

Article

Does Hospital–Physician Integration Improve Hospital Performance? Results from a USA Longitudinal Study

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Abstract: In a dynamic healthcare industry, aligning the goals and objectives of hospitals and physicians through integration has been suggested to influence performance. Physicians' leadership and active involvement in governance can direct resource usage, Electronic Health Record (EHR) implementation, price negotiation, better coordination, and continuity of services for patients, thus affecting performance. This study aimed to examine the relationship between physician integration and hospital performance, investigating both financial and quality outcomes. We used a longitudinal study design. Our sample was hospital-level data from 2014 to 2019, which contained 6000 U.S. hospital-year observations. The dependent variables were quality outcomes (readmission rates) and financial outcomes (total and operating margins). The independent variable explored three dimensions of integration: high, low, and overall integration. Findings showed no impact of hospital–physician integration on quality outcomes and financial performance. High-integration hospitals did not show any significant relationships with quality outcomes and financial performance compared to hospitals that did not have high integration. Hospital–physician integration may have little potential to bring clinical integration even though vertical integration is present. A commitment to improving quality as a strategic priority may be vital in impacting quality outcomes, followed by financial performance.

Keywords: hospital–physician integration; hospital performance; quality outcomes; financial outcomes; agency theory



Citation: Upadhyay, S.; Cochran, R.A.; Opoku-Agyeman, W. Does Hospital–Physician Integration Improve Hospital Performance? Results from a USA Longitudinal Study. *Hospitals* **2024**, *1*, 172–184. <https://doi.org/10.3390/hospitals1020014>

Academic Editor: Francisco Epelde

Received: 5 July 2024

Revised: 20 September 2024

Accepted: 3 October 2024

Published: 8 October 2024



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1. Introduction

Physicians' decisions significantly influence health service utilization, accounting for nearly 80% of healthcare expenditures [1]. Consequently, the relationship between hospitals and physicians has become an area of growing interest among managers and researchers [2]. Hospital–physician integration represents a structural combination of doctors and hospitals, achieved through ownership and contractual linkages to provide a continuum of care through various inter-relationships. This creates an integrated delivery system that enhances coordination and service delivery [3].

There are two main types of integration: vertical and horizontal integration. Vertical integration involves the alignment of different stages of delivery (e.g., primary care, specialty care, and hospital services), while horizontal integration integrates facilities offering similar services across various locations [4]. Hospital–physician integration is a form of vertical integration where physicians utilize hospital facilities and actively participate in the hospital's planning, management, and governance [2]. Integration is a valuable mechanism to mitigate the negative influences of fragmented, autonomous practitioner behavior; balance physician workloads; and enhance the hospital's bargaining power with insurers [2].

The increasing trend toward hospital–physician integration in U.S. healthcare systems has been driven by potential benefits, such as improved Medicare reimbursement and enhanced negotiating power with private payers [2]. Between 2016 and 2018, the percentage of U.S. physicians affiliated with vertically integrated health systems increased from 40% to 51% [5]. This shift reflects the evolving healthcare landscape, where physicians leverage their involvement in hospitals to control key aspects of care, such as admissions, length of stay, and the utilization of services, all of which have significant implications for hospital performance [6].

Hospital–physician integration aims to enhance alignment between hospitals and physicians through shared risk and reward structures. This alignment can harmonize individual contributors’ efforts, leading to better clinical and financial outcomes [7]. Physicians integrated with hospitals share common objectives. The depth and breadth of this integration can vary, with some systems employing deeper levels of integration that extend beyond mere facility usage to more comprehensive involvement in hospital economics, planning, and governance [2].

While existing research has explored the effects of hospital–physician integration on aspects such as hospital prices, admission volumes, and overall spending, there is a gap in the literature regarding how integration influences quality outcomes (e.g., readmission rates) and financial performance (e.g., profitability indicators) [8–10]. Few studies have examined how varying degrees of integration (high and low) affect these outcomes. Given the substantial influence physicians exert on resource use, cost management, and care coordination, understanding the impact of integration on hospital performance is vital [11].

Therefore, this study aims to examine the relationship between hospital–physician integration and hospital performance, focusing on both financial and quality outcomes. By employing a fixed-effects regression analysis, we investigate how integration affects readmission rates and profitability indicators. Our study contributes to the literature by filling the gap on how different levels of integration impact hospital quality and financial performance, providing healthcare administrators with insights on how to better align physicians’ goals with hospital objectives. The paper presents a conceptual framework that explains the key concepts, hypotheses development, and research questions, followed by the methodology used to answer the research questions, interpretation of results, and discussion of the results and practical implications.

2. Conceptual Framework

This study applies agency theory and transaction cost economics (TCE) as its conceptual framework, as shown in Figure 1, to explain how hospital–physician integration impacts hospital performance, focusing on quality and financial outcomes. According to agency theory, there are two parties: the ‘principal’ (hospital) and the ‘agent’ (physician) [12]. In this relationship, agents may act in their interests, which could diverge from the principal’s goals, potentially jeopardizing the hospital’s overall performance. Hospital–physician integration offers a governance structure that aligns incentives and reduces the risk of agency problems by creating shared economic and clinical goals between hospitals and physicians [12].

Traditionally, physicians worked independently of hospitals, making clinical decisions significantly affecting patient outcomes [13]. In contrast, hospitals bore the financial and reputational costs associated with poor outcomes, such as high readmission rates and penalties [13]. Integration seeks to mitigate this misalignment by synchronizing the objectives of both parties, ensuring that physicians’ clinical decision-making is aligned with the hospital’s quality and financial goals.

Proponents of integration argue that greater integration enhances physicians’ commitment to hospital objectives, reducing agency risks [8]. By linking physicians economically and psychologically to hospitals through risk-sharing agreements, such as employment contracts or participation in governance, hospitals can influence physician behavior in ways that benefit both clinical and financial performance [14]. For example, studies within

ACOs have demonstrated that integrated physicians may be more likely to focus on care coordination and patient safety, ultimately improving quality outcomes [14].

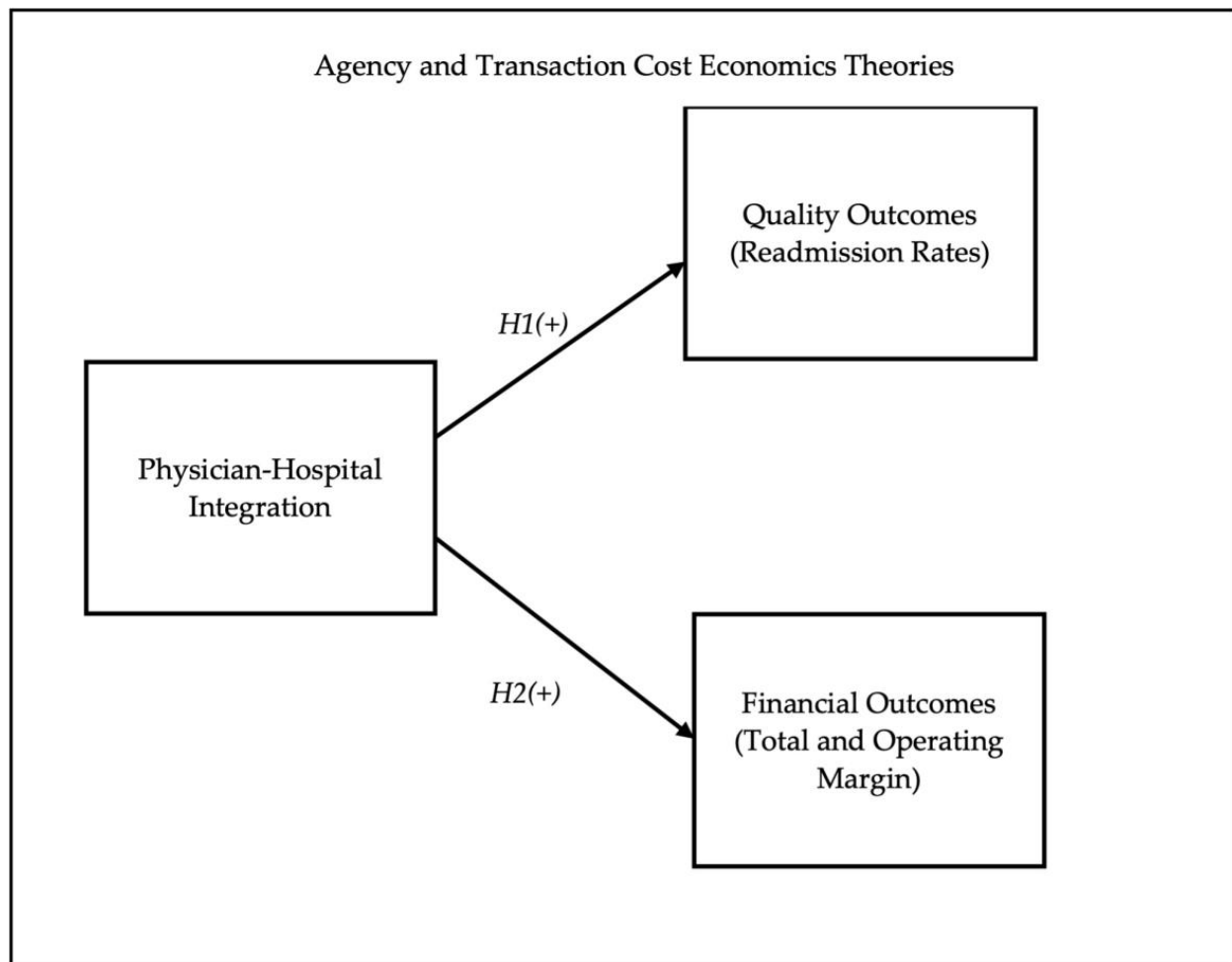


Figure 1. Conceptual framework.

Hospital governing board practices may enhance the accountability of the board, management, and medical staff by dedicating time to quality issues at strategic meetings or having a subcommittee that oversees the hospital's quality outcomes [15]. Studies have employed agency theory to study whether hospital–physician integration can be influential in reducing adverse incident rates. However, these studies have not seen any integration effect on improving patient safety, a critical aspect of quality outcomes [16]. On the other hand, certain studies that examined the role of physician leadership in improving hospitals' quality rankings have found a positive effect between the two [10].

Transaction cost economics (TCE) complements agency theory by focusing on the efficiency gains from integration [17]. TCE posits that integration can lower transaction costs related to governance, resource allocation, and coordination between hospitals and physicians [17]. TCE has been used to study organizational arrangements, such as vertical integration and other hybrid governance structures [17]. Integration enables the development of hybrid governance structures, like accountable care organizations (ACOs), that ensure a tighter coupling of physician and hospital goals, improving cost efficiency and quality outcomes [18]. Studies have shown that integrated governance structures lead to better decision-making and more cost-effective care delivery, thus improving financial performance [17,18].

Therefore, based on these theoretical frameworks, we hypothesize the following relationships:

H1: *Hospital–physician integration is positively associated with quality outcomes.*

We expect that hospital–physician integration will improve quality outcomes, such as lower readmission rates and better patient safety, as integration fosters better coordination and alignment of physician behaviors with hospital quality goals.

H2: *Hospital–physician integration is positively associated with financial outcomes.*

We expect integration to improve hospital financial performance by enhancing operational efficiency, reducing unnecessary resource use, and creating economies of scale through coordinated care and risk-sharing arrangements.

3. Materials and Methods

3.1. Data Sources and Sample

We employed a longitudinal study design with data from 2014 to 2019. The American Hospital Association (AHA) Annual Survey provided information on hospital characteristics. The Area Health Resource File (AHRF) offered county-level information on healthcare systems and factors that affect health outcomes. The clinical data and hospital quality outcomes were sourced from the Centers for Medicare and Medicaid Services (CMS) Hospital Compare. The Medicare Cost reports provided data on financial outcomes. These datasets offer both historical and current information on hospital characteristics. The study sample inclusive criteria were (1) non-federal, (2) general-medical, (3) acute care hospitals, and (4) hospitals that had integration functionalities within all 50 states of the United States, with the unit of analysis for multivariable relationships at the hospital-year level. The final sample was 13,306 hospital-year observations (or an average of 2210 hospitals per year).

3.2. Variables Studied

We used two dependent variables to measure hospitals' quality and financial outcomes; the goal was to capture a comprehensive view of hospital performance. The quality outcomes consisted of Acute Myocardial Infarction (AMI), Heart Failure (HF), Pneumonia (PN) readmission, and patient safety indicators. These quality metrics were chosen because they represent widely recognized metrics used in both healthcare policy and research to assess hospital performance [19]. These measures are tied to national quality initiatives and are relevant for clinical practice and public reporting. Specifically, AMI, HF, and PN readmission rates are objective, quantifiable indicators used in previous studies to evaluate hospital quality and patient outcomes, making them robust for analysis. In this context, AMI 30-day readmission for hospitals represents the unplanned hospitalization or readmission for AMI [20], HF 30-day readmission for hospitals represents the unplanned hospitalization or readmission for HF [20], and PN 30-day readmission for hospitals represents the unplanned hospitalization or readmission for PN [20]. Patient safety indicators are adverse incident rates (AIRs) that measure the rate of adverse incidents, such as an injury due to improper medical management that prolonged hospitalization or produced disability at discharge. Higher AIRs indicate worse patient safety outcomes [16].

The financial outcomes consist of total margin and operating margin. These two financial metrics have been used to explore performance indicators in the healthcare literature that address profitability strategy. Including these financial metrics allows us to examine how hospital–physician integration influences not only quality outcomes but also the financial health of hospitals, offering a more holistic view of performance. The total margin reflects the percentage of revenue that remains as profit after covering all expenses, including operating and non-operating activities (such as investment income, philanthropic contributions, etc.). The operating margin gives a more focused picture of the profitability of the hospital's core patient care activities. It omits non-operating revenues such as philanthropic contributions, endowment income, investment income, and other revenue and expenses unrelated to operations [11]. It is worth noting that for-profit

hospitals in the U.S. are subject to additional financial pressures related to taxation, owners' equity, and the provision of other services that contribute to the total margin but may not be directly related to core business operations. These factors may impact for-profit hospitals' overall profitability and margin performance compared to their not-for-profit counterparts.

This study's independent variables explore three dimensions of hospital–physician integration. The first and second, high and low integration, respectively, follow the methods of prior researchers [19,21] in creating the level of hospital–physician integration. Similar to Cervin 2020, hospitals were classified as high integration if they participated in any of these physician arrangements identified in the AHA data: group practice without walls, management service organization, integrated salary model, equity model, and foundation. Hospitals participating in independent practice associations, open hospital–physician organizations, and closed hospital–physician organization arrangements were classified as low integration. High-integration hospitals were given a value of 1 if high and 0 if not high; similarly, low-integration hospitals were coded as 1 and 0 (1 = low, 0 = not low). As an extension of the method by Cervin, we operationalized a third independent integration variable, 'overall integration,' that captures the breadth and depth of integration [22]. The breadth of physician integration was defined as the presence of at least one of eight types of the aforementioned physician arrangements (0–8). When these physician arrangements existed at the hospital, system, or network level, we defined this as the depth of integration (0–3). The overall integration level of a hospital is determined by a combination of breadth and depth (0–24).

Hospital organizational characteristics were incorporated as control variables in our analyses [22]. These characteristics include full-time-equivalent (FTE) registered nurses (measured as registered nurses who worked 35 h or more a week and were on the hospital payroll at the end of the reporting period), hospital size (measured as the total number of beds), teaching status (measured with a dummy variable; 0 = not a teaching hospital; 1 = teaching hospital), and hospital ownership. Hospitals were classified as teaching hospitals if they met any of the following criteria: (1) residency training approved by the Accreditation Council for Graduate Medical Education; (2) medical school affiliation reported to the American Medical Association; (3) member of the Council of Teaching Hospital of the Association of American Medical Colleges (COTH); or (4) residency approved by the American Osteopathic Association. Other characteristics included hospital ownership (measured as public, not-for-profit, and for-profit), system membership (measured as 'yes' if system-affiliated or 'no' if not affiliated with a system), if the hospital is contract-managed (measured with a dummy variable; 0 = not contract-managed; 1 = contract-managed), and payer mix (measured as the share of total inpatient discharge by either Medicare or Medicaid). We also included some market characteristics as control variables. Specifically, we included location (operationalized with three indicators: (1) metropolitan, (2) urban, or (3) rural). These indicators were based on the Rural-Urban Continuum Codes, where metropolitan "was defined as hospitals located in counties with greater than 250,000 population", urban was defined as hospitals located in counties with an "urban population between 2500 and 20,000 population adjacent or not adjacent to a metropolitan area", and rural was defined as hospitals located in counties that were "completely rural or less than 2500 urban population adjacent or not adjacent to a metropolitan area" [23]. Market competition (measured by the Herfindahl–Hirschman Index (HHI)) represents the sum of the squared market shares in a market, with market share based on the system-level share of hospital inpatient days in a health service area.

3.3. Analyses

Univariate analyses provided descriptive statistics on the variables used. Multivariable relationships between quality, financial outcomes, and integration types were examined using fixed-effects linear regression models. We used fixed-effects regression because fixed-effects controls for unobserved, time-invariant characteristics of hospitals that may influence their overall quality and financial performance [24]. The models used robust

standard error adjustments to account for repeated measurements at the hospital level. We additionally performed sensitivity and diagnostic test analyses. All statistical analyses were performed in Stata 17 [25] at a statistically significant level of 0.1, 0.05, and 0.01.

4. Results

Pooled average and frequency descriptive characteristics of our study variables over the period under consideration are presented in Table 1. First, the dependent variables (quality outcomes) recorded, on average, an AMI readmission rate of approximately 41.28 (SD = 30.75), an HF readmission rate of 90.21 (SD = 79.48), a PN readmission rate of 75.44 (SD = 61.84), and a patient safety indicator score of 0.92 (SD = 0.19). Regarding financial performance, hospitals reported a mean total margin of approximately 6% (SD = 9.00) and an operating margin of approximately 0.3% (SD = 10.62). Based on our construction of the dimensions of hospital–physician integration, hospitals were found to have a mean overall integration level of 1.02 (SD = 1.43), indicating both the breadth and depth of hospital–physician integration. Overall, 39% of hospitals had high integration of physician arrangements, while 20% reported having low integration of physician arrangements.

Exploring the control variables, on average, hospitals reported full-time nurse counts of 474.23 (SD = 566.86) and had an average bed size of 242 (SD = 218.50). Approximately more than half of our study hospitals were teaching hospitals (55%), with the majority being not-for-profit hospitals (70%). About two-thirds of hospitals belonged to a system (76%) and were in metropolitan areas (72%). Hospitals, on average, had 2401.79 (SD = 2870.11) Medicaid patient discharges and 5145.66 (SD = 4562.67) Medicare patient discharges and generally operated in a less competitive market (mean HHI = 0.06).

Multivariable relationships between our dependent variables and each independent variable are presented in Table 2 (depth of integration), Table 3 (high integration), and Table 4 (low integration). We report coefficients and standard errors of each fixed-effects model for the following dependent variables in each table: total margin (model 1), operating margin (model 2), AMI readmission rate (model 3), HF readmission rate (model 4), PN readmission rate (model 5), and patient safety indicator (model 6). Overall, there was no significant association between our key independent variables and all our dependent variables. Therefore, both H1 and H2 were not supported. Additionally, some of our dependent variables were significantly associated with specific hospital characteristics. Compared to public non-federal hospitals, for-profit hospitals, on average, experienced a lower total and operating margin (approximately 1.5% and 1.9%, respectively, Tables 2–4). Hospital size was associated with lower HF readmission rates (approximately 0.03, model 4, Tables 2 and 3). On the contrary, hospitals belonging to a system experienced, on average, higher HF readmission rates (approximately 0.23, model 4, Tables 2–4) compared to non-system hospitals. Similarly, hospitals belonging to a system experienced, on average, higher patient safety indicators (approximately 0.04, model 6, Tables 2–4) compared to non-system hospitals. Furthermore, as hospital size increases, PN readmission rates generally decrease by approximately 0.001 (model 5, Tables 2–4). Finally, hospital market competition was significantly associated with AMI readmission. Specifically, as market competition decreased, AMI readmission rates, on average, increased by approximately 0.85 (model 3, Tables 2–4).

Table 1. Descriptive characteristics of study variables (N = 13,306).

	M(SD) or F (%)
Dependent Variables	Pooled
Quality Outcomes	
AMI readmission	41.28 (30.75)
HF readmission	90.21 (79.48)
PN readmission	75.44 (61.84)
Patient Safety Indicator	0.92 (0.19)
Financial Performance	
Total Margin	5.52 (9.00)
Operating Margin	0.33 (10.62)
Independent Variables	
Depth of Integration	1.02 (1.43)
High Integration	
Yes	5205 (39%)
No	8101 (61%)
Low Integration	
Yes	2683 (20%)
No	10,623 (80%)
Control Variables	
Full Time Nurses	474.23 (566.86)
Hospital Size	241.62 (218.50)
Teaching Status	
Yes	7364 (55%)
No	5942 (45%)
Ownership	
For-profit	2531 (19%)
Not-for-profit	9270 (70%)
Public, non-federal	1505 (11%)
System Membership	
Yes	10,060 (76%)
No	3246 (24%)
Location	
Metropolitan	9543 (72%)
Urban	3500 (26%)
Rural	263 (2%)
Hospital Contract Managed	
Yes	589 (4%)
No	12,717 (96%)
Medicaid Patient Discharges	2401.79 (2870.11)
Medicare Patient Discharges	5145.66 (4562.67)
HHI	0.06 (0.03)

M = Mean, SD = Standard deviation, F = frequency, % = percentage. Data sources: AHA annual survey, AHRF, CMS hospital compare, and Medicare cost reports.

Table 2. Regression results of the relationship between overall integration and financial performance and quality outcomes.

	Financial Performance						Quality Outcomes					
	Total Margin (Model 1)		Operating Margin (Model 2)		AMI Readmission (Model 3)		HF Readmission (Model 4)		PN Readmission (Model 5)		Patient Safety Indicators (Model 6)	
	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E
Overall Integration	−0.021	0.07	0.009	0.08	−0.039	0.25	−0.245	0.49	−0.318	0.39	−0.002	0.00
Full Time Nurses	0.000	0.00	0.000	0.00	−0.003	0.00	−0.005	0.01	0.001	0.01	0.000	0.00
Hospital Size	−0.003	0.00	−0.004	0.00	−0.011	0.01	−0.031 *	0.02	−0.011	0.01	0.000	0.00
Teaching Status												
Yes	0.109	0.31	0.343	0.34	−0.841	1.19	−0.450	2.16	0.858	1.72	−0.005	0.01
No	Ref		Ref		Ref		Ref		Ref		Ref	
Ownership												
For-profit	−1.549 **	0.70	−1.948 **	0.78	−1.266	2.77	2.552	4.90	−1.686	3.91	0.021	0.02
Not-for-profit	−1.036	0.86	−0.902	0.96	−3.380	4.15	3.458	6.31	−1.291	4.96	0.004	0.02
Public, non-federal	Ref		Ref		Ref		Ref		Ref		Ref	
System Membership												
Yes	−0.338	0.47	−0.022	0.52	1.973	1.84	3.847	3.31	−0.869	2.65	−0.019	0.01
No	Ref		Ref		Ref		Ref		Ref		Ref	
Location												
Metropolitan	−0.090	7.20	9.776	8.02	0.000	0.00	43.917	49.38	25.261	47.51	0.241	0.19
Urban	−3.611	6.06	2.864	6.76	−5.761	11.39	31.341	41.59	16.548	42.39	0.155	0.16
Rural	Ref		Ref		Ref		Ref		Ref		Ref	
Hospital Contract Managed												
Yes	0.002	0.61	−0.494	0.68	2.064	3.09	0.226	4.44	3.544	3.46	0.010	0.02
No	Ref		Ref		Ref		Ref		Ref		Ref	
Medicaid Patient Discharges	0.040	0.17	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Medicare Patient Discharges	0.030	0.13	0.000	0.00	0.000	0.00	−0.001	0.00	−0.001 *	0.00	0.000	0.00
HHI	−8.699	6.56	−6.105	7.32	52.917	68.16	23.681	100.31	3.803	36.32	−0.147	0.17

** $p < 0.05$, * $p < 0.1$, Ref = Reference group, S.E = Standard Error, β = Beta Coefficient, HHI= Herfindahl-Hirschman Index. Data sources: AHA annual survey, AHRE, CMS hospital compare, and Medicare cost reports.

Table 3. Regression results of the relationship between high integration and financial performance and quality outcomes.

	Financial Performance						Quality Outcomes					
	Total Margin (Model 1)		Operating Margin (Model 2)		AMI Readmission (Model 3)		HF Readmission (Model 4)		PN Readmission (Model 5)		Patient Safety Indicators (Model 6)	
	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E
High Integration	−0.201	0.22	0.083	0.24	0.143	0.81	0.157	1.52	0.670	1.21	0.006	0.01
Full Time Nurses	0.000	0.00	0.000	0.00	−0.003	0.00	−0.005	0.01	0.001	0.01	0.000	0.00
Hospital Size	−0.003	0.00	−0.003	0.00	−0.011	0.01	−0.031 *	0.02	−0.011	0.01	0.000	0.00
Teaching Status												
Yes	0.106	0.308	0.344	0.34	−0.841	1.19	−0.443	2.16	0.878	1.72	−0.005	0.01

Table 3. Cont.

	Financial Performance				Quality Outcomes							
	Total Margin (Model 1)		Operating Margin (Model 2)		AMI Readmission (Model 3)		HF Readmission (Model 4)		PN Readmission (Model 5)		Patient Safety Indicators (Model 6)	
	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E
No	Ref		Ref		Ref		Ref		Ref		Ref	
Ownership												
For-profit	−1.543**	0.70	−1.951**	0.78	−1.261	2.77	2.568	4.90	−1.698	3.91	0.021	0.02
Not-for-profit	−1.045	0.86	−0.899	0.96	−3.355	4.15	3.549	6.31	−1.192	4.96	0.005	0.02
Public, non-federal	Ref		Ref		Ref		Ref		Ref		Ref	
System Membership												
Yes	−0.354	0.47	−0.016	0.52	1.995	1.84	3.849	3.31	−0.832	2.65	−0.019	0.01
No	Ref		Ref		Ref		Ref		Ref		Ref	
Location												
Metropolitan	−0.194	7.20	9.819	8.02	0.000	0.00	44.216	49.38	25.931	47.51	0.247	0.19
Urban	−3.679	6.06	2.892	6.76	−5.858	11.39	31.359	41.59	16.720	42.39	0.157	0.16
Rural	Ref		Ref		Ref		Ref		Ref		Ref	
Hospital Contract Managed												
Yes	0.000	0.00	−0.503	0.68	2.048	3.09	0.139	4.45	3.372	3.46	0.009	0.02
No	Ref		Ref		Ref		Ref		Ref		Ref	
Medicaid Patient Discharges	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Medicare Patient Discharges	0.000	0.00	0.000	0.00	0.000	0.00	−0.001	0.00	−0.001	0.00	0.000	0.00
HHI	−8.662	6.56	−6.120	7.32	52.265	68.20	22.879	100.31	3.581	36.32	−0.149	0.17

** $p < 0.05$, * $p < 0.1$, Ref = Reference group, S.E = Standard Error, β = Beta Coefficient, HHI = Herfindahl-Hirschman Index. Data sources: AHA annual survey, AHRF, CMS hospital compare, and Medicare cost reports.

Table 4. Regression results of the relationship between low integration and financial performance and quality outcomes.

	Financial Performance				Quality Outcomes							
	Total Margin (Model 1)		Operating Margin (Model 2)		AMI Readmission (Model 3)		HF Readmission (Model 4)		PN Readmission (Model 5)		Patient Safety Indicators (Model 6)	
	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E
Low Integration	−0.084	0.28	−0.135	0.31	−0.222	0.99	0.049	1.97	−0.703	1.57	0.004	0.01
Full Time Nurses	0.000	0.00	0.000	0.00	−0.003	0.00	−0.005	0.01	0.002	0.01	0.000	0.00
Hospital Size	−0.003	0.00	−0.004	0.00	−0.011	0.01	−0.031	0.02	−0.011	0.01	0.000	0.00
Teaching Status												
Yes	0.110	0.31	0.342	0.34	−0.838	1.19	−0.446	2.16	0.866	1.72	−0.005	0.01
No	Ref		Ref		Ref		Ref		Ref		Ref	
Ownership												
For-profit	−1.547**	0.70	−1.946**	0.78	−1.260	2.77	2.568	4.90	−1.663	3.91	0.021	0.02
Not-for-profit	0.110	0.31	−0.907	0.96	−3.371	4.15	3.532	6.31	−1.242	4.96	0.005	0.02

Table 4. Cont.

	Financial Performance				Quality Outcomes							
	Total Margin (Model 1)		Operating Margin (Model 2)		AMI Readmission (Model 3)		HF Readmission (Model 4)		PN Readmission (Model 5)		Patient Safety Indicators (Model 6)	
	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E	β	S.E
Public, non-federal	Ref		Ref		Ref		Ref		Ref		Ref	
System Membership												
Yes	−0.342	0.47	−0.026	0.52	1.964	1.84	3.839	3.31	−0.906	2.65	−0.019	0.01
No	Ref		Ref		Ref		Ref		Ref		Ref	
Location												
Metropolitan	−0.089	7.20	9.742	8.02	0.000	0.00	44.131	49.38	25.377	47.51	0.244	0.19
Urban	−3.613	6.06	2.868	6.76	−5.769	11.39	31.308	41.59	16.509	42.39	0.155	0.16
Rural	Ref		Ref		Ref		Ref		Ref		Ref	
Hospital Contract Managed												
Yes	−0.001	0.61	−0.489	0.68	2.066	3.09	0.159	4.44	3.468	3.46	0.009	0.02
No	Ref		Ref		Ref		Ref		Ref		Ref	
Medicaid Patient Discharges	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Medicare Patient Discharges	0.000	0.00	0.000	0.00	0.000	0.00	−0.001	0.00	−0.001*	0.00	0.000	0.00
HHI	−8.700	6.56	−6.095	7.32	52.758	68.15	23.017	100.30	3.759	36.32	−0.148	0.17

** $p < 0.05$, * $p < 0.1$, Ref = Reference group, S.E = Standard Error, β = Beta Coefficient, HHI = Herfindahl-Hirschman Index. Data sources: AHA annual survey, AHRF, CMS hospital compare, and Medicare cost reports.

5. Discussion

A key finding of this study was that hospital–physician integration is not associated with better quality outcomes, as represented by AMI, HF, and PN readmission rates and patient safety indicators. A study examining the relationship between integration leading to physician leadership at hospitals, quality ratings, and financial performance found that hospital systems with integrated physician arrangements had higher quality ratings than their counterparts, but financial performance did not differ [10]. Although our findings related to quality did not align with this study, our findings are consistent with those in other studies [10]. Another study that examined the linkage between hospital–physician affiliations and quality of care did not find a positive relationship [26]. A study investigating cross-sectional data to determine the relationship between hospital–physician arrangements and quality outcomes found no significant linkages [19].

Our study builds on the study by Cervin [19] in that it used longitudinal data over four years and fixed effects to control for unobserved latent variables. Despite using a more robust analysis methodology, we have not found any significant relationships between hospital–physician integration and hospital quality and financial outcomes. In our study, integration was measured by eight types of physician arrangements and the extent to which those were adopted (hospital, system, or network). Although it was expected, hospital–physician integration was not found to be impactful in reducing AMI, HF, and PN readmission rates and lowering adverse incident rates. With higher physician integration, it is expected that there will be a tighter coupling of goals and interests between hospitals and physicians, which may lead to better outcomes, but the common goals should include an improvement in quality. The symbiotic relationship between hospitals and physicians can reduce conflicts, stress among physicians, and turnover, while creating a healthy environment for better quality outcomes for patients [27–29]. Another study that measured integration mainly by financial means (physician employment, group ownership,

and joint ventures) did not find any significant relationships with reduced adverse incident rates [16]. This suggests that using physician arrangement variables to operationalize integration provides the same results as using financial integration variables.

Even though physicians may strive to improve quality, hospitals need to prioritize their commitment towards quality along with the structural integration component. Once arrangements such as group practice, management service organizations, integrated salary models, equity models, and foundation have been made to highly integrate hospitals and physicians, physicians need to prioritize quality. For this reason, we may not see any significant relationships. While it is expected that integration would allow for closer alignment of goals, our results may not reflect that. Even though integration has taken place, a convergence of objectives between hospitals and physicians may be lacking. Also, our results were the same for both high- and low-integration hospitals. This means that hospitals with high integration do not have an edge over those with low integration. Despite the above finding, managers should consider some form of hospital–physician integration and act on creating a closer alignment of priorities, including quality and financial performance.

This study also examined overall integration from the perspectives of integration’s breadth and depth. The presence of eight types of physician arrangements across hospital, system, and network levels signifies its breadth and depth. In creating the construct of overall integration, we have captured both high and low integration in one variable, which is a better representation of vertical integration. Some have suggested that vertical integration provides closer inpatient–outpatient coordination, and this integration is essential in achieving clinical integration [30]. However, it is possible that the physician arrangements considered in this study do not sufficiently lead to clinical integration or affect quality outcomes. Integrated models may be associated with better chronic disease management, health promotion, EHR implementation, and patient and physician reminders. However, these integration models may not sufficiently influence quality outcomes positively.

The physician arrangement types and degrees of integration considered in this study were not found to be associated with better financial performance. Researchers have maintained that there is higher resource use and costs in hospitals’ integrated models and a desire to bill at higher rates in outpatient settings, which is contrary to what our theory proposes [30]. Also, patients treated in integrated groups receive more intense treatment, including higher procedure rates, which may lead to higher expenditures driving up the costs, thus lowering financial performance [30].

It is essential to recognize some limitations in our study. We have used secondary data sources to operationalize physician integration based on eight types of physician arrangements across three levels. Secondary data sources based on surveys may be incomplete because the surveys are voluntary. Also, some other factors may be unavailable in our data that could have been missed while operationalizing the hospital–physician integration. For example, the patient–physician relationship is a critical aspect of quality of care, and our analysis was limited to hospital-level data, including readmission rates and patient safety indicators. Due to the lack of specific data on this dynamic in the datasets used, we could not directly measure the quality of physician–patient interactions or their impact on patient outcomes. While our eight physician arrangement models measure the structural form of integration, they need to assess the level of commitment that hospitals have to ensure better quality outcomes resulting from integration. Future studies should explore other ways of operationalizing hospital–physician integration so that clinical integration, in addition to economic integration, can also be captured.

6. Practical Implications

The findings from this study have important implications for practitioners and policymakers. Even though hospital–physician integration can help increase the alignment of goals between the two parties, reduce conflicts and stress, and enable better resource usage, it may not positively influence quality measured by a reduction in readmission rates

and adverse incidents. Besides integrating physicians into hospitals through physician arrangement types, hospitals should make the business case for quality when integrating physicians through group practice, foundations, or management service organizations. Hospital managers should consider increasing physicians' and staff's commitment to improving quality and reducing patient safety mistakes. A culture of safety needs to be fostered in hospitals for quality and patient safety to improve. An organizational culture and mindset of quality and safety need to be nurtured through physician involvement in hospitals' decision-making. Financial performance follows from improvement in quality outcomes. Studying clinical integration and physician integration may shed more light on how integration can impact quality outcomes and financial performance.

Author Contributions: Conceptualization, S.U., R.A.C. and W.O.-A.; methodology, S.U., R.A.C. and W.O.-A.; software, W.O.-A.; validation, S.U., R.A.C. and W.O.-A.; formal analysis, S.U., R.A.C. and W.O.-A.; investigation, S.U., R.A.C. and W.O.-A.; resources, S.U., R.A.C. and W.O.-A.; data curation, W.O.-A.; writing—original draft preparation, S.U. and W.O.-A.; writing—review and editing, S.U., R.A.C. and W.O.-A.; visualization, W.O.-A.; supervision, S.U.; project administration, S.U. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Some of the original data presented in the study are openly available in CMS Hospital Compare (<https://www.cms.gov/medicare/quality/initiatives/hospital-quality-initiative/hospital-compare>), CMS Cost Report (<https://www.cms.gov/data-research/statistics-trends-and-reports/cost-reports>) and AHRF (<https://data.hrsa.gov/topics/health-workforce/ahrf>). American Hospital Association (AHA) data presented in this study are available on request from the corresponding author due to (the purchasing agreement between AHA and other institutions).

Conflicts of Interest: The authors declare no conflicts of interest.

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