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Hospital Group Purchasing Alliances and Financial Performance

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Hospital Use of Group Purchasing Alliances (GPO) and Financial Performance

ABSTRACT

Background: Hospital use of Group Purchasing Organizations (GPOs) may serve as a cost-containment strategy in the purchase of supplies and services. However, there is limited research examining whether there are financial performance differences between users and non-users of GPOs.

Purpose: To explore whether hospital use of GPOs is related to financial performance.

Methods: Data on hospitals' GPO utilization and financial performance were combined with organizational and market characteristics. Panel ordinal logistic regression with facility and year fixed effects analysis was used to examine the relationship between operating margin and the use of GPOs controlling for organizational and market characteristics.

Results: Data from an average of 4,484 hospitals were available for analyses from 2004 to 2014. Overall, the number of hospitals utilizing the services of GPOs increased significantly from 3,027 (72.9%) in 2004 to 3,128 (75.2%) in 2014. In regression analysis, hospitals that utilized the services of GPOs were 17 percentage points more likely to be in the combined higher second, third, and fourth quartiles of operating margin (OR=1.19, $p<0.05$). The significant findings suggest that hospitals utilizing the services of GPOs had higher operating margins compared to hospitals that did not.

Practical Implications: Hospital utilization of GPO services is associated with better financial performance. These findings may inform practice managers and consultants about the benefit of utilizing the services of GPOs, which provides support for the utilization of GPOs when making strategic business decisions about purchasing.

Keywords:

Group purchasing organization; financial performance; supplies; hospitals

INTRODUCTION

Hospitals and other healthcare providers continue to face mounting pressures to provide the best quality of care, while at the same time are experiencing decreasing reimbursements from both public and private payers. It is a theme we have seen in the healthcare industry, particularly in recent years, as a result, of health care reform and value-based reimbursement. Hospitals are innovating by using both old and new strategies to achieve a high quality of care with fewer resources. One such strategy is utilizing the services of Group Purchasing Organizations (GPOs).

GPOs play an essential role in the hospital industry, as organizations that typically leverage the collective purchasing power of healthcare providers [1]. GPOs allow hospitals and healthcare providers to reduce their costs through group purchasing, where hospitals pool their resources together to increase their negotiating and buying power and obtain lower pricing on drugs, supplies, services, and medical devices. As such, GPOs serve as a vehicle to purchase medical equipment and supplies at below-market prices [2, 3]. GPOs also afford hospitals a steady flow of resources needed for their day-to-day operational tasks without intermittent operational disruptions [2] and without committing dedicated staff to handle the activities of the supply chain [3]. The number of GPOs has increased from 40 in 1970 to over 600 in 2010 [1, 4].

Several studies have shown that GPOs may reduce the pricing of equipment and materials for hospitals [5-8]. For example, Burns and Lee found that executives were satisfied with the utilization, services, and performance of GPOs. GPOs generated savings for hospitals and were effective at lowering product prices and reducing transaction costs of negotiating contracts [5]. Two additional studies found that GPOs saved hospitals approximately $36 billion a year [9] and saved the U.S. government about $64 billion in both public healthcare programs and incentives to hospitals [10]. However, there is limited research examining the relationship between GPO participation and hospital financial performance.

Therefore, this study attempts to fill the gap in the literature by examining whether hospitals that use GPOs perform better financially than hospitals that do not. Specifically, this study addresses whether or not there are financial performance differences between users and non-users of GPOs. We also focus on whether the size of the GPO has an impact on the financial performance of hospitals. This paper contributes to the literature on healthcare strategic alliances and provides policymakers and managers with rigorous data regarding whether or not the utilization of GPOs by hospitals has any financial bearing. This is particularly important given the current environment of declining resources and increased pressure for efficiency.

CONCEPTUAL FRAMEWORK

The conceptual model used in this paper is grounded in the strategic alliance's literature, or more specifically the pooling alliances and value-chain alliances perspectives [5]. Hospitals adapt to their ever-changing environments by engaging in strategies that help to improve their overall financial position, and among these are the use of strategic alliances. Strategic alliances have been defined as an agreement or cooperation among existing organizations that are designed to achieve a long-term strategy that is not possibly achieved by a single organization [11]. This definition

includes inter-organizational relationships such as purchasing groups/strategic alliances as a mean to negotiate with suppliers [2].

Hospitals may use GPOs as a group purchasing alliance to improve their financial performance by reducing their cost in the acquisition of needed supplies and services. GPOs are formed for the primary purpose of achieving economies of scale in purchasing. They represent a voluntary agency federation [5] that relinquishes specific functions to a central management entity [5, 12]. GPOs can be considered pooling alliances in healthcare, since members pool their supply activities together to reduce their dependencies on manufacturers for standard products and lower risk. Pooling alliances gain mutual influence over supplies and services [5, 13, 14]. Organizations that form these alliances benefit from being part of a larger system yet retain their existence as free-standing, self-governing institutions [2, 5]. However, the utilization of GPOs varies across hospitals regarding the percentage of purchases routed through them and the use of specific contracting services [13].

Besides their role as pooling alliances, GPOs also represent value-chain alliances, since they serve as intermediaries in the hospital supply chain, i.e. between hospitals and manufacturers from which hospitals acquire products and services [13]. Hospitals' purchasing and supply activities account for approximately one-third of their operating expenditures. As such, GPOs represents one of the few strategic vehicles left for cost-containment [5]. However, GPOs have not received the same level of cost-containment attention as other organizational strategies, such as work restructuring, lean systems, and total quality management.

Participation in GPOs primarily depends on the organizational needs and levels of confidence in GPOs' ability to negotiate the most competitive pricing. The cost associated with GPO participation is influenced by a variety of factors including purchasing volume, provider's fixed contracting cost, contract duration, and miscellaneous services fees. Burns and Lee (2008) noted that GPO membership fees are "nonnegligible" for providers, ranging from $300,000 to $600,000 for small hospitals systems that are anchored by teaching hospitals. Participation in a GPO is optional in the healthcare industry, but most hospitals find the use of GPOs as a strategy rather than a tactic as argued by some researchers in the operational research, logistic, and industrial engineering realms [5]. Thus, GPO utilization represents a different type of strategic alliance and serves an important function in hospital cost-containment.

Previous researchers have demonstrated that organizations that can adopt cost-containment strategies have better financial performance [15,16]. The use of GPOs by hospitals serves as a cost-containment strategy. Therefore, we argue that hospitals use GPOs as a strategy to reduce their cost of purchasing supplies and services, and ultimately improve their financial performance.

> *Hypothesis 1: Hospitals that utilize GPO services have better financial performance than hospitals that do not utilize GPO services.*

Size of GPO and Financial Performance

Previous studies have demonstrated that GPO size is associated with higher levels of negotiating leverage, economies of scale, and market power [17, 18]. Burns and Lee (2008) also found that

about 80% of hospitals belong to national GPOs as compared to only 20% of hospitals belonging to regional and local GPOs [2]. Thus, we hypothesize that larger or national GPOs will result in lower costs of purchasing of supplies and services than regional and local GPOs due to their size and negotiating power. The lower purchasing costs that national GPOs may be able to achieve, we argue, will translate into better financial performance for hospitals that use them.

> *Hypothesis 2: Hospitals that use the services of national GPOs will have better financial performance than hospitals that use the services of regional or local GPOs.*

METHODS

Source of Data

Our study draws on secondary data from multiple sources including the American Hospital Association (AHA) Annual Survey, the Area Health Resource File (AHRF) including Rural-Urban Commuting Area Codes Data (RUCA codes), and the Healthcare Cost Report Information System (HCRIS). The AHA survey provides data about hospital utilization of GPOs and the name of the GPO by hospitals (size) [19]. Additionally, the AHA survey provides data about organizational characteristics including health system member, size, and ownership type [19]. The AHRF provides data regarding county-level market characteristics of hospitals [20]. Finally, the Healthcare Cost Report Information System (HCRIS) from the Centers for Medicare and Medicaid Services (CMS) provides data on financial performance measures. The HCRIS dataset contains hospitals utilization, cost, and charge data [21]. The different datasets were linked using hospital identification number of HCRIS and Federal Information Processing Standard Codes (FIPS codes). Based on a national sample of non-federal general acute care hospitals, our study utilized a longitudinal design from 2004 to 2014 with 41,971 hospital-year observations (or an average of 4,484 hospitals per year).

Measures

Dependent variable. The dependent variable, which captures the hospital financial performance, is the operating margin. This is the most commonly used financial performance indicator in the healthcare literature that addresses cost strategy [22]. The operating margin reflects the profitability of a hospital from patient care services revenue over patient care services cost. It omits non-operating revenues such as philanthropic contribution, endowment income, investment income, and other revenue and expenses not related to operations [22]. The operating margin was divided into quartiles, providing four levels of profitability with the lowest quartile as the reference group [23].

Independent variables. The primary independent variable represents the utilization of a GPO by a hospital (1=utilize a GPO, 0=does not utilize the services of a GPO). The second independent variable is the size of the GPO, a proxy for service reach of the GPO. GPOs that provided services on a national and regional level were categorized as large GPOs, and local GPOs were classified as small GPOs (0=small scale, 1=large scale).

Control variables. We included several organizational and market level control variables that researchers have shown to influence hospitals' financial performance [24, 25]. Organizational variables included hospital size (measured as total number of beds); an interaction variable of

ownership status and system membership (not-for-profit, for-profit, or public, system affiliated-'yes' or 'no'); payer mix (measured as share of total inpatient discharge by payer); and teaching status (measured with a dummy variable; 0= not a teaching hospitals; 1= teaching hospital). Hospitals were classified as a teaching hospital if they met any of the following criteria: 1) have residency training approved by the Accreditation Council for Graduate Medical Education; 2) medical school affiliation reported to the American Medical Association; or 3) member of Council of Teaching Hospital of the Association of American Medical Colleges (COTH), or residency approved by American Osteopathic Association. Market characteristics included per capita income (measured as total personal income of the residents in given area divided by resident population in the county); percent of population 65 years or older (measured as percentage of total resident population age 65 year or older in a county); the geographic location of hospital (urban, metropolitan, and rural); and the Hirschman-Herfindahl Index (HHI) as a measure of competition. The geographic location was determined based on the Rural-Urban Continuum Code (RUCC) for the county where the hospital is located. The HHI represents the sum of the squared market shares in a market, with market share based on the system level share of hospital inpatients days in a Health Service Area. Based on the HHI, we created a dichotomous variable, were 1= monopolistic markets (HHI=1), and 0= competitive markets (HHI < 1).

Analytical Approach

The unit of analysis was the hospital. Univariate statistics and bivariate analyses provide descriptive statistics on the variables used. Multivariable relationships between the operating margin and use of GPO were examined using panel ordinal logistic regression with facility and year fixed effects and robust standard errors to address correlation of repeated observations [26]. Facility fixed effects control for unobserved, time-invariant characteristics of hospitals that may influence their overall financial performance [26]. The year fixed effects adjust for unmeasured time trends which could affect hospital financial performance in a given year [26]. Independent variables were lagged by one year given that the benefits of joining a GPO may not be immediate and may take at least one year to have an effect. All statistical analyses were conducted at 95%, 99%, and 99.9% confidence intervals ($p < 0.05$, $p < 0.01$, and $p < 0.001$) in SAS 9.4 and STATA 13.

RESULTS

Table 1 presents the descriptive characteristics of hospitals in the sample, stratified by baseline (2004) and final year (2014) of the study period. For financial performance, there was a decrease in average operating margin for the first, second, and third quartile groups from 2004 to 2014, but the fourth quartile group (the best financially performing hospitals) did not significantly change from 2004 to 2014. The number of hospitals utilizing the services of GPOs increased significantly by 2.3% from 2004 to 2014. Likewise, there was an increase in the proportion of hospitals utilizing the services of large GPOs of 3% from 2004 to 2014, and a similar decrease in the use of small GPOs. As of 2014, Vizient was the GPO with the largest market share of hospitals using its services (18%) (Table 2).

Table 1. Descriptive Statistics of Variables (N = 44,048 hospital year observation)

	2004 n = 4152	2014 n = 4160	
Variables	**Mean (SD) or Frequency (%)**		***ρ***
Dependent Variable			
Operating Margin			
1st Quartile	-0.09 (0.13)	-0.13 (0.21)	*<0.001*
2nd Quartile	-0.04 (0.15)	-0.07 (0.12)	*<0.001*
3rd Quartile	-0.01 (0.09)	-0.03 (0.13)	*<0.001*
4th Quartile	0.04 (0.25)	0.05 (0.14)	*0.11*
Independent Variables			
Utilization of GPO services			
Yes	3,027 (72.9%)	3,128(75.2%)	*0.02*
No	1,125 (27.1%)	1,032 (24.8%)	
GPO Scale			
Large Scale	2,809 (67.65%)	2,932 (70.48%)	*0.01*
Small Scale	1,343 (32.35%)	1,228 (29.52%)	
Organizational Factors			
Hospital Size	172 (181)	165 (191)	*0.13*
Ownership Systems Types			
For-profit system membership	535 (12.89%)	580 (13.94%)	*<0.001*
For-profit non-system membership	86 (2.07%)	113 (2.72%)	
Not-for-profit system membership	1,427 (34.37%)	1,709 (41.08%)	
Not-for-profit non-system membership	1,136 (27.36%)	857 (20.60%)	
Public non-federal	968 (23.31%)	901 (21.66%)	
Teaching status			
Yes	979 (23.58%)	1,157 (27.81%)	*<0.001*
No	3,173 (76.42%)	3,003 (72.19%)	
Payer mix			
Medicare payer mix	50.28 (18.72%)	52.32 (18.96%)	*<0.001*
Medicaid payer mix	19.30 (16.29%)	19.03 (16.51%)	*0.45*
Market Factors			
Per capita income per 1000	29.70 (8.58)	41.95 (10.81)	*<0.001*
Percent of population 65 year or older	13.92 (3.89)	15.84 (4.18)	*<0.001*
Location			
Metro	2,347 (56.53%)	2,402 (57.77%)	*0.52*
Urban	1,471 (35.43%)	1,433 (34.46%)	
Rural	334 (8.04%)	323 (7.77%)	
Market competition (HHI)			
Competitive markets	1,659 (39.96%)	1,624 (39.04%)	*0.39*

Monopolistic markets	2,493 (60.04%)	2,536 (60.96%)

**p <0.05; **p < 0.01; ***p < 0.001, HHI-Hirschman-Herfindahl index*

Table 2. Twelve Largest GPOs by Hospital Market Share (2014)

Major GPOs	Number of Hospitals Using GPO	Percent
Novation/Provista (Vizient)	837	18.4
Premier, Inc.	782	17.2
HealthTrust	602	13.2
MedAssets, Inc. (Vizient)	522	11.5
Amerinet, Inc.	183	4.0
FirstChoice Cooperative	44	1.0
ROi	35	1.0
Resource and Supply Management Group, LLC	31	1.0
APS	26	1.0
Yankee Alliance Supply Chain Cooperative, Inc.	16	0.5
UnityPoint Health	11	0.2
Shared Health Services Corporation	10	0.2

With respect to organizational control variables, there was a 5% increase in the proportion of teaching hospitals from 2004 to 2014. Across ownership-system membership combinations, there were increases in the percentages of for-profit system, for-profit non-system, and not-for-profit system hospitals, but decreases in the percentages of not-for-profit non-system and public non-federal hospitals from 2004 to 2014. In addition, Medicare payer mix on average increased by 2.1% from 2004 to 2014, while there was no significant change in Medicaid payer mix. There was also no significant change in the average number of beds. With respect to market variables, per capita income per 1,000 increased from 29.7 in 2004 to 41.9 in 2014. Also, the percentage of the population 65 years or older increased significantly by 1.9% from 2004 to 2014. There were no significant changes in competition or geographic location of hospitals from 2004 to 2017, with the majority of hospitals being located in monopolistic markets (61%) and metropolitan areas (58%) in 2014.

Bivariate analyses indicated a significant association between the quartiles of operating margin and all other independent variables except Medicare payer mix (Table 3). Specifically, hospitals using GPOs were associated with higher quartiles of operating margin. Similarly, hospitals located in metropolitan areas were associated with higher quaritles of operating margin. Additionally, hospital bed size, owernship and system membership were also associated with higher quartiles of operating margin.

Table 4 shows the results from the multivariable-adjusted ordered logistic regression model evaluating the association between the operating margin quartiles of hospitals and their utilization of GPO services. We found support for Hypothesis 1 that hospitals that utilize the services of GPOs have better financial performance than hospitals that do not utilize the services of GPOs. Specifically, hospitals that utilized the services of GPOs were 17 percentage points more likely to be in the combined higher second, third, and fourth quartiles of operating margin (OR=1.19, $p<0.05$), thus having a better financial performance compared to hospitals that did not utilize the

services of GPOs (Figure 1). On the other hand, we found no support for Hypothesis 2; hospitals that utilize the services of large GPOs did not have better financial performance compared with hospitals that utilize the services of small GPOs.

In addition to these findings, several organizational and markets control variables were significantly associated with hospitals' higher quartiles of operating margin. Larger hospitals were one percentage point more likely to belong to the middle and upper quartiles of operating margin (OR=1.00, $p<0.001$). Similarly, belonging to a system was associated with higher quartiles of operating margin. Specifically, for-profit system members (OR=1.96, $p<0.001$) and not-for-profit system members (OR=1.46, $p<0.001$) were 67 percentage points and 36 percentage points, respectively, more likely to belong to higher quartiles of operating margin compared to those that did not belong to any system. On the other hand, hospitals with a higher proportion of Medicare (OR=0.98, $p<0.001$) and Medicaid (OR=0.99, $p<0.001$) payer mix were one percentage point and two percentage points, respectively, less likely to belong to the higher quartiles of operating margin. In general, hospitals operating in areas with a higher percentage of population 65 years or older were four percentage points less likely to belong to the second, third, and fourth quartiles of operating margin, thus having a lower financial performance (OR=0.90, $p<0.001$). On the other hand, hospitals operating in an urban environment were 27 percentage points more likely to belong to the middle and upper quartiles of operating margin (OR=1.31, $p<0.001$) compared to hospitals operating in a rural environment. However, hospitals operating in metro areas were not significantly different from hospitals operating in rural environments regarding their financial performance. Similarly, there was no significant difference in operating margin between hospitals operating in monopolistic and competitive markets.

Table 3. Bivariate Analysis of Variables and Operating Margin (2014) (N=4,482)

Variables	Operating Margin Mean (SD) or Frequency (%)				
	1st Quartile	**2nd Quartile**	**3rd Quartile**	**4th Quartile**	***p-value***
Utilization of GPO services					
Yes	669(66.30%)	633(74.12%)	795(79.42%)	1,031(79.55%)	*<0.001*
No	340(33.70%)	221(25.88%)	206(20.58%)	265(20.45%)	
GPO Scale					
Large Scale	641(63.53%)	590(69.09%)	746(74.53%)	955(73.69%)	*<0.001*
Small Scale	368(36.47%)	264(30.91%)	255(25.47%)	341(26.31%)	
Organizational Factors					
Hospital Size	109.98(125.58)	163.84(187.57)	190.42(207.47)	191.81(212.30)	*<0.001*
Ownership Systems Types					
For-profit system membership	143(14.17%)	84(9.84%)	104(10.39%)	249(19.21%)	
For-profit non-system membership	37(3.67%)	16(1.87%)	16(1.60%)	44(3.40%)	
Not-for-profit system membership	340(33.70%)	311(36.42%)	409(40.86%)	649(50.08%	*<0.001*
Not-for-profit non-system membership	219(21.70%)	226(26.46%)	245(24.48%)	167(12.89%)	
Public non-federal	270(26.76%)	217(25.41%)	227(22.68%)	187(14.43%)	
Teaching status					
Yes	193(19.13%)	249(29.16%)	328(32.77%)	387(29.86%)	*<0.001*
No	816(80.87%)	605(70.84%)	673(67.23%)	909(70.14%)	
Payer mix					
Medicare payer mix	53.38(21.62)	52.21(19.10)	52.25(19.32)	51.63(16.13)	*0.18*
Medicaid payer mix	19.46(16.83)	20.86(22.04)	18.75(14.24)	17.71(13.16)	*<0.001*
Market Factors					
Per capita income per 1000	40.24(10.69)	42.23(10.98)	42.44(10.69)	42.71(10.73)	*<0.001*
Percent of population 65 year or older	16.40(3.98)	16.41(4.06)	15.83(4.25)	15.05(4.23)	*<0.001*
Location					

Metro	467(46.33%)	466(54.63%)	585(58.44)	884(68.21)	*<0.001*
Urban	432(42.86%)	302(35.40%)	350(34.97)	349(26.93)	
Rural	109(10.81%)	85(9.96%)	66(6.59)	63(4.86)	
Market competition (HHI)					
Competitive markets	337(33.40%)	303(35.48%)	368(36.76%)	616(47.53%)	*<0.001*
Monopolistic markets	672(66.60%)	551(64.52%)	633(63.24%)	680(52.47%)	

**p <0.05; **p < 0.01; ***p < 0.001, HHI-Hirschman-Herfindahl index*

Table 4. Ordered Logistic Regression Analysis with Operating Margin as Dependent Variable

	Operating Margin (N=41,971) ‡	
Variables	**Odds Ratios**	**Margins**
Utilization of GPO services		
Yes	1.19	0.17**
No	*Ref*	*Ref*
GPO Scale		
Large-scale	1.08	0.08
Small-scale	*Ref*	*Ref*
Organizational Factors		
Hospital Size	1	0.01***
Ownership Systems Types		
For-profit system membership	1.96	0.67***
For-profit non-system membership	1.16	0.14
Not-for-profit system membership	1.46	0.36***
Public non-federal	1.06	0.06
Not-for-profit non-system membership	*Ref*	*Ref*
Teaching status		
Yes	0.91	-0.09
No	*Ref*	*Ref*
Payer mix		
Medicare payer mix	0.98	-0.01***
Medicaid payer mix	0.99	-0.02***
Market Factors		
Per capita income per 1000	1	0
Percent of population 65 year or older	0.97	-0.04***
Location		
Metro	1.12	0.12
Urban	1.31	0.27***
Rural	*Ref*	*Ref*
Market competition (HHI)		
Monopolistic markets	1.01	0.01
Competitive markets	*Ref*	*Ref*

*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$, ‡ Hospital year observations (2004-2014), HHI-Hirschman-Herfindahl index

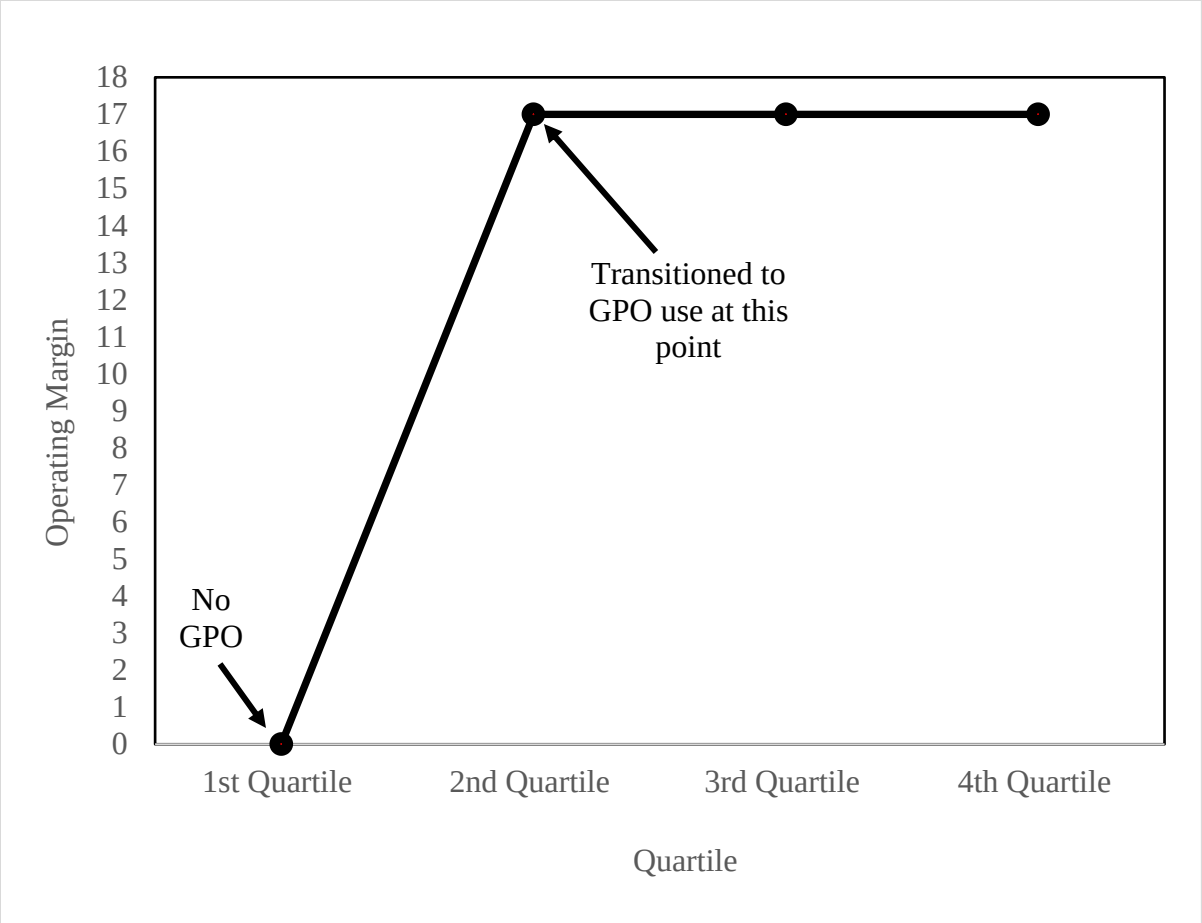

Figure 1. Marginal Increase in Operating Margin

DISCUSSION

This research aimed to examine the impact of GPO use by hospitals on their financial performance. Specifically, this research strived to determine whether there were financial performance differences between users and non-users of GPOs services. The study used tenets from the pooling alliance and value-chain alliance theoretical perspectives. Prior studies on hospital purchasing alliances have provided valuable insights into topics such as the perceived satisfaction of hospitals with service delivery of GPOs and cost savings that GPOs provide to the healthcare industry. However, to date, no study has empirically examined the impact of utilization of GPOs on hospital financial performance. As such, this study contributes to the literature on the performance of hospitals participating in purchasing alliances [5, 27, 28].

Our major finding suggests that there is an association between the financial performance of hospitals and their utilization of GPO services. Specifically, hospitals that utilized the services of GPOs had higher operating margins compared to hospitals that did not. This may be a result of GPO utilization resulting in supply chain efficiencies and lower costs. As such, GPO utilization may serve as a source of competitive advantage. This is an important finding given the current environmental pressures for hospitals to contain costs and achieve better quality outcomes. While

no prior studies have examined the effect of hospital use of GPOs services on financial performance, a survey of over 5,000 hospital materials managers showed that strategic alliances between purchasing groups (GPOs) and hospitals served to contain health care costs by reducing product prices [5]. Moreover, hospitals were highly satisfied with the contract convenience and multisource contracts provided by GPOs.

Our findings suggest that hospitals that utilized the services of large GPOs did not perform financially better than hospitals that utilized the services of small GPOs. Typically, one would expect hospitals that utilize the services of larger GPOs to obtain better prices on products and services due to economies of scale. These economies of scale could translate to better pricing and lower costs for hospitals. However, our findings are consistent with those of Bhattacharya (2007) who suggested that smaller GPOs can focus on regional healthcare organizations, which helps them consolidate their resources and can occasionally provide better product prices than larger GPOs [17].

Several findings related to organizational and market characteristics were also associated with hospital financial performance. First, we found that hospitals with a higher Medicare and Medicaid payer mix were more likely to have lower financial performance. This finding corroborates our expectation as, traditionally, Medicare and Medicaid reimbursements to hospitals are lower compared to other third-party payers. Second, larger hospitals were more likely to have better financial performance. This is likely because larger hospitals may benefit from economies of scale, and can provide more products and services than smaller hospitals [29, 30]. Lastly, compared to not-for-profit non-system members, our results indicated that for-profit system members and not-for-profit system members were more likely to have better financial performance. Traditionally, system hospitals exhibit higher financial performance due to access to system resources, i.e. financial, human, and technology. The results here regarding higher financial performance by system members are consistent with earlier studies of multi-hospital system hospitals [31-33].

Concerning market factors, hospitals operating in areas with lower per capita income, a measure of fewer resources in the environment, were more likely to have lower financial performance. Areas with lower per capital income may have higher unemployment rates and higher uninsured rates. This finding is consistent with a previous study, which found that hospitals operating in areas with lower per capita income generally have lower financial performance [30]. We also found a positive relationship between hospitals operating in an urban area and better financial performance. This finding is consistent with prior research that explored the association between the location of hospitals and financial performance [34]. The differential performance may be a result of urban hospitals having lower patient acuity than metro or rural hospitals.

Although this study provides valuable new insights into the relationship between hospital utilization of GPO services and their profitability, there are several limitations to note. First, the study relied on secondary data, which were primarily collected for reporting purposes rather than research. Second, throughout this 10-year study period, there were many changes in the service delivery and operations of GPOs. These changes included mergers, acquisitions, and consolidations of GPOs. Due to data limitations, our study was not able to account for these changes, which may have affected GPO utilization and therefore the profitability of hospitals. Third, this study did not account for the actual percentage of purchases that hospitals channeled through GPOs. Data concerning the pricing of products, warranty details, product features, and manufacturers' details, are crucial to conduct an in-depth analysis of the financial performance of

hospitals using the GPOs. Finally, the classification of large-scale and small-scale GPOs was subjectively based on information that was reported by GPOs on their websites.

Despite these limitations, our study presents many strengths. First, this study is one of the first to explore how GPO utilization relates to hospital financial performance. Second, we employed rigorous statistical analysis methods suitable for our study population over a 10-year study period. Finally, we examined a more heterogeneous national sample of hospitals compared to previous authors [2, 5, 35].

This study provides several implications for policymakers, researchers, and practitioners. First, the study provides insights to policymakers, researchers, and hospital managers on how the utilization of GPO services can influence financial performance. Findings suggest that GPOs may provide lower costs of supplies and services to hospitals. As such, policymakers can develop policies to encourage the use of GPO services for hospitals that do not currently utilize the services of GPOs. Second, our research informs practice managers and consultants about the benefit of utilizing the services of GPOs, which provides a strong case for the utilization of GPOs when making strategic business decisions about purchasing. Third, findings from this research provide areas for future research. Further research is needed to understand hospitals utilization of GPO services. A qualitative approach may be helpful to explore what types of GPOs are utilized, how much of purchasing is routed through GPOs by hospitals, and how GPO utilization relates to a hospital's financial performance. Additionally, more research is needed to understand hospital cost-containment strategies specifically about GPO utilization. In sum, this study regarding the effect of GPO utilization on the financial performance of hospitals should be considered the first step towards future research to understand the mechanisms by which GPOs may influence financial performance.

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