Organizational Characteristics and Environmental Factors Associated with Hospitals Identified as Consolidation Targets

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Abstract

In today's dynamic health care landscape, hospitals face uncertainty and financial strain from changing reimbursement schemas, intense government regulation, technological advances, consumer demand, and workforce scarcity. These increased pressures have led to an acceleration of consolidation activities as hospitals position themselves to cope with a shifting, complex external environment by maximizing resources, creating economies of scale, and expanding access to care. Despite increased hospital consolidation activity, scholars know little about what makes a hospital attractive as a consolidation target to an acquiring organization, particularly after the Affordable Care Act.

The purpose of this study is to evaluate the organizational characteristics and environmental factors associated with hospitals identified as targets through the lens of resource dependence theory. A multivariate binary logistic regression model is used to analyze the differences between hospitals selected as consolidation targets and hospitals that were not.

Our findings were somewhat mixed; we found weak support found for one hypothesis (sociodemographic factors), partial support for two of the six hypotheses (structural characteristics, competitive factors), and no support for three of the hypotheses (operational performance, financial performance, physical factors). The results suggest that while operational performance is important to hospital success, acquiring organizations tend to be motivated by traditionally favorable organizational characteristics (i.e., ownership status) and market factors (i.e., Herfindahl-Hirschman Index).

Introduction

Today's health care organizations face uncertainty and pressure from changing financial reimbursement schemas, government regulation, technological advances, consumer demands, clinical quality, efficiency expectations, clinical resource shortages, and the structural pressures of vertical and horizontal integration. These increased pressures have led to an acceleration of consolidation activities as hospitals position themselves to respond to the external environment by maximizing resources, expanding access to care, and building economies of scale. According to KaufmanHall (2017), hospital and health system merger and acquisition transactions increased 55% from 2010 to 2016.

Hospitals engage in consolidation activities to maximize the fit between the organization's external environment and its internal capabilities (Trinh & O'Connor, 2002). When selecting acquisition targets, the acquirer determines the value; therefore, value depends on multiple factors, such as the increasing need to deliver evidenced-based, up-to-date care while improving patient experience and controlling costs (Barker, 2017). Because there are many motives or drivers behind organizational consolidation, and because strategic value is assessed using various methods by numerous stakeholders, studying consolidation activities can be difficult (Alexander & Morrisey, 1988).

While research evaluating post-consolidation effects on hospitals is robust, few studies have explored the characteristics of hospitals that are targeted in a consolidation transaction. Harrison, McCue, Wang, and Wolfe (2003) explore characteristics of acquired hospitals compared to nonacquired hospitals specific to the age of physical plant, competitive environment, and hospital size. McCue, Thompson, and Kim (2015) explore similar characteristics in the period immediately prior to Affordable Care Act (ACA) implementation. Organizational characteristics and environmental factors of target hospitals may help to explain why they are selected. For example, operating performance factors such as clinical quality, patient experience, and financial performance are overt, observable characteristics that can be prospectively assessed, providing important information to the acquiring organization. A hospital may pursue the organizational strategy of consolidation to reduce the political, economic, social, and technological uncertainties of its external environment and to gain new competitive advantages. Using a framework of resource dependency theory (RDT), we predict which organizational characteristics and environmental factors are important to acquiring hospitals as they make strategic decision in an effort to minimize resource scarcity and external uncertainty.

We seek to learn which organizational characteristics and environmental factors differentiate target hospitals from nontarget hospitals. For purposes of this analysis, mergers, acquisitions, and member substitutions are referred to as a "consolidation" or "consolidation transactions" when there is a change in control, hospital board structure, or delegation that does not result in facility closure. Hospitals that initiate consolidation transactions are referred to as the "acquiring hospital," and hospitals that are subject to consolidation activities are referred to as the "target" or the "target hospital."

Theory

RDT provides a helpful context for considering the proliferation of hospital consolidation in the health care industry. RDT asserts that resource scarcity and environmental uncertainty will influence strategies and drive change as organizations attempt to manage the constraints of their environment (Pfeffer, 2009). Firms will attempt to enhance or control the environment by focusing on resource acquisition through mergers, acquisitions, or other types of affiliations and strategic partnerships (Alexander et al., 1986). As regulatory and financial pressures make the environment more hostile, hospitals will seek out integration activities such as mergers/acquisitions, joint ventures, and joint operating agreements (Balotsky, 2005).

Alexander and Amburgey (1987) describe consolidation as an intentional "strategic manipulation resulting from resource dependence" whereby hospitals adapt to changes in their environment by developing new ventures to share critical services, maximize scarce resources, and create economies of scale. With increasing environmental uncertainty, the environment will positively select characteristics that increase an organization's ability to compete in the market (Alexander et al., 1986).

In RDT, hospitals seek to minimize the uncertainty of their external environment by procuring necessary resources—for example, engaging in consolidation activities to acquire a needed competency or competitive advantage. Kaul and Wu (2016) suggest that firms will create value from selected targets in two ways: (a) by exploiting their current abilities to improve the performance of a target firm or (b) by acquiring new abilities from the target to achieve a competitive advantage.

Organizational Characteristics

Hospital-level organizational characteristics are an important consideration in consolidation activities. These include structural, operational, and financial aspects of a hospital's complexity, general structure, interaction with the external environment, and overall performance.

Structural Characteristics

Structural characteristics reflect a hospital's relatively stable governance and social mechanisms used to coordinate efforts toward common goals. Structural characteristics include ownership status, network affiliation status, status as a teaching hospital, volume, and number of beds. For-profit or not-for-profit ownership status may characterize different management oversight and practices as well as strategic goals (e.g., maximization of stakeholders' wealth vs. a mission to provide indigent care for the local community). A hospital's number of beds, inpatient and outpatient volume, and teaching status may be an indication of organizational complexity and specialty service offerings. Hospitals with greater volumes and bed capacity generally serve a greater number of patients. Greater scale requires the resources necessary to the support systems and structures of patient care. In terms of profit, larger size presents two possibilities: on one hand, greater volumes and subsequently more revenue; on the other hand, more indigent care resulting in lower revenues and profitability. Teaching hospitals are generally associated with complex, specialized services. For example, unlike nonteaching counterparts, teaching hospitals may serve as a local trauma center or offer specialized surgery. Participation in a network may indicate a hospital's ability to coordinate care and could serve as a proxy for population health competencies. Therefore, a hospital's structural characteristics may contribute to the likelihood being selected as a consolidation transaction target, such that:

H1: There are differences in structural characteristics of target hospitals as compared to nontarget hospitals.

Operational Characteristics

Operational characteristics describe a hospital's overall performance. They include clinical quality performance and patient experience performance. As the way that hospitals are reimbursed for care delivery continues to change, is the industry places greater emphasis on clinical quality and patient experience in addition to financial results. Performance in clinical quality and patient experience directly influences a hospital's bottom line, with reimbursement dollars at risk for both Medicare value-based purchasing programs and insurance-based pay-for-performance programs.

Clinical quality is an important value indicator. A hospital's readmission rate is often evaluated to determine its effectiveness in providing and managing care. The Centers for Medicare & Medicaid Services (CMS) defines readmission as a return to any inpatient setting within 30 days of discharge from an inpatient hospital stay, regardless of the reason for readmission (Boccuti & Casillas, 2017). While many variables contribute to a readmission, readmissions are generally associated with problems in care coordination and management. The better care is coordinated across a continuum, the less likely that a patient will be readmitted for a condition (Boccuti & Casillas, 2017). The CMS Hospital Readmissions Reduction Program (HRRP) evaluates all acute-care hospital readmissions for specific diagnoses. Hospitals with risk-adjusted readmissions higher than the national average receive a readmission penalty percentage that is subtracted from its base operating payments for diagnosis-related groups.

As consumers have become more active in making health care purchases, patient experience has become an important element of securing market share. All acute-care hospitals are required to report patient experience data publicly through the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, where former patients evaluate hospitals based on their perceptions of care and care management during their hospital stay. Patients answer specific questions related to communication with caregivers, communication regarding medications, discharge instructions, and care transitions.

Higher performance through higher HCAHPS scores may represent a more effective approach for coordinating care and communicating with patients. Therefore, hospitals that perform better in operational metrics may be considered a more attractive target compared to other hospitals, such that:

H2: Hospitals reporting better operating performance will be more likely to be a consolidation target.

Financial Characteristics

The literature is mixed on the financial performance of consolidation targets. In the banking industry, Hannan and Pilloff (2009) find that less profitable firms were more likely to be acquired. Specific to hospital consolidation, McCue and Furst (1986) argue that investor-owned hospitals typically acquire smaller hospitals in a weaker financial position, and Sloan et al. (2003) suggest that hospitals with financial struggles were more likely to be involved in consolidation activities. However, Agrawal and Jaffe (2003) find little evidence that target firms had a weak financial position before acquisition, regardless of industry. Dor and Friedman (1994) report similar

findings for hospital consolidations—target hospitals with strong operating margins in less regulated markets were more likely to be involved in a consolidation. Butcher (2016) reports that, as a result of the changing nature of health care consolidations, stronger hospitals and health systems are more likely to consolidate with equally strong—or stronger—peers as the industry anticipates the transition to value-based care. Given the need to prepare proactively for this form of reimbursement, hospitals will seek out targets that are financially sound to help support and subsidize population health strategies. As such, we argue that:

> *H3: Hospitals reporting better financial performance are more likely to be a consolidation target.*

Environmental Factors
Environmental factors may also contribute to the likelihood of being selected as a consolidation target. These external factors may indicate the demand for health care services in the market and the intensity of this demand (McCue et al., 2015). Environmental factors include competitive, sociodemographic, and physical elements that describe a hospital market's competitiveness, general wealth, and access to care.

Competitive Factors
The Herfindahl–Hirschman Index (HHI) measures market concentration and competitiveness, which may help acquiring firms estimate the ease of market entry and penetration. A target hospital in a market with a higher HHI suggests it may have greater market power and is potentially in a better negotiating position with payers, making it a more attractive target (Sloan et al., 2003). The penetration of Medicare Advantage, a Medicare-managed insurance product, can provide information on the overall dominance of managed care in a market (Hearld et al., 2018). Therefore, a hospital's competitive environment may contribute to the likelihood of a hospital being selected as a consolidation transaction target, such that:

> *H4: Hospitals located in less competitive environments are more likely to be a consolidation target.*

Sociodemographic Factors
Sociodemographic market factors describe a hospital's population as well as potential risks that may influence health outcomes. Market demographics may provide insight into social determinants of health that can influence the degree to which residents require health care services, how residents access services, and the potential for an access gap (e.g., percentage 65 or older, residents living 1.5 times below the US federal poverty level as a percentage of total county population size, access to primary care or physicians). This information may also provide insight into the percentage of the population with Medicare and Medicaid coverage. Given that sociodemographic factors may influence the likelihood of being selected as a consolidation target, the following hypothesis is offered:

H5: Hospitals located in communities reporting more favorable sociodemographic factors will be more likely to be a consolidation target.

Physical Factors
Physical market factors (i.e., core-based service area) describe a hospital's geographic location. Whether a hospital is in a metropolitan, micropolitan, or rural area may indicate the potential for market growth. Given that physical market factors may influence the likelihood of being selected as a consolidation target, the following hypothesis is offered:

H6: Hospitals located in communities reporting more favorable physical market factors will be more likely to be a consolidation target.

Method
The unit of analysis for this study was the non-federal-government-owned, general medical/surgical, acute-care hospital for the period 2014–2016. The final sample included 5,076 acute-care general medical/surgical hospital year observations.

Data were collected from the American Hospital Association Annual Survey, Area Health Resource Files, CMS, and KaufmanHall's proprietary hospital transaction database, which we used to determine whether a hospital was party to a consolidation announcement. The authors validated the data with an Internet search to confirm transaction details. HCAHPS survey data were accessed through the Hospital Compare data archive, the HRRP data were accessed through the archived supplemental data files, and the profitability data were accessed in the CMS Medicare Cost Report.

The dependent variable—whether the hospital was identified as a target—was binary (1 = yes, 0 = no). The independent variables for all hypotheses included hospital organizational characteristics (structural, operating, financial) and environmental factors (competitive, sociodemographic, physical) reflected at the hospital and county levels, respectively (Table 1).

We employed a pooled cross-sectional analysis with year and state fixed effects to determine whether hospitals targeted for consolidation activities differed from nontarget hospitals with respect to organizational characteristics and environmental factors. Bivariate statistical analysis was conducted to compare nontarget hospitals to target hospitals on all variables used in the analysis. To assess the association between being selected as a target hospital and its organizational characteristics and environmental factors, a multivariate binary logistic regression model was used to analyze differences in predictor variables for hospitals selected as targets. All analyses were completed using Stata version 15.1 (StataCorp, 2017). We derived cluster-adjusted standard errors in our regression models to account for situations in which sample hospitals (and consolidation trends) were grouped in the same geographic areas, which can violate the assumptions of independent observations and affect estimates of variance and standard errors (Froot, 1989; Williams, 2000). Statistical tests were evaluated at the .05 level of significance. Tests of significance were conducted as appropriate (*t* tests for continuous variables and chi-square for categorical variables).

Results

The descriptive statistics and bivariate association of nontarget and target hospitals are reported in Table 2. When compared to the nontarget hospital group, the target hospitals (n = 185) were more likely to be investor-owned/for-profit, nonteaching entities with a smaller number of beds. They also tended not to be affiliated with a network and had lower inpatient and outpatient volumes. Target hospitals tended to have higher readmission reduction penalties and lower HCAHPS scores. In addition, they reported lower operating margins and ROA ratios. Target hospitals were in counties with relatively low populations and relatively high poverty levels.

Table 3 shows the multivariate binary logistic regression results. Based on the results, hypothesis 1 was partially supported, with two of the six variables found to be statistically significant. The odds of a not-for-profit hospital being a target hospital were 49.3% lower than a for-profit hospital (OR = 0.507, p<.01). For every additional inpatient admission, the likelihood of being selected as a target hospital decreased by 0.5% (OR = 0.995, p = .048). Hypothesis 2 was not supported— none of the variables were found to be statistically significant. Hypothesis 3 was also not supported. Though operating margin was found to be statistically significant (OR = 0.979, p≤.001), for every increase in operating margin, the likelihood of being selected as a target hospital decreased by 2.1%, meaning that hospitals with poorer financial performance were more likely to be selected as a target.

Among the environmental factors, hypothesis 4 was partially supported, as we found one of the two variables to be statistically significant. For hospitals in markets with a one-unit-higher level of HHI, the likelihood of being selected as a target hospital was 1.4% higher (OR = 1.014, p = .036). Hypothesis 5 had weak support because only one of the four variables was statistically significant. For every percentage increase in Medicare-eligible individuals, the likelihood of being selected as a target hospital decreased by 5.6% (OR = 0.944, p = .032). Hypothesis 6 was not supported, as none of the variables analyzed were found to be statistically significant.

To check for multicollinearity in the model, variance inflation factor (VIF) scores were obtained for each variable. The average VIF score for all variables was 4.46, with most variable VIF scores less than three. However, two variables, population and primary care physician supply, had VIF scores greater than 10. To mitigate the potential for multicollinearity, these variables were removed from the model, and the logistic regression was rerun. The results of the revised model reflected that the variables that were statistically significant in the original model (ownership status, inpatient volume, operating margin, HHI, percentage of population that was Medicare eligible) remained constant in addition to two other variables, HCAHPS overall rating (OR = 0.968, p = .043) and a hospital market's percent poverty (OR = 1.035, p = .038).

Discussion

The purpose of this study was to determine what organizational characteristics and environmental factors differentiate target hospitals from nontarget hospitals. We first examined the differences in organizational characteristics between target and nontarget hospitals (hypotheses 1–3). We did not anticipate that operational characteristics, described as a hospital's performance measured by clinical quality and patient experience performance, would not be statistically significant. This result was surprising, given the industry's continued focus on value-based care and the rise of consumerism, with patients and insurers demanding improvement in access to care, results,

convenience, and transparency (Allen et al., 2016; PwC, 2017). The significance of inpatient volumes as a structural characteristic was also surprising. While inpatient admission volume has not been studied directly in the literature in relation to target hospital selection, higher inpatient admissions may translate to higher occupancy rates and higher demand for services compared to local competitors. Previous studies found mixed results related to occupancy rates. Alexander and Morrisey (1988) do not find a statistically significant relationship between occupancy rate and entry into a multihospital system, whereas Harrison et al. (2003) report that hospitals with lower occupancy are more likely to be acquired.

Our study's finding regarding a target hospital's financial characteristics was not surprising, as previous research studies have found that acquiring hospitals sought out targets that had poorer finances or needed efficiency improvements and managerial enhancements (Alexander & Morrisey, 1988; Harrison et al., 2003; McCue et al., 2015). However, this finding is contrary to Butcher (2016), who proposes that hospitals showing strong performance would be more likely to consolidate with peers that were equally strong or stronger. Acquiring hospitals may be more likely to select a target hospital that is available at a discounted rate because of its relatively poor financial performance. Alternatively, the hospital characteristics and many other variables, such as the talent level and experience of the management team, governance structure, and the effectiveness of financial and operating controls, can also have a profound influence on profit, though these variables are very difficult to measure. The expected future cash flows of the target are the primary determinate of the price an acquiring firm is willing to pay. Projected return on investment was not available.

Second, we examined the differences in environmental market factors between target and nontarget hospitals (hypotheses 4–6). We found that hospitals in less competitive markets were more likely to become a target. This result aligns with previous literature arguing that hospitals are inclined to engage in consolidation activities in markets with less concentration (Alexander & Morrisey, 1988; Connor et al., 1997; Sloan et al., 2003). Regarding sociodemographic factors, we found that hospitals located in markets with a higher percentage of Medicare-eligible residents, or a larger proportion of individuals older than 65, were more likely to be targeted. This result is consistent with other studies in which the percent of Medicare-eligible people is an indication of the consumer demand for health care services in a market (Alexander & Morrisey, 1988; Harrison et al., 2003; McCue et al., 2015). Harrison et al. (2003) suggest that acquiring hospitals may forgo consolidation activities in markets with a high number of Medicare-eligible population to avoid declining Medicare reimbursement, which would have a negative impact on financial performance.

Last, we found no differences in the physical market factors of target hospitals compared to nontarget hospitals. While these variables have not been studied directly or extensively in the related literature, the lack of variable significance was surprising given the findings of related variables from previous studies. Sloan et al. (2003) find that consolidation transactions or ownership conversion occurred more frequently in markets with a lower population density. Conner et al. (1997) argue that acquiring hospitals tended to select target hospitals with fewer rural attributes. McCue et al. (2015) predict that target hospitals would be in markets with population growth; however, his results do not substantiate this finding. His outcome may stem from pre- and pos- ACA consolidation resulting in a less attractive pool of targets.

This study indicates that many organizational characteristics and environmental factors are considered by an acquiring hospital. Folta and O'Brien (2008) suggest that hospital leaders should develop "fluid" acquisition thresholds depending upon the desired outcome of the consolidation. For example, an acquiring hospital may tolerate poor performance in some metrics based on the potential positive performance in other areas (Folta & O'Brien, 2008). This decision may be dependent on the potential pool of eligible targets. As the hospital industry continues to experience consolidation waves, targets will pair off with acquiring hospitals, reducing the pools. Gorton et al. (2009) state that consolidation waves can lead to defensive consolidation tactics that aim to preempt competitor consolidation strategies. Recognizing that the hospital industry experienced a consolidation wave triggered by environmental pressures from the ACA, progressive acquiring hospitals may have initiated consolidation strategies and subsequent transactions prior to 2014, reducing the potential pool of target hospitals for future consolidation transactions. Assuming that more attractive hospitals are selected as targets before less attractive hospitals, the organizational characteristics and environmental factors of the remaining pool of potential target hospitals in the 2014–2016 study period may be different, and potentially diluted, compared to earlier consolidation targets. Looking to the future, acquiring hospitals may be required to modify their acquisition thresholds to satisfy their consolidation strategies.

As with all studies, this analysis has limitations. First, because consolidation waves in a given time span have specific environmental triggers and characteristics, the unique features of a particular consolidation wave may not be generalizable to other periods (Andrade et al., 2001; Sloan et al., 2003). Our analysis did not consider how waves might influence the potential for irrational behavior or the risk of competitive anticipation when choosing consolidation as a strategy (Folta & O'Brien, 2008; Trinh & O'Connor, 2002). Second, while we attempted to capture all potential consolidation activities and announcements in the study period, there may have been some consolidations unintentionally excluded from the sample.

Practical Implications
Hospitals operate in complex environments with limited resources. Consolidation is a strategic activity that they may employ to respond to environmental uncertainty and munificence while also creating value. Scholars have explored improved financial performance as a benefit of hospital consolidation; however, there are additional nonfinancial motivations that may drive an acquiring hospital to select target hospitals (e.g., value-based health care reimbursement, care coordination; Allen et al., 2016).

Given the scant literature evaluating the characteristics of target hospitals and their markets, this exploratory study creates an opportunity for expanded dialogue on the characteristics of future hospital consolidation targets. Continued merger and acquisition activity in the hospital industry requires hospital and health system leaders to understand the drivers for consolidation. This study is relevant those who seek to understand all potential motivators when selecting a target hospital—hospital practitioners, economists, and policy makers alike.

RDT asserts that resource limitations and environmental complexity will influence the strategies hospital use to control or enhance their environments through the acquisition of resources. In addition, RDT predicts that hospitals will work to develop and exploit competitive advantages in

their markets to preserve market share and profitability. By understanding the internal characteristics and market factors of target hospitals, hospital practitioners and policy makers are better able to study hospital behaviors and actions antecedent to consolidation, which may help to sketch out a profile of a potential target hospital in comparison to nontarget hospitals. Understanding organizational characteristics and environmental factors may also help managers better understand their hospitals' individual risk profiles as potential targets.

The results of this study enhance the current body of knowledge on hospital consolidations. Our analysis provides a greater understanding of the status of target hospitals compared to nontarget hospitals and may assist health care policy makers, economists, and practitioners who seek to understand how consolidation activities are formulated and how targets are selected in consolidations.

Conclusion
The purpose of this study was to examine the organizational characteristics and environmental factors of hospitals selected as consolidation targets compared to nontargeted hospitals. Though the findings in this study were mixed, our results suggest that when organizations select a hospital target, organizational characteristics that have traditionally been emphasized (e.g., ownership status) and market factors (e.g., HHI) have continued to motivate the selection of target hospitals. As the health care industry continues to shift toward a value-driven approach to reimbursement, operational performance may play a more important role in target selection over time.

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Table 1

Operationalization of Variables: Listing of Variables, Description, and Source

Hypothesis/ construct	Variable	Variable definition	Type	Data source
Dependent variable	Target hospital	1 if target hospital; 0 if nontarget hospital	Binary	Kaufman, Hall & Associates
H1: Structural characteristics				
	Hospital ownership type	1 if not-for-profit; 0 if investor-owned, for-profit	Binary	AHA Survey
	Teaching status	1 if COTH member; 0 if not COTH member	Binary	AHA Survey
	Number of beds	6–199 = 1; 200–399 = 2; 400+ = 3	Nominal	AHA Survey
	Hospital in a network?	1 if yes; 0 if no	Binary	AHA Survey
	Inpatient volume	Total number of hospital admissions	Continuous	AHA Survey
	Outpatient volume	Total number of outpatient visits	Continuous	AHA Survey
H2: Operational characteristics				
	Clinical quality: readmission reduction penalty (CMS Readmission Reduction Program)	% penalty received	Continuous	HRRP Supplemental Data File (www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Archived-Supplemental-Data-Files.html)
	Service quality: willingness-to-recommend score (HCAHPS)	% top-box score (rating of "Definitely yes")	Continuous	Hospital Compare Data archive (https://data.medicare.gov/data/archives/hospital-compare)

Service quality: overall rating (HCAHPS)	% top-box score (rating of 9 or 10)	Continuous	
	H3: Financial characteristics		
Operating margin	(Total operating revenue - Total operating expenses)/Total operating revenue	Continuous	Medicare Cost Report (https://wrds-web.wharton.upenn.edu/wrds/)
Return on assets ratio	Total margin/total assets	Continuous	
	H4: Competitive factors		
Herfindahl–Hirschman Index (HHI)	(Total inpatient days of a hospital/total inpatient days of health service area)^2	Continuous	Calculated/AHA Survey
Medicare Advantage penetration	% of Medicare Advantage penetration	Continuous	AHRF
	H5: Sociodemographic factors		
Medicare-eligible population	% of population 65 or older	Continuous	AHRF; US Census population by age
Access to primary care/ physician supply	# of primary care physicians in country per 1,000	Continuous	AHRF
Poverty level	Families with income below $1.5 \times$ the federal poverty level	Continuous	AHRF; American Community Survey Poverty Levels, 2012–2016
% ethnic minorities	% of population identified as a minority	Continuous	AHRF
	H6: Physical factors		
Core-based service area name (CBSA)	1 if metropolitan or micropolitan service area; 0 if rural	Binary	AHA Survey
Population of county	Number of residents	Continuous	AHRF

Note. AHA = American Hospital Association; AHRF = Area Health Resource Files; CMS = Centers for Medicare & Medicaid Services; HRRP = Hospital Readmission Reduction Program

Table 2

Descriptive Statistics and Bivariate Association of Nontarget and Target Hospitals

	Nontarget hospitals (N = 4,891)	Target hospitals (N = 185)	Total hospitals (N = 5,076)	t-test/ X2
Year**				X2 =
2014 (n/%)	1,768/36.15	57/30.81	1,825/35.95	11.45
2015 (n/%)	1,763/36.05	89/48.11	1,852/36.49	p≤.01
2016 (n/%)	1,360/27.81	39/21.08	1,399/27.56	
Structural characteristics				
Hospital ownership type				
Not-for-profit (n/%)	3,810/77.90	133/71.89	3,943/77.68	X2 = 3.71
Investor-owned, for-profit (n/%)	1,081/22.10	52/28.11	1,133/22.32	p = .054
Teaching hospital Status				
COTH member (n/%)	396/8.10	12/6.49	408/8.04	X2 = 0.63
Non-COTH member (n/%)	4,495/91.10	173/93.51	4,668/91.96	p = .429
Number of beds				
6–199 (n/%)	2,837/58.0	111/60.0	2,948/58.08	X2 = 1.60
200–399 (n/%)	1,287/26.13	51/27.57	1,329/26.18	p = .45
400 or more (n/%)	776/15.87	23/12.43	799/15.74	
Participation in a network?				
Participates in a network (n/%)	2,344/47.92	78/42.16	2,422/47.71	X2 = 2.37 p = .12
Does not participate in a network (n/%)	2,547/52.08	107/57.84	2,654/52.59	
Inpatient volume (in thousands) (M/SD)	54.84/64.69	47.56/45.67	54.57/64.11	t = 1.52 p = .13
Outpatient volume (in thousands) (M/SD)	222.05/300.06	213.98/296.04	221.75/300.00	t = 0.36 p = .72
Operational characteristics				
Readmission reduction penalty % (multiplied by 100) (M/SD)	0.41/0.54	0.47/0.55	0.41/0.54	t = -1.54 p = .12

HCAHPS: willingness to recommend (M/SD)*	95.07/3.03	94.62/2.62	95.05/3.02	t = 1.98 p = .05
HCAHPS: overall rating (M/SD)***	71.01/8.04	68.77/7.54	70.93/8.03	t = 3.73 p≤.001
Financial characteristics				
Operating margin (OM) % (M/SD)***	1.53/14.08	-3.38/12.91	1.35/14.06	t = 4.67 p≤.001
Return on assets (ROA) ratio % (M/SD)	6.83/32.41	3.08/43.07	6.69/32.86	t = 1.53 p = 0.13
Competitive factors				
Herfindahl–Hirschman Index (M/SD)** (HHI) (multiplied by 100)	15.23/10.29	17.28/9.16	15.31/10.26	t = -2.67 p≤.01
Medicare Advantage penetration % (M/SD)	29.44/13.69	29.12/13.34	29.43/13.68	t = 0.32 p = 0.75
Sociodemographic factors				
Medicare-Eligible population % (M/SD)	17.5/4.31	17.7/3.8	17.5/4.29	t = -0.62 p = 0.53
Access to primary care physicians	567.00/941.00	465.62/725.13	563.30/934.12	t = 1.45 p = 0.15
Poverty level % (M/SD)**	15.73/5.54	16.78/5.65	15.77/5.54	t = -2.51 p = .01
% minorities	23.76/15.98	25.00/16.25	23.80/15.99	t = -1.04 p = 0.30
Physical factors				
Core-based service area type (CBSA) Metro- or micropolitan service area (n/%)	4,608/94.21	174/94.05	4,782/94.21	X2 = 0.01 p = 0.93
Rural service area (n/%)	283/5.79	11/5.95	294/5.79	
Population of county (in thousands) (M/SD)	681.40/1181.20	565.59/872.17	677.18/1171.50	t = 1.32 p = 0.19

* p≤.05; ** p≤.01; *** p≤.001

Table 3

Analysis with Target Hospitals as a Dependent Variable

	Odds ratio	Standard error	p-value	95% CI
Year	1.095	0.107	.352	0.904 - 1.327
Structural characteristics				
Hospital ownership type**	0.507	0.117	≤.01	0.323 - 0.797
Teaching hospital status	1.044	0.379	.904	0.513 - 2.13
Number of beds				
6–199	Reference			
200–399	1.323	0.277	.181	0.878 – 1.995
400+	1.369	0.571	.451	0.605 – 3.102
Participation in a network?	0.796	0.137	.184	0.569 - 1.114
Inpatient volume*	.995	0.003	.048	0.989 – 1.000
Outpatient volume	1.000	0.000	.845	0.999 – 1.001
Operational characteristics				
Readmission reduction penalty	1.044	0.152	.767	0.785 - 1.388
HCAHPS: willingness to recommend	1.080	0.473	.080	0.991 - 1.176
HCAHPS: overall rating	0.971	0.156	.064	0.941 - 1.002
Financial characteristics				
Operating margin (OM)***	0.979	0.005	≤.001	0.968 - 0.990
Return on assets (ROA) ratio	1.001	0.003	.522	0.997 - 1.007
Competitive factors				
Herfindahl-Hirschman Index (HHI)*	1.014	0.007	.036	1.001 - 1.028
Medicare Advantage penetration	1.002	0.008	.761	0.987 - 1.018
Sociodemographic factors				
Medicare-eligible population*	0.944	0.026	.032	0.895 – 0.995
Access to primary care physician	0.999	0.000	.132	0.999 - 1.000

Poverty level	1.025	0.178	.153	0.991 - 1.060
% minorities	1.005	0.008	.483	0.990 - 1.021
Physical factors				
Core-based service area type	1.101	0.413	.797	0.528 - 2.126
Population of county	1.000	0.000	.323	1.000 - 1.001

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$