Hospital acquisitions:
Evidence of competitive impact on costs and efficiency

Rhonda Bartlett
Rollins College

Halil Kiymaz
Rollins College

ABSTRACT

In response to increased financial pressures, hospitals continue to seek new ways to control costs and improve efficiency through mergers and acquisitions (M&A). The purpose of this study is to determine whether hospital acquisitions impact their costs and efficiency. We use a sample of 19 acquiring and matching non-acquiring acute care hospitals in the same geographic area during the period of 2011 through 2014. The results suggest that non-acquiring hospitals experienced increased costs and decreased efficiency during the measurement period whereas the acquiring hospitals did not. As well, for the acquiring hospitals, the results indicate a shift in the cost predictor variable (total expenses) from registered nurse full-time equivalents to licensed practical nurse full-time equivalents and a shift in the efficiency predictor variable (privileged physicians) from inpatient admissions to outpatient visits. In summary, this study finds that hospitals involved in an acquisition outperform their local competitors in the first two years following an acquisition in key performance indicators related to intensity of service, unit cost, and efficiency.

Keyword: Hospital acquisitions, Cost control, Efficiency, Healthcare

1. Introduction

Over the past few decades, hospitals have experienced increased financial pressures from many fronts, including lower reimbursements from payors, higher acuity patients, and growing competition from rival organizations, all factors which have driven hospitals to find ways to reduce costs (Carey, Burgess, & Young, 2011; McCue, Mark, & Harless, 2003; Kane, Shamliyan, Mueller, Duval, & Wilt, 2007). While hospitals continue to seek cost-saving measures to address these legacy pressures, additional legislative initiatives (primarily driven by the Affordable Care Act of 2009) have motivated hospitals to find new ways to minimize costs and improve efficiency. In response, the hospital industry has turned to mergers and acquisitions (M&A) as one means to this end. This research study seeks to understand if the current wave of hospital acquisitions is impacting costs and efficiency and improving hospital performance.

Key regulatory initiatives have shaped the hospital industry over the past three decades and facilitated M&A waves, due predominantly to how hospitals are reimbursed for services. Unique from most industries, hospitals do not receive the bulk of their revenue directly from customers (patients) but rather through third-party insurers, including the federal government, in the form of Medicare and Medicaid programs. Over the past three decades, the methodology for payment from these third-party payors has shifted, and as such, hospitals have responded with growth strategies redesigned to maximize their revenue streams.

Prior to 1983, third-party payors paid hospitals on a cost-plus model for services. During this time driving a high volume of services was the main strategy and cost containment was not a high priority, so the motivation for M&A was thought to be targeted at increasing the volume of services through the organization. After 1983 the model shifted to a predetermined payment for services. With predetermined fees as the predominant driver of revenue, volume and cost containment became dual priorities and the motivation for M&A fast became the achievement of economies of scale. Starting in 2010, payments began shifting again, this time to a value based system. In this environment, third-party payors started reimbursing for value of care and quality entered the payment equation. In summary, M&A activity spiked in the 1990s when costs first became a concern, activity leveled off between the years of 2000–2009, and surged again after 2010 when regulatory changes started driving a new demand for value on top of cost containment. Two major regulatory changes (1983 and 2009) initiated cost savings activities in hospitals that facilitated subsequent merger waves. For this reason, this study takes a neoclassical perspective with the assumption that hospital M&A transactions are predominantly driven by economies of scale.

The purpose of this study to investigate whether hospital acquisitions impact their costs and efficiency using a sample of 19 acquiring and matching non-acquiring acute care hospitals during the period of 2011 through 2014. The study contributes the literature in the following ways: First, the question of how acquisitions in hospital industry impact efficiency and cost structure is not resolved hence this study provides additional evidence on the issue. Second, this is the first study following 2009 regulatory change to investigate the hospital performance following acquisitions. Finally, the study provides evidence on how cost shifts takes place within the sector with respond to lower reimbursements from payors, higher acuity patients, and growing competition from rival organizations.

Our findings show that acquisitions in the hospital industry improves competitive position of the acquiring hospitals. Specifically, we find that that non-acquiring hospitals experienced increased costs and decreased efficiency during the measurement period whereas the acquiring

hospitals did not. We further find that the acquiring hospitals experience a shift in the cost predictor variable (total expenses) from registered nurse full-time equivalents to licensed practical nurse full-time equivalents and a shift in the efficiency predictor variable (privileged physicians) from inpatient admissions to outpatient visits. In summary, we find that hospitals involved in an acquisition outperform their local competitors in the first two years following an acquisition in key performance indicators related to intensity of service, unit cost, and efficiency.

The remainder of the paper is organized as follows. A review of the literature is given in the next section. Section 3 describes the data and details of the empirical methodology. Findings of the data analysis are presented and discussed in Section 4 and conclusions and discussion are provided in Section 5.

2. Literature Review

The highest volume of research to date on hospital M&A activity was published between the years 1989–2000 and draws on data and information from the merger wave of the 1980– 1990s. The current wave the hospital industry is experiencing is well documented in terms of volume of M&A transactions as well as general trends, but is not well studied in terms of the impact of this activity on hospital performance. This study intends to contribute to the literature by providing a current perspective of the impact of M&A on hospitals from a cost and efficiency perspective. Due to the nature of the regulatory changes and the history of merger waves this review provides historical insight to understand how research unfolded over the past three decades. The merger wave of the 1980s and 90s was well researched and eight of those studies are relevant to this study as they all sought to determine the impact of M&A on hospital performance. This review is divided into three sections: first, a brief discussion on local hospital consolidation; second, a review of the impact of M&A on hospital costs; and third, a review of the impact on hospital efficiency. It is these three themes that dominate the current literature and thus are presented in that fashion.

2.1. M&A - Local Consolidation of Hospitals

While most hospitals have different physical structures, and provide different types of services, the core operating structure of hospitals is highly regulated due to the professional nature of the organization (Mintzberg, 1979). Hospitals of the same service type, such as acute care hospitals, can be considered as "related organizations." This is an important point and relative to a study conducted by Singh and Montgomery (1987) who demonstrated that acquired firms in related acquisitions have substantially higher gains than acquired firms in unrelated acquisitions, and the rationale for superior economic performance in related acquisitions derives from the synergies that are expected through a combination of supplementary or complementary resources. While their study was not directed at the hospital industry, their findings are relevant to the industry nonetheless and suggests that merging hospitals should enjoy gains from similar business structures. Cuellar and Gertler (2003) studied the formation of U.S. hospital systems in the late 1990s and felt many of the benefits were more likely to accrue within local markets since they could rationalize service delivery and coordinate care more effectively within a local area, a finding that supports the economies of scale theory to consolidation.

2.2. M&A – Historical Impact on Hospital Costs

Manheim, Shortell, and McFall (1989) studied the effect of acquisitions on hospital expenses and staffing levels within an investor-owned hospital chain and found that hospital costs increase while staffing decreases, relative to competitor hospitals. Dranove and Shanley (1995) examined the motives for the formation of local multihospital systems and found that local systems do not appear to have lower costs but do appear to enjoy reputation benefits over non-system hospitals. Their findings challenged the assumptions behind popular health reform initiatives. Connor, Feldman, and Dowd (1998) analyzed the market conditions, operating characteristics, and costs and prices of approximately 3,500 short-term general hospitals (including 112 within-market-area mergers) from 1986 to 1994, and the results show that horizontal hospital mergers produced average cost savings of approximately 5%. Dranove and Lindrooth (2003) investigated whether hospital consolidation leads to cost savings and found that consolidation into systems does not generate savings, even after four years, but mergers in which hospitals consolidate financial reporting and licenses generate savings of approximately 14%, two, three, and four years after merger. Ermann and Gabel (1984) provide the most comprehensive review of the impact of M&A on hospital costs, pooling data from the American Hospital Association and Modern Healthcare for multiple years between 1975 and 1982, studying the growth of multihospital systems (MHS) to understand why they grow, what are the advantages of growth, and what are the impacts on cost, quality, and access to care. Specifically related to costs, they found that hospital systems raise the cost of hospital care, and that these findings apply whether costs are measured as hospital expenses, charges, revenues, on a per diem or per case basis. The authors do state a consideration that the research was based on, "The experience of the late 1960's through the 1980's, a period when cost reimbursement was the predominant reimbursement mechanism" (Ermann & Gabel, 1984).

2.3. M&A – Historical Impact on Hospital Efficiency

Alexander, Halpern, and Lee (1996) believed that hospitals engaged in mergers to introduce efficiencies and consolidate their operations to remain viable and competitive in their markets and their study found that the observed difference in the change of operating scale between the merging and non-merging hospitals was more likely the result of initial differences between these two groups rather than mergers. Harris, Ozgen, and Harris (2000) also sought to understand whether mergers have an impact on organizational performance by examining the impacts of horizontal mergers of U.S. hospital's technical efficiency before and after mergers, and found that mergers do increase a hospital's level of efficiency with an overall reduction in input utilization after merger. Groff, Lien, and Su (2007) studied the impact of mergers on the technical efficiency of hospitals and found that there are no detectable improvements in efficiency in the first year after the merger, but efficiency improved significantly in the second year. Table 1 summarizes the characteristics and findings from selected studies.

Table1: Prior Studies on Hospital M&As and Performance

Study	Source	Cost Variable	Staff Variable	Data Years	Method	Findings
Cost Studies						
Ermann & Gabel (1984)	AHA	NA	NA	1979-1982	Literature Review	Increase in Costs Decrease in Staff

Manheim, Shortell, & McFall (1989)	AHA	Total Expenses	Total FTE*	1979, 1983	Multiple Regression	Increase in costs, Decrease in staff
Dranove & Shanley (1995)	CA OSHPD	Costs/ Admission	NA	1988	Coefficient of Variation	No decrease in costs
Alexander, Halpern, & Lee (1996)	AHA	Total Expenses/ Adjusted Admission	Total FTE*, Total RN*	1982-1989	Paired and 2-Sample t-test	No change in costs
Connor, Feldman, & Dowd (1998)	HCFA	Costs/ Admission	NA	1994	Multiple Regression	Cost savings
Dranove & Lindrooth (2003)	AHA	Total Expenses	NA	1988-1996	Multiple Regression	No cost savings
Efficiency Studies						
Harris, Ozgen, & Ozcan (2000)	AHA	Total Expenses	Total FTE*	1991 1992 1993	DEA	Increase in efficiencies
Groff, Lien, & Su (2007)	AHA	NA	FTE MD*, RN*, LPN*	1992-1997	DEA	Increase in efficiencies in year 2

*FTE - Full-Time Equivalent   MD - Medical Doctor   RN - Registered Nurse   LPN - Licensed Practical Nurse

While these studies provide insight into the effects of M&As on hospital performance, it is worth noting that all the studies reviewed used federal or state data sets, used different statistical tests to validate their assumptions, had no commonly accepted measurement of performance, and provided less than compelling evidence that M&A improves cost and efficiency in hospitals. Based on these findings, this study aims to utilize a more current data set relative to the present merger wave, and more standardized and acceptable industry measurements of hospital cost and efficiency performance to understand the impacts of the current merger wave.

3.   Data and Methodology

3.1. Data

The American Hospital Association (AHA) Annual Surveys for 2011, 2012, 2013, and 2014 were used to obtain information on acquisitions, as well as all data for the cost and efficiency indicators. The Case Mix Index (CMI) for each hospital was obtained from the Centers for Medicaid and Medicare Services data sets. The data set has been collected annually since 1980 from AHA members using a structured survey. In general, the AHA data set includes respondent identifiers such as the AHA identification number and AHA hospital number, as well as data related to organizational structure, facilities and services, facility beds, utilization, finances, and staffing. The sample of acquiring hospitals was identified in the 2012 AHA data set, and included only short-term acute care hospitals that acquired another hospital in 2012, but were not involved in any other merger or acquisition activity during the study period, and included only those hospitals that had reported the required data needed for all years of the study period. The study includes 19 acquiring and 19 non-acquiring hospitals.

We test the following hypotheses:

H1: An acquisition will positively influence costs for an acquiring hospital compared to a non-acquiring hospital.

H2: An acquisition will positively influence efficiency for an acquiring hospital compared to a non-acquiring hospital.

3.2. Methodology

The study utilized four years of AHA data from 2011 through 2014 with the identified acquisition year being 2012. The change in costs (C) and efficiency (E) will be a function of the change between the measurement periods (P) according to these models:

$\% \Delta C_{(-1, +1)} = f(P_{+1}-P_{-1}/P_{+1}) \times 100$

$\% \Delta C_{(-1, +2)} = f(P_{+2}-P_{-1}/P_{+2}) \times 100$

$\% \Delta C_{(+1, +3)} = f(P_{2}-P_{+1}/P_{+3}) \times 100$

$\% \Delta E_{(-1, +1)} = f(P_{+1}-P_{-1}/P_{+1}) \times 100$

$\% \Delta E_{(-1, +2)} = f(P_{+2}-P_{-1}/P_{+2}) \times 100$

$\% \Delta E_{(+1, +3)} = f(P_{2}-P_{+1}/P_{+3}) \times 100$

To compare the organizations over time and between the two groups (acquiring and non-acquiring hospitals) two groups of dependent variables will be analyzed, a cost group and an efficiency group. The cost group of indicators will include Intensity of Service Indicators and Unit Cost Indicators. The Intensity of Service Indicators include expenses (EXP) per adjusted admission (AADM), full-time equivalents (FTEs) per AADM, and total privileged physicians (TPR) per AADM. The Unit Cost Indicators include FTE man hours (MH) per admission (ADM), Salary (SAL) per FTE, Supply Costs (SC) per ADM, Capital Costs (CC) per ADM, and Fringe Benefits Percentage (FRBE) of SAL. Efficiency Indicators include FTEs per average daily census (ADC) and TPR per ADC. The independent variable is time from acquisition in 2012. The dependent variables and groups have been adapted from a standard set of indicators recommended by the American College of Healthcare Executives (ACHE) for measures of hospital performance. It is through the use of these indicators that this study seeks to establish a common language for measuring performance related to hospitals and acquisitions. Some of the ACHE indicators have been modified to account for the data available from AHA, but every effort has been made to keep the intent of the indicators measurement groups intact.

The present study includes 19 acute care hospitals that acquired another acute care hospital during 2012. These hospitals are compared to acute care hospitals located in the same geographical area as the acquiring hospitals when possible, and if not, were compared to a group of hospitals matched by bed size and Case Mix Index (CMI) in the same region of the state. The non-acquiring hospitals were not part of a merger or acquisition during the study period. The reason for comparing the acquiring hospitals with other non-acquiring hospitals in the same area was to eliminate as much as possible the effect of local geographic factors on the outcomes and to isolate and identify the effects of an acquisition on hospital performance. The areas examined were not limited, and the samples represent all major geographical areas of the country. The number of observations for the regressions in all years was equal at nineteen. The acquiring hospitals had no additional acquisitions after the 2012 period. For the acquiring hospitals 16 of the 19 belong to a system (84.2%) and for the non-acquiring hospitals 14 of the 19 belong to a system (74%). The target to acquirer bed ratios were also extremely varied, with 10 of the 19 (52.3%) target to acquirer bed ratios less than 30% and 9 of the 19 (47.4%) target to acquirer bed ratios greater than 30%. As well, the data does not reflect a net gain of beds equal to the total bed count between the targets and the acquirers after the acquisition. Prior to the 2011 acquisitions, the acquirer's aggregate total bed count was 9, 397 beds across the 19 hospitals. These 19 hospitals acquired 2,065 beds in 2012, but the data shows that in 2013 they only had a total bed

count of 9,917 beds, suggesting that they closed 1,545 (74.8%) of the beds they acquired. In 2014, the total bed count across the 19 hospitals was 9, 964 indicating that approximately 1,498 (72.5%) of the acquired beds were still closed. The changes in the bed totals following the acquisitions for the acquiring and the non-acquiring hospitals are presented in Table 2.

Table 2: Change in Hospital Bed Count during the Study Period
This table reports the changes in bed counts for both acquiring and non-acquiring hospitals during the 2011-2014 period

Acquiring Hospitals						Non-Acquiring Hospitals			
ID	Total Beds 2011	Beds Acquired 2012	Total Beds 2013	Total Beds 2014	Δ Total Beds 2011-2014	ID	Total Beds 2011	Total Beds 2013	Total Beds 2014	Δ Total Beds 2011-2014
1	962	406	1612	1576	614	1	613	817	898	285
2	480	50	360	378	-102	2	551	551	532	-19
3	212	80	225	220	8	3	249	270	310	61
4	120	124	91	120	0	4	2170	2396	2478	308
5	1491	206	1168	1168	-323	5	147	125	115	-32
6	430	222	626	577	147	6	409	409	443	34
7	514	47	611	658	144	7	83	71	94	11
8	203	104	147	147	-56	8	53	43	43	-10
9	189	178	189	189	0	9	180	187	166	-14
10	435	9	447	431	-4	10	801	719	717	-84
11	524	71	584	548	24	11	600	696	713	113
12	327	116	327	362	35	12	380	414	280	-100
13	194	45	206	222	28	13	160	160	160	0
14	225	86	234	244	19	14	205	205	205	0
15	778	112	766	766	-12	15	1342	1527	1672	330
16	1484	75	1589	1585	101	16	265	265	253	-12
17	195	12	268	268	73	17	263	263	263	0
18	429	58	262	300	-129	18	449	486	486	37
19	205	64	205	205	0	19	236	203	201	-35
Count	9397	2065	9917	9964			9156	9807	10029	
Δ Beds			520	47	567			651	222	873
% Δ Beds			5.2%	0.5%	5.7%			6.6%	2.2%	8.7%
Acquired Beds Closed			1545							
% Acquired Beds Closed			74.8%							

Overall, the acquiring hospitals grew their total bed count by 5.7% between 2011 and 2014 and the non-acquiring group of hospitals grew their total bed count by 8.7% during the same period. Since the non-acquiring hospitals were not involved in any merger or acquisition activity during the study period, it will be assumed that the growth is predominantly organic in nature.

4. Empirical Results

A one-way repeated measure analysis of variance (ANOVA) was completed for each dependent variable for both the acquiring and non-acquiring hospitals to determine if there was any change over time to costs and efficiency. If the ANOVA was significant, a post hoc T-Test was completed to determine which reporting periods represented a significant change in costs and efficiency. Multiple regression analysis was then used to understand further what factors may be contributing to the changes (or lack of changes) in costs and efficiency within the

acquiring and non-acquiring hospitals. By also including in the regressions a potentially confounding factor such as CMI that factor could be "held constant."

4.1. M&A: The Current Impact on Hospital Costs and Efficiency

The results of the ANOVA analysis show a significant increase in costs and decrease in efficiency for the non-acquiring hospitals during the same measurement periods as the acquiring hospitals. The results of the ANOVA are shown in Table 3.

Specifically, for the intensity of service, the non-acquiring hospitals showed a significant increase in expenses per adjusted admission (.003) and privileged physicians per adjusted admission (.03). For unit costs, the non-acquiring hospitals showed a significant increase in the salary per full-time equivalent (.038). The non-acquiring hospitals also showed a decrease in efficiency with a significant increase in privileged physicians per average daily census (.016). The acquiring hospitals showed no significant change in costs or efficiency during the measurement period. Hypothesis 1 stated that an acquisition would positively influence costs for an acquiring hospital compared to a non-acquiring hospital and hypothesis 2 stated that an acquisition would positively influence efficiency for an acquiring hospital compared to a non-acquiring hospital, both hypotheses were supported by the data. Full-time equivalents per adjusted admission (intensity of service), supplies and capital expenses per adjusted admissions (unit cost), fringe benefits percentage of salary (unit cost), and full-time equivalents per average daily census (efficiency) showed no significant change for the acquiring or non-acquiring hospitals during all years of the study.

Table 3: Impact of Acquisitions on Hospital Cost and Efficiency Indicators

This table reports ANOVA analysis for both acquiring and non-acquiring sample with the following cost and efficiency indicators. EXP/AADM: Total Expenses per Adjusted Admission; FTE/AADM: Full-Time Equivalents per Adjusted Admission; TPR/AADM: Total Privileged Physicians per Adjusted Admissions; FTEMH/ADM: Full-Time Equivalent Man Hours per Adjusted Admissions; SAL/FTE: Total Salary per Full-Time Equivalents; SUP/ADM: Total Supply Costs per Total Admissions; CAEX/ADM: Total Capital Expenses per Total Admissions; FRBE%/SAL: Fringe Benefits Percentage of Salary; FTE/ADC: Full-Time Equivalents per Average Daily Census; TPR/ADC: Total Privileged Physicians per Average Daily Census

ANOVA	Dependent Variables									
	Cost Indicators								Efficiency Indicators	
	Intensity of Service			Unit Cost					Efficiency	
Hospital Group	EXP/ AADM	FTE/ AADM	TPR/ AADM	FTEMH/ ADM	SAL/ FTE	SUP/ ADM	CAEX/ ADM	FRBE%/ Sal	FTE/ ADC	TPR/ ADC
Acquiring										
Mean 2011	10121.95	0.0671	0.0158	225.82	62831.51	2606.82	624.02	22.75	7.96	1.799
Mean 2013	10863.87	0.0670	0.0141	236.80	63426.06	2498.91	16787.70	24.83	8.15	1.547
Mean 2014	10941.61	0.0674	0.0139	245.35	61681.92	3964.35	1015.39	24.00	8.20	1.498
Sig	0.059	0.951	0.778	0.541	0.830	0.056	0.353	0.405	0.855	0.692
Non-Acquiring										
Mean 2011	9674.74	0.0665	0.0108	247.11	58167.73	3220.72	1266.69	24.70	8.19	1.324
Mean 2013	10680.86	0.0620	0.0198	246.20	66276.22	4290.59	1428.33	25.21	8.46	2.560
Mean 2014	11193.59	0.0634	0.0207	258.89	66117.62	4160.37	1191.26	23.94	8.69	2.666
Sig	0.003*	0.301	0.03*	0.563	0.038*	0.098	0.642	0.295	0.516	0.016*
Pair 1: 11-13	0.003		0.031		0.037					0.018
Pair 2: 11-14	0.004		0.036		0.045					0.018
Pair 3: 13-14	0.110		0.665		0.903					0.538

*Significant at p < .05

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4.2. M&A: Factors Contributing to the Current Impact on Costs and Efficiency

The indicators that displayed significance regression analysis were completed to understand the contributing variables. For each group of variables, the regression results are presented.

4.2.1. Intensity of Service

Multiple regression analysis of the acquiring and non-acquiring hospitals in 2011 revealed a moderately strong positive linear relationship, acquiring (.629) and non-acquiring (.676), between expenses per adjusted admission and registered nurse full-time equivalents per adjusted admission only. After 2011, the acquiring hospitals no longer exhibit this strong relationship with the registered nurse full-time equivalents per adjusted admission, and by 2014 the expense relationship switches to a moderate (.487) negative relationship to licensed practical nurse full-time equivalents per adjusted admission for the acquiring hospitals.

Table 4: Intensity of Service Indicators
This table reports the regression results for Intensity of Service Indicators

Dependent Variables: Intensity of Service Indicators*												
Predictor Variables	EXP/ AADM 2011	EXP/ AAD M 2013	EXP/ AADM 2014	EXP/ AADM 2011	EXP/ AADM 2013	EXP/ AADM 2014	TPR/ AAD M 2011	TPR/ AAD M 2013	TPR/ AADM 2014	TPR/ AAD M 2011	TPR/ AADM 2013	TPR/ AADM 2014
	ACQ	ACQ	ACQ	NON	NON	NON	ACQ	ACQ	ACQ	NON	NON	NON
R^2	0.753	0.491	0.658	0.784	0.832	0.796	0.573	0.508	0.632	0.223	0.332	0.313
Adj. R^2	0.629	0.237	0.487	0.676	0.847	0.695	0.359	0.262	0.448	-0.165	-0.002	-0.031
Sig	0.004*	0.157	.023*	0.002*	0.000**	0.001*	0.069	0.134	0.033*	0.743	0.471	0.519
OP Visits												
Sig	0.099	0.405	0.180	0.964	0.608	0.414	0.060	0.048	0.031*	0.792	0.104	0.192
Partial	0.458	0.242	0.380	-0.013	-0.150	-0.238	-0.514	-0.537	-0.578	-0.078	-0.452	-0.370
Part	0.257	0.178	0.240	-0.006	-0.062	-0.110	-0.392	-0.446	-0.479	-0.069	-0.414	-0.330
Admits												
Sig	0.777	0.578	0.055	0.551	0.718	0.472	0.404	0.224	0.181	0.207	0.773	0.257
Partial	-0.083	-0.163	-0.522	0.174	-0.106	-0.209	-0.553	-0.347	-0.379	0.359	-0.085	-0.325
Part	-0.042	-0.118	-0.358	0.082	-0.044	-0.097	-0.434	-0.260	-0.248	0.339	-0.070	-0.285
MD FTE												
Sig	0.557	0.406	0.260	0.647	0.776	0.619	0.359	0.610	0.524	0.261	0.851	0.691
Partial	0.172	0.241	0.323	-0.134	0.084	-0.146	0.266	0.150	0.186	-0.323	0.055	0.117
Part	0.087	0.177	0.199	-0.063	0.034	-0.066	0.180	0.106	0.115	-0.300	0.045	0.097
RN FTE												
Sig	0.006*	0.267	0.105	.000**	.000**	.000**	0.327	0.196	0.158	0.908	0.197	0.457
Partial	0.695	0.318	0.451	0.847	0.878	0.865	0.283	0.367	0.398	-0.034	-0.367	-0.217
Part	0.480	0.240	0.296	0.740	0.753	0.779	0.193	0.277	0.264	-0.030	-0.323	-0.184
LPN FTE												
Sig	0.888	0.942	0.038*	0.989	0.246	0.178	0.075	0.681	0.984	0.857	0.452	0.749
Partial	-0.042	0.021	-0.557	-0.004	-0.322	-0.382	-0.490	-0.121	-0.006	-0.053	-0.219	-0.094
Part	-0.021	0.015	-0.393	-0.002	-0.145	-0.186	-0.367	-0.085	-0.003	-0.047	-0.183	-0.078
# of Cases	19	19	19	19	19	19	19	19	19	19	19	19

*Significant at $p < .05$
**Significant at $p < .001$

In contrast, the non-acquiring hospitals continue to exhibit a moderately strong to the strong relationship between expenses per adjusted admission and registered nurse full-time equivalents per adjusted admission, across all three measurement years: 2011 (.676); 2013 (.847); and 2014 (.695). These results could suggest that the acquiring hospitals have increased the utilization of licensed practical nurse full-time equivalents per adjusted admission as a method of controlling costs. The regression results are presented in Tables 4 and 5.

The second indicator for the intensity of service is privileged physicians per adjusted admission. Years 2011 and 2013 showed no significant relationship for the acquiring hospitals for this indicator, but in 2014 a moderate (.448) negative linear relationship with outpatient visits per adjusted admission was observed for the acquiring hospitals. This observation could indicate a shift in service intensity to primary care (outpatient) model for the privileged physicians as a way to decrease costs associated with unnecessary admissions. No significant relationships were found for the non-acquiring hospitals for this indicator for all years of the study.

4.2.2. Unit Costs

For unit costs, no significant relationship for the acquiring or non-acquiring hospitals for this indicator was observed across all measurement years. Although the ANOVA revealed that salary per full-time equivalent significantly increased for the non-acquiring hospitals between 2011 and 2013 and 2011 and 2014, the regression analysis predictor variables did not show any significant relationship to the dependent variable. This observation requires further study, possibly to understand the impact of premium wages (overtime) as a predictor variable. Premium wages are often a primary focus of management after an acquisition and may be why a significant increase in salary per full-time equivalent for the non-acquiring hospitals is seen, but not the acquiring hospitals.

4.2.3. Efficiency

The number of privileged physicians per average daily census is an efficiency indicator that showed a moderate (.422) negative linear relationship with inpatient admitted per adjusted admission and licensed practical nurse full-time equivalents per adjusted admission for the acquiring hospitals in 2011 only. The non-acquiring hospitals did not show any relationship during any of the years. Again, this observation could support a shift in service intensity to a primary care (outpatient) model for privileged physicians as a way to decrease costs associated with unnecessary admissions.

Table 5. Efficiency and Unit Cost Indicators

This table reports the regression results for efficiency and unit cost indicators for both acquiring and non-acquiring hospitals. SAL/FTE: Total salary for Full-Time Equivalents; TPR/ADC: Total Privileged Physicians per Average Daily Census.

	Dependent Variable: Unit Cost Indicator						Dependent Variable: Efficiency Indicator					
Predictor Variables	Sal/ FTE 2011	Sal/ FTE 2013	Sal/ FTE 2014	Sal/ FTE 2011	Sal/ FTE 2013	Sal/ FTE 2014	TPR/ ADC 2011	TPR/ ADC 2013	TPR/ ADC 2014	TPR/ ADC 2011	TPR/ ADC 2013	TPR/ ADC 2014
	ACQ	ACQ	ACQ	COM	COM	COM	ACQ	ACQ	ACQ	COM	COM	COM
R^2	0.580	0.279	0.552	0.148	0.450	0.375	0.615	0.403	0.407	0.196	0.528	0.353
Adj. R^2	0.371	-0.081	0.328	-0.278	0.175	0.063	0.422	0.104	0.111	-0.206	0.292	0.029
Sig	0.063	0.604	0.087	0.899	0.220	0.370	0.041*	0.310	0.301	0.805	0.111	0.421
OP Visits Sig	0.185	0.289	0.105	0.828	0.181	0.375	0.062	0.081	0.075	0.801	0.732	0.801

Partial	0.376	-0.305	-0.452	-0.064	-0.379	-0.257	-0.511	-0.482	-0.491	-0.074	-0.101	0.074
Part	0.263	-0.272	-0.339	-0.059	-0.304	-0.210	-0.369	-0.425	-0.434	-0.067	-0.070	0.060
Admits												
Sig	0.008	0.333	0.475	0.384	0.586	0.864	0.024*	0.261	0.386	0.253	0.152	0.617
Partial	0.674	0.279	-0.208	0.252	-0.159	-0.051	-0.599	-0.322	-0.251	0.328	0.404	0.147
Part	0.592	0.247	-0.143	0.241	-0.120	-0.040	-0.464	-0.263	-0.200	0.311	0.303	0.119
MD FTE												
Sig	0.955	0.879	0.289	0.318	0.300	0.247	0.316	0.612	0.631	0.243	0.853	0.331
Partial	0.017	0.045	0.305	-0.288	-0.298	-0.332	0.289	0.148	0.141	-0.344	0.055	0.280
Part	0.011	0.038	0.214	-0.277	-0.232	-0.278	0.188	0.116	0.110	-0.318	0.038	0.235
RN FTE												
Sig	0.230	0.632	0.314	0.770	0.898	0.674	0.623	0.309	0.310	0.745	0.011	0.041
Partial	-0.343	-0.140	-0.290	0.086	-0.038	0.123	0.144	0.293	0.293	-0.096	-0.653	-0.551
Part	-0.237	-0.120	-0.203	0.080	-0.028	0.098	0.090	0.237	0.236	-0.086	-0.591	-0.531
LPN FTE												
Sig	0.930	0.963	0.012	0.692	0.035	0.077	0.024*	0.297	0.618	0.760	0.536	0.867
Partial	-0.026	0.014	-0.650	-0.117	-0.566	-0.488	-0.597	-0.300	-0.146	-0.090	-0.181	-0.049
Part	-0.017	0.012	-0.573	-0.108	-0.509	-0.422	-0.462	-0.243	-0.114	-0.081	-0.126	-0.040
# of Cases	19	19	19	19	19	19	19	19	19	19	19	19

*Significant at $p < .05$ **Significant at $p < .001$

Regarding the licensed practical nurses, these results could suggest that the acquiring hospitals have increased the utilization of licensed practical nurse per privileged physician as a method of controlling costs.

5. Conclusion and Discussion

The hospital industry has turned to mergers and acquisitions (M&A) as means to find new ways to minimize costs and improve efficiency. The purpose of this study to investigate whether hospital acquisitions impact their costs and efficiency using a sample of 19 acquiring and matching non-acquiring acute care hospitals during the period of 2011 through 2014.

Our empirical findings suggest that non-acquiring hospitals experienced increased costs and decreased efficiency during the measurement period whereas the acquiring hospitals did not. As well, for the acquiring hospitals, the results indicate a shift in the cost predictor variable (total expenses) from registered nurse full-time equivalents to licensed practical nurse full-time equivalents and a shift in the efficiency predictor variable (privileged physicians) from inpatient admissions to outpatient visits. Regarding the privileged physicians, these findings are consistent with a study by Laditka, Laditka, and Probst (2005) that finds a negative relationship between physician supply and hospitalization is better for hospital performance. Regarding the shift from registered nurse full-time equivalents to licensed practical nurse full-time equivalents, it could be seen as an effort to decrease costs through the use of more nurse extenders. Using data from the AHA Annual Survey and CMS, it was demonstrated that hospital acquisitions do impact costs and efficiency in the first two years following an acquisition and evidence of the competitive impact of hospital acquisitions is provided. In summary, this study finds that hospitals involved in an acquisition outperform their local competitors in the first two years following an acquisition in key performance indicators related to the intensity of service, unit cost, and efficiency.

The research question addressed in this paper is whether M&A impacts costs and efficiency in hospitals. There were several limitations that must be considered for the study. First, hospitals are complex organizations, and it is difficult to accurately compare like for like. By accounting for geography, case mix index, and bed size this approximates a close fit, but many other factors

could account for differences between the acquiring and non-acquiring hospitals such as service mix, payor mix, and teaching affiliation. With these thoughts in mind, several recommendations for future studies are suggested.

To begin, the majority of the hospitals in both groups were in hospital systems at the beginning of the study period, 84.2% of the acquirers and 74% of the non-acquiring hospitals. Further studies could aggregate the hospitals and compare them at a system as well as a local level to determine if a differential performance gradient exists by geography and if it is relevant. This information could help with strategic management of national systems for senior management of health systems and hospitals.

Second, the acquiring hospitals in this study only grew in bed size by 5.7% while the non-acquiring hospitals grew organically by 8.7% over the 4-year period of the study. Future studies could understand how this is impacting the service intensity in local geographies as well as patient satisfaction. This study would be important as hospital consolidation and urbanization is two critical factors presenting an opportunity for the healthcare industry. Together these two phenomena will push metropolitan areas to self-identify quickly and early as urban medical centers so they can begin to lay the foundation for that competitive opportunity if they so choose. To become a competitive urban medical center will require developing key dynamic capabilities to attract and retain the best medical talent, provide the best tools and technology to ensure top medical performance, and attract and retain medical consumers. This research would be of value to the hospital, community, and state leaders.

Third, future studies could consider payer mix, service mix, and the financial indicators of the hospitals to determine the impact of acquisitions on hospital performance.

Fourth, the current merger wave continues into 2017 and a longer study period would present an opportunity to understand the long-term impacts of an acquisition on costs and efficiency.

Fifth, salary costs as premium wages (overtime) are significant in most hospitals but were not studied as a predictor variable in this study. Future research could seek to understand the impact of this variable after an acquisition as management focus may influence this in the post-acquisition period.

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