalanced sample of patient care outcome data. The unbalanced sample was chosen as a result of its greater statistical power comparative to the balanced sample due to its significantly greater number of observations.

Table 4-5: Individual Measures Unbalanced Panel, Baseline Specification

Variables	(1) Standardized Readmission AMI Measure	(2) Standardized Readmission HF Measure	(3) Standardized Readmission PN Measure
Target	0.0114	0.0930	0.0979
	(0.0310)	(0.0493)	(0.0660)
Target x Post	**-0.0573**	**-0.153****	**-0.145**
	(0.0652)	(0.0595)	(0.104)
Fixed Effects	Hospital	Hospital	Hospital
	Event	Event	Event
	Event-time	Event-time	Event-time
Clustering	Event	Event	Event
Observations	23,692	40,196	42,302
R-squared	0.572	0.642	0.633

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4-6: Individual Measures Unbalanced Panel, Event FE Specification

Variables	(1) Standardized Readmission AMI Measure	(2) Standardized Readmission HF Measure	(3) Standardized Readmission PN Measure
Target	0.0136	0.0916*	0.0989
	(0.0623)	(0.0490)	(0.0602)
Target x Post	**-0.0607**	**-0.150***	**-0.145**
	(0.0999)	(0.0809)	(0.0956)
Fixed Effects	Hospital	Hospital	Hospital
	Event	Event	Event
	Event-time	Event-time	Event-time
Clustering	Event	Event	Event
Observations	23,692	40,196	42,302
R-squared	0.577	0.645	0.636

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Based on the regression panels above in Table 4-5 and Table 4-6, one individual measure is generally responsible for the significant change in the readmission composite variable shown in Table 4-1, Table 4-2, Table 4-3, and Table 4-4. The results show that mergers on average lead to a 0.15-standard deviation decrease in the READM_30_HF variable score. However, the magnitude displayed by the Standardized Readmission PN Measure is still similar in magnitude despite not qualifying as statistically significant. Thus, across both unbalanced individual measure regression outputs displayed in Table 4-5 and 4-6, only one individual readmission measure variable experienced a statistically significant reduction.

Potential Explanations for Results

The results previously described suggest that as a result of transaction activity, modest improvements to patient care outcomes in addition to the lowering of total hospital patient-associated revenues and costs occur in target hospitals. Each of the four main regression outputs display improvement to the Standardized Median Readmission Measure variable. The statistically significant reduction of this variable in the study's results suggests a moderate improvement to general patient care is a result of M&A activity in target hospitals.

In addition, the most econometrically stringent regression panel, also found target hospitals experience a significant reduction in total patient associated-costs in addition to both outpatient and inpatient charges following M&A activity. This contributes to the findings of this study by providing significant evidence that transaction activity can result in the reduction of both outpatient and inpatient charges as well as to total patient-associated hospital costs. In other words, deal activity can decrease the costs hospitals pay associated to patient care while also decreasing the amount both outpatients and inpatients pay for the care they receive in the form of charges.

The results found by this study are generally unsupported by the existing literature on the effects of hospital M&A activity with respect to quality enhancement (patient care). However, the findings of this study on quality-of-care is supported by the existing financial literature. Thus, the patient care outcome results of this study provide new findings to hospital M&A literature that suggest there are patient care benefits associated with hospital consolidation in targets. More specficially, this study is the first of hospital M&A academic literature to provide statistically significant evidence to suggest hospital deals and quality-of-care are positively related.

As previously discussed, the existing literature largely finds quality of care to change insignificantly following M&A activity despite consistent observation across financial literature that M&A activity improved product quality (Maksimovic et al., 2002; Maksimovic et al., 2011; Braguinsky et al., 2014). The variation in results between the existing hospital M&A literature and this study may be explained through several differences in methodological approaches used to evaluate similar questions.

The previously mentioned study by the NEJM results varied with this study. The NEJM study found that acquisitions were not associated with significant differential changes in 30-day readmission or mortality rates by the third-post transaction year. This study, however, found a statistically significant reduction in 30-day readmission rates in target hospitals relative to non-target in-state hospitals. The difference in results between these studies may be attributed to two key methodological factors: the parameters used to define the respective control groups and pre- and post-periods for difference-in-differences regression analysis.

The NEJM study defined their control group as all United States hospitals while excluding hospitals within a 5-mile radius of acquired hospitals and acquirers located in the same state as the hospitals they were acquired. This study, however, exclusively used in-state hospitals in each treatment hospitals respective control group. The control group was defined as such in this study to provide enhanced characteristic comparison to evaluate the changes observed each variable following deal activity. This study sought to use hospitals in geographic proximity to generate improved comparative factors for target hospitals and non-target firms. Thus, by providing more specific geographic alignment between the control and treatment group, this study aimed to align comparative factors between observations with more similar socioeconomic characteristics.

In addition, as previously mentioned, the NEJM study used data to evaluate patient care outcome scores in the post-period that were collected prior to the year they were published. As a result, the use of published annual data in the post-deal group may be problematic when evaluating the study's overall results. This study's pre-period was established using the file and any additional files with collection periods that end at least one year before the transaction year. The post-period was established using the file and any additional files with collection periods that start at least one year after the transaction year. The difference in definition of the pre- and post-period used in the respective difference-in-differences regression models may also explain possible differences in results between these two studies.

The findings of the NEJM study are also supported by the previously mentioned Charles River Associates study for the AHA. The study found small yet statistically insignificant improvements were made to patient care quality following hospital transactions. The different output observed by Charles River Associates and this study specifically may also be attributed to the methodology used to examine quality-of-care data and the parameters used to define the control group.

The Charles River Associates study used both mortality and readmission measures in tandem to create one overall composite measure to assess patient care quality outcomes. As seen by this study's results, significant changes were observed to the Composite Median Readmission Measure variable in all panels, whereas the Composite Median Mortality Measure variable was statistically insignificant across all regression panels. This study's use of one composite measure for readmission and mortality provided additional context to associate the changes to quality-of-care.

Another potential explanation for the difference in results may be attributed to variance in regression methodology used to evaluate the occurrence of significant changes such as: the control group being defined in this study as all hospitals in the same state as the target firm that were not themselves an M&A target in the event year as well as the use of various fixed effects across each panel to limit the potential effects of unobservable factors.

With respect to cost and revenue specifically, the evidence provided by the Charles River Associates study aligns with the findings of this study. Both the Charles River Associates study and this study found costs to decrease in target hospitals as well as a net patient revenue per admission to decrease following transaction activity compared to non-target hospitals. Despite the methodological differences defined above with respect to the difference-in-differences models between the two studies, HCRIS data was applied in both studies to arrive at these results.

More broadly, the findings of this study were consistently supported by existing hospital M&A and financial literature on the effects of consolidation on cost in targets (Schmitt, 2017; Harrison, 2011). A study by Schmitt found average realized cost savings to be between 4 and 7 percent in target hospitals (2017). The most econometrically stringent panel shown in Table 4-2 displays a 6.45% reduction in patient-associated cost which is in-line with the findings of existing hospital M&A. Overall, provides additional support to existing literature that hospital M&A does effect target hospital's overall reduction in patient-associated costs.

With respect to revenue, the study also found charges to outpatients and inpatients decrease significantly following hospital transaction activity. As previously mentioned, evidence regarding patient-associated revenue with respect to both inpatients and outpatients is mixed. However, despite alignment with the Charles River Associates study mentioned above, the

results provided by this study are indicators and do not provide additional details as to what is driving these significant changes to both outpatient and inpatient charges. This result may be explained by a decrease in overall patients or procedures in target hospitals as a result of hospital M&A.

There is no one explanation for the results of this study that can be directly attributed as the sole driver. Generally speaking, M&A activity is driven by a desire to improve product quality while enhancing bottom line results. More specifically, the results found by this study are consistent with general finance literature on industry consolidation such as Sheen (2014). Sheen (2014) finds that the long-term results of M&A activity generally improve product pricing and quality after transactions. In relation to this study, this suggests that deal activity can improve the quality-of-care patients receive over the longer term in addition to total hospital patient-associated costs. Overall, these findings are supported by several existing financial studies discussed previously (Maksimovic et al., 2002; Maksimovic et al., 2011; Braguinsky et al., 2014).

The enhanced efficiency of M&A deals can be potentially explained by the increasing selectivity firms have been using over recent years to initiate transactions (Cogman, 2014). The methodological approach employed by firms to hold potential deals to a higher standard is may explain why despite additional value creation through M&A activity, companies overall are engaging in less activity. This additional value creation can be found in the form of lower costs and improvements to quality (patient care). In the case of this study, this suggests that hospital transaction activity, despite a recent decline, is continuing to create value for hospital systems and the communities they serve.

Thus, this study's evidence suggests hospital M&A activity provides opportunities for enhanced efficiency in targets with respect to cost and revenue while improving the quality-of-care patients receive through statistically significant reduction in readmission. These results are overall generally supported by the findings of financial literature on mergers despite malalignment with existing hospital M&A literature. This study provides new evidence to firms and policy makers to define the overall benefits associated with hospital consolidation. These results can be potentially explained by the general benefits of M&A activity provided by financial literature in addition to the increasing selectivity of firms when deciding to conduct consolidation efforts.

Chapter 5

Conclusion

In conclusion, this study finds that hospital M&A positively effects patient care while decreasing total annual hospital costs and revenue associated with patients. The purpose of this paper was to contribute to the existing hospital M&A literature to further investigate the effects deal activity may have on patient care quality outcomes, hospital costs, and revenue in target hospitals. The empirical study specifically challenged whether patient care outcomes would improve following M&A activity while evaluating the financial impacts associated with patient care. This study expected to find that quality-of-care improves following consolidation, while patient-associated costs and revenues decrease.

The study evaluated these factors by using a stacked difference-in-differences regression model to evaluate changes in quality, cost, and revenue measures at target hospitals before and after M&A activity in comparison to changes in identified control hospitals. For each merger event, the control group was defined as all hospitals in the same state as the target firm that were not themselves an M&A target in the event year. This methodology was applied to two samples, unbalanced and balanced, across two regression models, baseline and event fixed effect, to provide output of whether these variables statistically changed following deal activity.

Results indicated that overall quality of care was improved, in addition to a reduction of both cost and revenue associated with patients. This indicates that hospital consolidation provides direct benefits to both hospitals and the patients and communities they serve. There are several potential reasons behind this relationship including the general efficiencies produced by

M&A activity and the increasing selectivity of acquirers. The study's findings associated with patient care are inconsistent with the existing literature, whereas total cost findings align with current research. Output related to patient-associated revenue provides additional findings to the existing M&A literature where there are fewer existing studies.

The conclusions drawn by the results of this paper provide the foundation for an interesting argument within healthcare, finance, and policy makers. The evidence provided by this study suggests overall benefits can be observed from hospital consolidation to hospital's themselves and the patients they serve. Thus, additional reserach should be conducted to further evaluate the effects of these variables across a broader timeline of more-recent deals. Understanding the benefits experienced by target hospitals is critical to improving patient care and the overall efficiency of hospital organizations. As hospitals continue to navigate the paradigm associated with deal activity, its critical to evaluate how patient care can be further improved while assessing both cost and revenue associated with patients.

Appendix A

Electronic Reporting Specifications for Form CMS-2552-10

Inpatient Routine Service Cost Centers

- Adults & Pediatrics
- Intensive Care
- Coronary Care Unit
- Burn Intensive Care
- Surgical Intensive Care
- Subprovider – IPF
- Subprovider – IRF
- Nursery
- Skilled Nursing Facility
- Nursing Facility
- Other Long Term Care
- Detoxification Intensive Care
- Neonatal Intensive Care Unit
- Pediatric Intensive Care Unit
- Premature Intensive Care
- Psychiatric Intensive Care
- Trauma Intensive Care Unit
- ICF/IID
- Other Special Care (specify)
- Subprovider (specify)

Ancillary Service Cost Centers

- Operating Room
- Recovery Room
- Delivery Room & Labor Room
- Anesthesiology
  Radiology - Diagnostic
- Radiology - Therapeutic
  Radioisotope
- CT Scan
- MRI
- Cardiac Catheterization
- Laboratory
- PBP Clinical Lab. Service – Pgrm Only
- Whole Blood & Packed Red Blood Cells
- Blood Storing, Processing & Trans
- Intravenous Therapy
- Respiratory Therapy
- Physical Therapy
- Occupational Therapy
- Speech Pathology
- Electrocardiology
- Electroencephalography
- Medical Supplies Charged to Patients
- Imp. Dev. Charged to Patients
- Drugs Charged to Patients
- Renal Dialysis
  ASC (Non-Distinct Part)
- Allogeneic Stem Cell Acquisition
- Acupuncture
- Angiocardiography
- Audiology
- Bacteriology & Microbiology
- Biopsy
- Birthing Center
- Cardiology

- Cardiopulmonary
- Chemistry
- Chemotherapy
- Circumcision
- Cytology
- Dental Services
- Echocardiography
- EKG and EEG
- Electromyography
- Electroshock Therapy
- Endoscopy
- Gastro Intestinal Services
- Osteopathic Therapy
- Prosthetic Devices
- Pulmonary Function Testing
- Recreational Therapy
- Stress Test
- Ultra Sound
- Urology
- Vascular Lab
- Other Ancillary Service Cost Centers (specify)
- Blood Clotting Factors for Hemophilia
- Cardiac Rehabilitation

Outpatient Cost Centers

- Rural Health Clinic (RHC)
- Federally Qualified Health Center (FQHC)
- Clinic
- Emergency
- Observation Beds (Non- Distinct Part)
- Partial Hospitalization Program
- Family Practice
- Telemedicine
- Other Outpatient Service Cost Center (specify)
- Observation Beds (Distinct Part)

Other Reimbursable Cost Centers

- Home Program Dialysis
- Ambulance Services
- Durable Medical Equipment - Rented
- Hematology
- Histology
- Holter Monitor
- Immunology
- Laboratory - Clinical
- Laboratory - Pathological
- Mammography
- Nuclear Medicine – Diagnostic
- Nuclear Medicine – Therapeutic
- Oncology
- Ophthalmology
- Psychiatric/Psychological Services
- Sleep Lab
- Hyperbaric Oxygen Therapy
- Lithotripsy
- Durable Medical Equipment - Sold
- CMHC
- CORF
- OPT
- OOT
- OSP
- I&R Services - Not Apprvd Pgrm
- Home Health Agency
- Other Reimbursable Cost Centers (specify)
- Support Surfaces- Rented
- Support Surfaces- Sold

Special Purpose Cost Centers

- Kidney Acquisition
- Heart Acquisition
- Liver Acquisition
- Lung Acquisition
- Pancreas Acquisition
- Intestinal Acquisition
- Islet Acquisition
- Interest Expense
- Utilization Review - SNF
- Ambulatory Surgical Center (Distinct Part)
- Hospice

- Other Special Purpose Cost Centers (specify)
- Other Organ Acquisition (specify)

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ACADEMIC VITA

ALLIE E. MOLLO

aemollo99@gmail.com

EDUCATION

The Pennsylvania State University | Schreyer Honors College — **University Park, PA**
Smeal College of Business | Bachelor of Science in Finance — *Class of 2021*
Concentration in Organizational Leadership

CASE COMPETITIONS

- 1st Place Deloitte Consulting Penn State 2019
- 1st Place Boeing Penn State 2019
- 1st Place Johnson & Johnson Penn State 2018
- 2nd Place Kohl's Business with Integrity 2020
- 3rd Place Deloitte Consulting Nationals 2019
- 4th Place Princeton University Graduate 2018

PROFESSIONAL EXPERIENCE

PricewaterhouseCoopers (PwC) — **New York, NY**
M&A Management Consulting Intern — *Jul 2020*
- Engaged with waste disposal client in examining human resource integration touch-points for upcoming divestiture
- Earned a Human-Centered Design Badge by completing modules in design thinking, agile techniques, and data-driven storytelling while also identifying opportunities to apply human perspective to problems solving with clients

University Professional and Continuing Education Association (UPCEA) — **Washington D.C.**
Research Consultant — *May 2020 – Present*
- Proposed 15 new graduate certificate offerings with an estimated $500k of expected annual revenue to a small, private health science focused institution through course inventory analysis, competitive benchmarking, and market research
- Designed a new service to evaluate the strength of higher education institutions' online assets by identifying and analyzing 12 website and social media specific variables which is estimated to earn $50k of revenue over the next year

Smeal College of Business Consulting Initiative — **University Park, PA**
Consultant — *Dec 2019 – Apr 2020*
- Assisted the Director of the Smeal Management Department in creating a university accredited consulting group that would provide students with for-credit consulting projects and access to enhanced training from university faculty
- Developed a sustainable, self-funded long-term model with a Fall 2020 pilot roll out which aimed to improve university recruiting, provide additional engaged scholarship opportunities, and consolidate university consulting resources

Johnson & Johnson — **New Brunswick, NJ**
Global Finance Intern — *Jun 2019 – Aug 2019*
- Enhanced data quality for over 6,000 platform users by conducting data validation on Q2 Medical Device accounts using SQL to find discrepancies within internal reporting and external reports to shareholders on BRAVO
- Improved company data security by developing a quarterly procedure to review 200 users with greatest system access by meeting with business partners to evaluate the auditing procedure and elevate task delegation for Q3

LEADERSHIP EXPERIENCE

Nittany Consulting Group — **University Park, PA**
Executive Director of Operations (Co-President) — *Oct 2019 – May 2020*
- Directed all operational logistics of the organization by overseeing the internal development of NCG members, corporate and alumni outreach, the organization's $10,000 budget, and a 10-week consultant training program
- Enhanced efficiency of new member selection by modeling after industry recruitment methods of creating and administering group case interviews aimed to better assess emotional intelligence amongst candidates

Senior Consultant — *Jan 2018 – Present*
- Recommended a new, systematic approach to categorizing digital health venture capital deals based on current sector investments for a Fortune 50 Healthcare company's strategic venture arm enabling more accurate deal valuation

Alpha Kappa Psi Co-ed Professional Business Fraternity — **University Park, PA**
New Member Educator — *Aug 2018 – Present*
- Mentored 16 newly inducted members by hosting biweekly meetings to inform new members of fraternal standards
- Maintained integrity of fraternal bylaws by leading chapter proceeding and chapter-wide bylaw education

SKILLS, HONORS & INTERESTS

Skills: Proficient in Tableau, Microsoft Office, Adobe Captivate
Honors: Smeal College of Business Student Marshal, Smeal College of Business Most Outstanding President Award, 1st Place PSU Diversity Essay Contest, PSU Student Leader Scholarship, Evan Pugh Scholar, Sapphire Leadership Academic Program
Interests: Cycling, Fareed Zakaria, *Hamilton*, Historical Fiction, London, Peloton, Rummikub, *Survivor*, Theatre, Yellow