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Hospital Purchasing Alliance: Contextual Factors And Financial Performance

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HOSPITAL PURCHASING ALLIANCE: CONTEXTUAL FACTORS AND FINANCIAL PERFORMANCE

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ABSTRACT

Collectively, the purpose of the three papers included in this dissertation was to provide empirical evidence on the contextual factors that influence hospital utilization of services of group purchasing organizations and how utilization of group purchasing organizations impacts hospitals' financial performance. The findings of these studies are important both to researchers and to managers as it sheds light on the relationship between hospitals and group purchasing organizations. The results of this dissertation suggest that better financial performance is associated with hospital utilization of group purchasing organizations. Additionally, some measures of environmental munificence and dynamism are associated with hospital utilization of group purchasing organizations. Specifically, the association seemed more consistent across less munificent and more dynamic environments. Taken together, the findings of these studies will be beneficial to hospital leaders as they make decisions about strategies on group purchasing organizations.

Keywords: Group purchasing organizations, financial performance, environment, munificence, strategy

DEDICATION

I dedicate this dissertation to the Almighty God for providing me with the strength, knowledge, understanding, and resources to not only pursue but also complete my studies. I also dedicate this dissertation to my parents, my mother Mrs. Lilian Achiaa-Agyeman and my father Mr. Kwame Opoku-Agyeman for their patience, constant love, and countless sacrifices they have made in raising and educating me.

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CHAPTER 1

INTRODUCTION

The purpose of this chapter is to provide an overview of the three papers included in this dissertation. The common theme across these three papers is hospital purchasing alliances (group purchasing organizations) and financial performance. The chapter begins with a background section discussing hospitals' group purchasing organizations. Specifically, how the relationship between hospitals and group purchasing organizations has evolved over the last two decades. Additionally, the background discusses the importance of group purchasing organizations in the healthcare supply chain industry in the United States. The chapter concludes with an overview of each of the three papers included in this dissertation and their contribution to the literature of healthcare strategy and performance.

Background

Healthcare costs are increasing rapidly at a time when hospitals are faced with providing quality care for their patients. This poses challenges to hospitals as they are confronted with what to do in the context of reduced reimbursement without passing on the extra cost load to patients. One outcome of this shift in reimbursement is that hospitals have increasingly directed their attention to cost containment strategies as a way to survive. In some cases this has involved the management of supply networks and relationships with other organizations (Burns & Lee, 2008). To counteract the reductions in reimbursement, hospitals are also joining alliances: specifically, group purchasing alliances (organizations) as a cost-containment strategy.

Group purchasing organizations (GPOs) are organizations that typically leverage the collective purchasing power of healthcare providers (Blair & Durrance, 2014). In doing so, GPOs can negotiate discounted contracts for their clients (Schneller, 2009). As some scholars have noted, GPOs tend to focus on medical and surgical supplies, physician preference items, nutrition, pharmacy, laboratory, and other services (Blair & Durrance, 2014). According to Schneller (2009), GPOs provides an estimated $36 billion in annual direct price savings to hospitals. Moreover, some experts have argued that hospitals channel about 75% of their purchases through GPOs, and these supplies and purchased services account for approximately one-third of a hospital's operating expenditures (Burns, DeGraaff, Danzon, Kimberly, Kissick, & Pauly, 2002; Schneller, 2009).

Not surprisingly, research on GPOs and how they help our understanding of cost containment in an era of rising health expenditures has received significant attention in the literature (Burns et al., 2002; Burns & Lee, 2008; Chakraborty, Bhattacharya, & Dobrzykowski, 2014; Doucette, 1997; Hu, Schwarz, & Uhan, 2012). GPOs have been considered a branch of strategic alliances (Zajac, D'Aunno, & Burns, 2011). Strategic alliances have been defined as an agreement or cooperation among existing organizations that are designed to achieve long-term strategy that cannot be achieved by a single organization (Swayne, Duncan, & Ginter, 2012).

Hospitals typically purchase large volumes of products and services from a variety of sources. Examples of products and services they source include the following: pharmaceutical, laboratory, diagnostic imaging, office facilities, dietary, maintenance, IT, and insurance (Burns et al., 2002). The original group purchasing organization was

established in the 1910s by the Hospital Bureau of New York. The need for such an organization was based on the vast array of products and services that hospitals in New York were purchasing at that time. By the 1970s there were approximately 40 established GPOs dealing with healthcare nationwide. Currently, there are over 600 healthcare GPOs. Of this number, only 30 are true GPOs that directly negotiate sizable contracts for their members. The remaining GPOs are relatively smaller organizations that may offer buying members' access to larger GPOs.

Similar to cooperatives, GPOs leverage the collective purchasing power of healthcare providers to negotiate discounts with manufacturers, distributors, and other vendors for an array of medical supplies, capital equipment, and services contracts. From the manufacturers' perspective, GPOs provide economies of scale. By representing the purchasing needs of their members and clients, they provide unique information to manufacturers, which enable them to adjust their prices based on normal market conditions.

Furthermore, they help influence the providers with manufacturing capacity, raw material availability, and competitive suppliers. The commitment of volume by GPOs helps manufacturers to forecast their production quantities. Even though GPOs are involved in the purchasing of products and services in healthcare, they never actually take possession of them. According to the American Hospital Association, about half of U.S. hospitals utilize a GPO or some form of a GPO to realize savings and supply chain efficiencies; many belong to multiple GPOs (American Hospital Association, 2010).

According to Schneller (2009), purchases through GPO contracts yield savings for providers of about 10% to 15% compared to purchases on the general supply chain

market. To some degree, GPOs are able to control healthcare costs through contract negotiations that secure the best price possible for hospitals and other healthcare providers. Through contract negotiations, GPOs obtain the best value for their members and clients including lower prices and a reliable, safe, and consistent supply of products and services. GPOs also allow for standard contracted terms and conditions. The use of GPO-contracted prices is voluntary, with hospitals or healthcare providers having the ability to choose among multiple options that fit their needs.

How GPOs Work

GPO business operations are funded through two models. The first model involves contract administrative fees paid by manufacturers and vendors with whom the GPO provides a market. These fees are typically a set percentage of the total purchase through the GPO or an annual flat rate.

The second model involves a subscription fee for the right to purchase discounted products and services; this fee is charged to the buying member to fund their activities. In recent years, most GPOs fund their activities through a combination of both models. The level of participation in GPOs varies by members. Participation depends primarily on the needs of the client and the level of confidence in what members believe is the most competitive pricing negotiated by their GPOs. Participation in a GPO is optional in the healthcare industry, but most hospitals use GPOs as a strategy to find better deals on products and services than what they can individually negotiate with vendors. Some of the major GPOs that exist in today's healthcare environment include: Vizient (formally-VHA, NOVATION, MedAssets, Broadlane), Premier, HealthTrust Purchasing Group, Intalere (formally-AMERINET), Associated Purchasing, FirstChoice Cooperative,

Resource and Supply Management Group, ROi, Greater New York Hospital Association, and Yankee Alliance. GPOs have evolved to offer different models of purchasing and sourcing with for-profit and not-for-profit status hospitals and other healthcare organizations.

Effects of GPOs Utilization

GPOs allows hospitals and healthcare providers to reduce their costs through group purchasing, where hospitals pool their resources together through negotiating and buying power to obtain lower pricing on drugs, supplies, services, and medical devices. GPOs serve as a vehicle to purchase supplies at below market prices.

Several studies have examined the effectiveness of GPOs in reducing the pricing cost of equipment and materials for hospitals; these studies yielded equivocal results (Burns & Lee, 2008; Litan & Singer, 2010; Litan, Singer, & Birkenbach, 2011; Yang, Cheng, & Ding, 2015). Burns and Lee (2008) found that hospital executives were satisfied with the utilization, services, and performance of GPOs. Specifically, GPOs generated savings for hospitals and were effective at lowering product prices and reducing transaction costs of negotiating contracts (Burns & Lee, 2008). Two additional studies found that GPOs saved hospitals about $36 billion a year (Schneller, 2009) and saved the U.S. government about $64 billion in both public healthcare programs and incentives to hospitals (Goldenberg & King, 2009).

However, other studies have found that GPOs may actually result in higher costs. For example, a 2002 study by the Government Accountability Office (GAO) found that hospitals paid as much as 1% to 5% higher prices on safety syringe modes and pacemakers using GPOs compared to what they would have paid on the general market.

Similarly, a recent study that used a game-theoretic model concluded that even though the presence of GPOs lowers total purchasing costs for hospitals, hospitals still faced higher unit prices than if they had negotiated directly with vendors on certain products and services. This was especially true for hospitals with smaller purchasing requirements (Hu et al., 2012). The smaller purchasing requirements presented lower total purchasing cost in the presences of a GPO but higher per-unit price on certain products and services (Hu et al., 2012). With these mixed results about the effectiveness of GPOs, few studies have examined whether hospitals that use the services of GPOs perform better financially than hospitals that do not.

The utilization of GPOs varies across hospitals in terms of the percentage of purchases channeled through them and the use of specific contracting services (Schneller & Smeltzer, 2006). Participation in GPOs mostly depends on the needs and the levels of confidence in what members believe is the most competitive pricing negotiated by their GPOs. The costs associated with GPO participation are 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 hospital systems anchored by teaching hospitals.

Participation in or belonging to a GPO is optional in the healthcare industry, but most hospitals find the use of GPO as a strategy rather than a tactic as argued by some researchers in the operational research, logistic, and industrial engineering realms (Burns & Lee, 2008). Thus, GPO utilization is important because it represents a different type of strategic alliance and serves an important function in hospital cost-containment.

Additionally, prior research has demonstrated that organizations that can adopt a cost-containment strategy have better financial performance (Sethi, 2006; Zsidisin, Ellram, & Ogden, 2003). As such, organizations use these cost containment strategies to increase their overall profitability. The use of GPOs by hospitals serves as a cost-containment strategy

Given the potential benefits of GPOs in containing costs for hospitals based on supplies and purchased services, an important question has to be asked regarding the conditions that support or hinder the utilization of GPOs by hospitals and what financial performance differences exist between hospitals that utilize the services GPOs and hospitals that do not. While such a question is relevant for policy purposes, we do not know of any study to date that has investigated the links between participation in GPOs and a hospital's organizational and market profiles and financial performance. Previous studies have focused primarily on the structure and performance of GPOs (Burns & Lee, 2008; Hu, Schwarz, & Uhan, 2012), the structure and function of GPOs (Burns et al., 2002; Schneller, 2000; Schneller & Smeltzer, 2006), and satisfaction with GPOs by hospitals (Burns & Lee, 2008).

Dissertation Contents

This dissertation consists of three distinct but related research papers; each addresses gaps in the hospital purchasing alliance performance literature. The first paper is a systematic review of the relationship between hospitals and GPOs. The review provides a structured overview of prior work on topics and findings related to the relationship between hospitals and GPOs. The second paper focuses on the contextual factors that influence the utilization of GPO services by hospitals. Using the conceptual

framework of Resource Dependency Theory (RDT), this study examined the relationship between GPO use by hospitals and market and organizational characteristics. The third paper focuses on the impact of GPO use by hospitals in the United States on their financial performance. Specifically, this paper provides answers to whether there are financial performance differences between users and non-users of GPOs. The following provides a more in-depth summary of each paper.

Paper 1: A Systematic Review of Hospital Group Purchasing Organizations and Strategic Alliance Performance Literature in Healthcare

This study presents a synthesis of the literature and identifies strengths and weaknesses of the peer-reviewed literature in hospitals and group purchasing alliances from 1995 to 2014. The paper presents the methodological approaches used to identify and study hospitals' group purchasing organizations literature, and provides rich analyses based on emerging themes of how hospitals and GPOs can be studied. The themes developed in the review introduce new considerations in the study of hospitals and GPOs.

Paper 2: Environmental and Organizational Factors Associated with Hospital Use of GPO Services

This study attempts to fill the knowledge gap in our understanding of GPOs in the context of cost-containment and reduced reimbursement. Using the conceptual framework of Resource Dependency Theory (RDT), the study examined the relationship between GPO use by hospitals and market and organizational characteristics. Additionally, the study explored how the market and organizational characteristics associated with hospital use of GPOs have evolved overtime. Based on a national sample of non-federal, general acute care hospitals, the study utilized a longitudinal design from

2004 to 2013 with 45,383 hospital-year observations with data obtained from the American Hospital Association (AHA) Annual Survey; the Area Health Resource File (AHRF), including rural-urban commuting area codes data (RUCA codes); and the Bureau of Labor Statistics (BLS). Multivariate relationships between hospitals' utilization of GPO services and hospitals' organizational and market characteristics were examined using panel logistic regression with random effect and state and year fixed effects.

This study provides a new contribution to the healthcare literature by examining environmental and organizational factors that relate to hospital utilization of GPO services using the RDT framework.

Paper 3: Hospital Group Purchasing Alliance and Financial Performance

The purpose of this study was to examine the impact of GPO use by hospitals in the United States on their financial performance. Specifically, it provides answers to whether there are financial performance differences between users and non-users of GPOs. The study also focused on whether the size of the GPO had any impact on the financial performance of hospitals. The study draws from the strategic alliance literature specifically tenets from the pooling alliance and value-chain alliance theoretical perspectives. Based on a national sample of non-federal, general acute care hospitals, the study utilized a longitudinal design from 2004 to 2013 with 41,971 hospital-year observations with data obtained from 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).

Multivariable relationships between the operating margin and use of GPO were examined using panel ordinal logistic regression with facility and year fixed effects.

This paper contributes to the literature of strategic management based on the pooling alliance and provides policymakers and researchers an avenue that identifies whether the utilization of GPOs by hospitals has any financial bearing.

CHAPTER 2

A SYSTEMATIC REVIEW OF HOSPITAL GROUP PURCHASING ORGANIZATIONS AND STRATEGIC ALLIANCE PERFORMANCE LITERATURE IN HEALTHCARE

WILLIAM OPOKU-AGYEMAN, ROBERT WEECH-MALDONADO, KRISTINE HEARLD, GRANT SAVAGE, ANTHONY HOOD, AND DARRELL BURKE

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CHAPTER 2

A SYSTEMATIC REVIEW OF HOSPITAL GROUP PURCHASING ORGANIZATIONS AND STRATEGIC ALLIANCE PERFORMANCE LITERATURE IN HEALTHCARE

Executive Summary

The study presents a synthesis of the literature and identifies strengths and weaknesses of the peer-reviewed literature in hospitals and group purchasing alliances from 1995 to 2014. The paper presents the methodological approaches used to identify and study hospitals' group purchasing organizations literature and provided a rich analyses based on emerging themes of how hospitals and GPOs can be studied. The themes developed in the review introduce new considerations in the study of hospitals and GPOs. The hospital and group purchasing organization alliance literature were organized along the themes of the environment, structure, and performance, and subsequently presented from either the hospital or GPO perspective. Overall, the review process resulted in 13 journal articles. Articles that focused on the environment were less research-intensive and tended to focus on the enacted environment that influenced GPO activities rather than the hospital environment. Articles that focused on structure explored a wide variety of mechanisms by which GPOs are organized and classified (e.g., types, models of contracting) and how these configurations of GPOs help to provide better prices for hospitals (e.g., reduced unit prices on capital equipment, tier pricing, procurement strategies). Lastly, articles that focused on performance identified how

hospitals evaluated their alliances with GPOs in terms of the overall benefit of the alliances in cost-containment as well as how GPOs measured their contribution toward cost-containment of hospitals' supply management. In light of this findings, healthcare managers wishing to utilize the services of hospital purchasing alliances have a limited literature base from which to draw to identify contextual factors and performance of purchasing alliances. Therefore, further research is needed to explore the market and organizational factors that influence hospital strategy choice to use GPOs in acquiring needed supplies and equipment. More than ever before, this is important as approximately 65% of hospitals are utilizing the services of GPOs.

Introduction

In an environment characterized by rising costs for healthcare and decreasing reimbursements, both by the private and public sectors, the need for a strategy that matches an organization's desire of attaining a better financial performance while reducing cost becomes quite desirable and urgent. Currently, hospitals are using group purchasing organizations as one strategy to reduce the cost of purchasing as well as overall health expenditures and operational costs. Not surprisingly, research on group purchasing organizations (GPOs) and how they help our understanding of cost-containment in an era of rising health expenditures has received significant attention in the literature (Burns, DeGraaff, Danzon, Kimberly, Kissick, & Pauly, 2002; Burns & Lee, 2008; Chakraborty, Bhattacharya, & Dobrzykowski, 2014; Doucette, 1997; Hu, Schwarz, & Uhan, 2012).

A GPO is an organization that leverages the purchasing power of a group of businesses to obtain below-market value of goods and services from manufacturers and vendors (Silverman, 2014). GPOs have been considered a branch of strategic alliances (Zajac, D'Aunno, & Burns, 2011). Strategic alliances have been defined as an agreement or cooperation among existing organizations that are designed to achieve long-term strategy that cannot be achieved by a single organization (Swayne, Duncan, & Ginter, 2012)

In the area of group purchasing and strategic alliances, researchers have studied the structure of GPOs, the evolution of GPOs, contextual factors that influence its structure, and the contribution of GPOs to hospital performance (Bhattacharya, 2007; Huet al., 2012; Litan & Singer, 2010; Saha, Seidmann, & Tilson, 2010, 2011; Schneller,

2009; Schneller & Smeltzer, 2006). Although a significant number of studies have focused on GPOs, several researchers have also noted that prior research has been widely unstructured; therefore, a more systematic approach towards research on GPOs in healthcare is necessary. More specifically, critiques of the existing literature (Burns & Lee, 2008; Saha, Seidmann, & Tilson, 2010, 2011) mentioned that there is a need to shift the focus away from GPOs and towards hospitals to study the conditions that support or hinder the use of GPOs by hospitals.

Accordingly, this paper presents the results of a literature review of the relationship between hospitals and group purchasing organizations. The review provides a structured overview of prior work on topics and findings related to the relationship between hospitals and group purchasing organizations. Additionally, the paper identifies gaps in the existing literature that may be addressed in future research.

The goals of this systematic review are to (1) synthesize prior research, (2) identify contextual factors related to GPO utilization by hospitals, (3) present a conceptual framework by which hospitals and group purchasing organizations may be studied, and (4) identify promising areas for future research.

The next sections of this paper present the background of GPOs, discuss the conceptual framework of the paper, and describe the methodology of the literature review. The last section discusses the findings and limitations of the studies in the review and provides suggestions for future research.

Background

Hospitals and Groups Purchasing Organizations

Hospitals typically purchase large volumes of products and services from a variety of sources. Examples of the products and services they source include the following: pharmaceutical, laboratory, diagnostic imaging, office facilities, dietary, maintenance, IT, and insurance (Burns et al., 2002). In sourcing what they need to function effectively, hospitals use or rely on group purchasing organizations. The original group purchasing organization was established in the 1910s by the Hospital Bureau of New York. The need for such an organization was based on the vast array of products and services that hospitals in New York were purchasing at that time. By the 1970s there were approximately 40 established GPOs dealing with healthcare nationwide. Currently, there are over 600 healthcare GPOs. Of that number, only 30 are true GPOs that directly negotiate sizable contracts for their members. The remaining GPOs are relatively smaller organizations that may offer buying members' access to larger GPOs.

Similar to cooperatives, GPOs leverage the collective purchasing power of healthcare providers to negotiate discounts with manufacturers, distributors, and other vendors for an array of medical supplies, capital equipment, and services contracts. From the manufacturers' perspective, GPOs provide economies of scale. By representing the purchasing needs of their members and clients, they provide unique information to manufacturers, which enable them to adjust their prices on the basis of normal market conditions. Furthermore, they help influence the providers with manufacturing capacity, raw material availability, and competitive suppliers.

The commitment of volume helps manufacturers to forecast their production quantities. Even though GPOs are involved in the purchasing of products and services in healthcare, they never actually take possession of products and services. According to the American Hospital Association, about half of U.S. hospitals utilize a GPO or some form of a GPO to realize savings and supply chain efficiencies, and many belong to multiple GPOs (American Hospital Association, 2010).

According to Schneller (2009), purchases through GPO contracts yield savings to providers of about 10% to 15% compared to purchases on the general supply chain market. To some degree, GPOs are able to control healthcare costs through contract negotiations that obtain the best prices possible for hospitals and other healthcare providers. Through contract negotiations, GPOs work to obtain the best value for their members and clients including lower prices and a reliable, safe, and consistent supply of products and services. GPOs also allow for standard contracted terms and conditions. The use of GPO-contracted prices is voluntary, with hospitals or healthcare providers having the ability to choose among multiple options that fit their needs.

How GPOs Work

GPO business operations are funded through two models. The first model involves contract administrative fees paid by manufacturers and vendors with whom the GPO provides a market. These fees are typically a set percentage of the total purchase through the GPO or an annual flat rate.

The second model involves a subscription fee for the right to purchase discounted products and services; this fee is charged to the buying member to fund their activities. In recent years, most GPOs fund their activities through a combination of both models. The

level of participation in GPOs varies by members. Participation depends primarily on the needs of the client and the level of confidence in what members believe is the most competitive pricing negotiated by their GPOs. Participation in a GPO is optional in the healthcare industry, but most hospitals use GPOs as a strategy to find better deals on products and services than what they can individually negotiate with vendors.

Conceptual Framework

To understand organizational decision-making in adopting strategies, specifically engaging in inter-organizational relationship and alliances, researchers have examined the external environment, the internal environment (structure), and performance of these organizations. These concepts are based on the notion that organizations with different organizational designs perform better when their structures are aligned properly with the conditions of their environment (Glock & Hochrein, 2011; Mintzberg & Waters, 1985).

The environment-structure-performance (ESP) framework allows us to model how the environment of an organization, in this context hospital and health providers, influences their structure and how these environmental factors and structures are associated with better performance. The central concepts suggest that the environment of an organization determines its structure and performance is described by the environment-structure view of organizational design and performance (Bernard, 1938; Dess & Beard, 1984; Ginn & Young, 1992; Miller, 1987; Miller & Friesen, 1983).

The environment-structure-performance (ESP) framework was used in this paper to guide the content analysis of the literature review (Figure 1). The review aims at providing researchers with the current research agenda of hospitals and GPOs. Specifically, it addresses the environmental and organizational factors that are associated

with hospitals' use of GPOs services. Moreover, the review highlights the impact of GPO utilization on hospitals' financial performance.

The environment can be conceptualized as a multidimensional construct, integrating the dimensions of munificence, dynamism, and complexity (Dess & Beard, 1984; Dess & Davis, 1984; Dess & Origer, 1987). Munificence pertains to the abundance and availability of resources in the external environment. Dynamism pertains to the rate of change in the environment. Complexity reflects the interactions and interconnectivity with other organizations (e.g., other providers, patient groups, insurance companies, competing GPOs) in the external environment. In general, higher levels of munificence and lower levels of dynamism and complexity reflect more stable and certain resource environments (Weech-Maldonado, Qaseem, & Mkanta, 2009; Zinn, Weech, & Brannon, 1998).

The second component of the framework is frequently construed as a response of an organization to its environment (Child, 1972). The structure of an organization can also be seen as the contextual variable that influences another part of an organization (e.g., performance) (Glock & Hochrein, 2011). The structural characteristics of organizations constitute a set of dimensions which define a continuum of alternative organizational forms. In healthcare, structure pertains to the attributes of settings where care is delivered and can have a direct influence on financial and patient outcomes (Flood & Scott, 1987; Shortell et al., 1994). Examples of attributes of setting include noticeable organizational resources and physical aspects, ownership type, size, system affiliation and membership, diversity of product and services offered, and occupancy (Hearld, Alexander, Fraser, & Jiang, 2008).

The third component of the framework (performance) includes the determinants of the environment and structure of the organization. Performance measures how successfully organizations adapt to environmental changes both externally and internally (Child, 1972). In the literature of strategic management, this component has been broadly labeled as either organizational performance (Child, 1974; Lenz, 1981) or organizational effectiveness (Cameron & Whetten, 1983; Steers, 1977). Lebas (1995: 29) defined performance as "deploying and managing well the component of causal models that leads to the timely attainment of stated objectives within constraints specific to firm and situation". Performance is the primary variable used in research and practice to represent the overall health of the organization (Lebas, 1995).

Performance can be categorized into several distinct dimensions. For example, Venkatraman and Ramanujam (1986) categorized performance by highlighting 10 different approaches to measurement in strategic research using financial and non-financial indicators. Drucker (1995) identified five measures of organizational performance that used both quantitative and qualitative measures. Specifically, Drucker outlined market standing, innovative performance, productivity, liquidity and cash flow, and profitability as measures that provide a clear picture of organizational performance.

Other authors have researched the evolution and trends of performance over the last two decades (Kennerley & Neely, 2002; Neely, 2005; Srimai, Radford, & Wright, 2011; Yadav & Sagar, 2013). Performance measures in prior studies have included market share (Buzzell, Gale, & Sultan, 1975; Schendel & Patton, 1978); intangible assets such as patents and human resources (Hall, 1992); customer satisfaction (Chakravarthy, 1986); new product development (Venkatraman & Ramanujam, 1986); product quality

(Powell, 1995); technology efficiency (Chakravarthy, 1986); efficiency (Schendel & Patton, 1978); and safety (Chakravarthy, 1986).

Measures of environment, structure, and performance have historically been employed in studies of strategic decisions of organizations especially in forming alliances and inter-organizational networks (Oumlil & Williams, 2011; Zajac et al., 2011). However, how these constructs have been operationalized especially in examining the conditions, which support or hinder the relationship between hospitals and group purchasing organizations, has not been given considerable attention in the literature.

Method

The methodology used in the literature review was developed based on the three step inclusion/exclusion criteria established by Yeager et al. (2014). The search was limited to years ranging from 1995 to 2014. Briefly, these steps included the following:

Step 1: Bibliographic search. A sequential search of ABI INFORM, Business Source Complete (EBSCO host), PubMed, and Google Scholar was performed. All articles focused on hospitals and group purchasing organizations were retrieved and indexed at the time of the literature search (January 2016). The keys words used in the search criterion included: Group Purchasing, Group Purchasing Organization, GPOs, Healthcare Supply Chain, Hospital Supply Chain, Purchasing Group Memberships, Supply Chains, Supply Chain Management, Economic Value, and Hospitals and Procurement. These sets of citations were then crossed-checked with "health care/healthcare" as the subject area. Only peer-reviewed articles written in the English language were considered for inclusion regardless of the country of origin.

Step 2: Hand search. For a comprehensive search, we recognized that potential articles may not have been indexed in the three major journal warehouses; therefore, we performed a hand search of all the references of the articles identified in step 1. We included articles that were peer-reviewed, employed empirical methods, and examined hospitals and GPOs.

Sept 3: Inclusion/Exclusion criteria. All abstracts derived from these searches were screened and analyzed (Step 1). A total of 63 articles were obtained, 45 from ABI/INFORM, 36 from Business Source Complete, and 21 from Google Scholar. Thirty-two of these articles were common to all three databases. Thirty-three articles were excluded because they did not focus on hospital group purchasing organizations. Four articles were excluded because they were not written in English and two were not peer-reviewed (n=6). After Step 2 was completed, an additional four articles were identified that were peer-reviewed, focused on hospital group purchasing organizations and not duplicated in the search, for a total of 19 articles. Finally, we excluded six articles because their unit of study was not the hospital. Based on these criteria, a total of 13 articles were available for review (Figure 2).

Results

The review process used in the selection of articles resulted in 13 journal articles for use in this study. These articles met all of the inclusion criteria and were the most relevant to the relationship between hospitals and group purchasing organizations. Twelve of the 13 articles in our review were published in non-health-related journals (see Table 1). Additionally, all of the reviewed articles were unfunded studies with approximately half-using conceptual purchasing models and half-using interviews and

questionnaires. The hospital and group purchasing organization alliance literature is organized along the three themes of the conceptual framework (Figure 1): environment, structure, and performance, and subsequently presented from either the hospital or GPO perspective.

Articles that focused on the environment were less research-intensive and tended to focus on the enacted environment that influenced GPO activities rather than the hospital environment (Hu & Schwarz, 2011; Hu et al., 2012; Johnston & Rooney, 2012; Nollet & Beaulieu, 2003, 2005; Saha et al., 2010; Weinstein, 2006). Articles that focused on structure explored a wide variety of mechanisms by which GPOs are organized and classified (e.g., types, models of contracting) and how these configurations of GPOs help to provide better prices for hospitals (e.g., reduced unit prices on capital equipment, tier pricing, procurement strategies). Lastly, articles that focused on performance identified how hospitals evaluated their alliances with GPOs in terms of the overall benefit of the alliances in cost-containment as well as how GPOs measured their contribution toward cost-containment of hospitals' supply management. A summary classification of the articles is displayed in Table 1.

Environment

Several of the environment-based research studies on hospital group purchasing organizations focused on the enacted environment especially from the perspective of the GPOs rather than the hospital. Only a few of the articles from the hospital perspective examined the organizational environment of the hospital. Articles on the enacted environment examined how government and private organizations have enacted laws and incentives that have contributed to the general development of GPOs (Hu & Schwarz,

2011; Johnston & Rooney, 2012; Nollet & Beaulieu, 2003, 2005; Saha et al., 2010; Schneller 2009).

Articles on government policies and laws provide insights regarding the Safe Harbor legislation, which was part of the 1987 Medicare and Medicaid Patient Protection Act, and how this legislation allowed GPOs to charge contract administration fees (CAF) from manufacturers and suppliers (Hu & Schwarz, 2011; Nollet & Beaulieu, 2003, 2005; Saha et al., 2010; Schneller 2009). Under this legislation, GPOs are provided protection from federal anti-kicker laws for the collection of fees as compared to other industries like real estate and agriculture (U.S. GAO, 2010).

For example, two studies that examined the effect of the Safe Labor legislation found that even in the presence of CAFs, GPOs provided lower total purchasing costs for hospitals using different purchasing models (Hu et al., 2012; Schneller 2009). Controversially, congressional hearings of 2002 and 2003 on GPOs revealed that the CAF structure of GPOs created market inefficiencies which resulted in increased prices for certain products and services for hospitals (Weinstein, 2006).

These studies were categorized as environmental-based research because they generally looked at the external conditions under which GPOs developed (Nollet, 2003). Specifically, they examined the laws and regulations that affected the purchasing alliance of hospitals and its relation to cost-containment (Hu, 2012; Johnson, 2012; Nollet, 2005; Saha, 2010) and purchasing strategies (Nollet, 2005). Most of these studies were retrospective in nature and written prescriptively with little to no empirical design. While these studies are valid research, they do not provide theoretical frameworks or models with which to examine the actual policy effects of these enacted environments.

Structure

Research studies in the structure literature were varied and generally focused on the perspective of the group purchasing organizations rather than the hospitals. Many of the articles focused on structure and dimension of GPOs (Burns & Lee, 2008; Nollet & Beaulieu, 2005; Saha et al., 2010; Weinstein, 2006) and procurement strategies (Anderson & Katz, 1998; Nollet & Beaulieu, 2003). Regarding the structure and dimensions of GPOs, Saha et al. (2010) categorized GPOs using three models of contractual organizations related to volume commitment. Under this organization, GPOs were (1) committed to volume, (2) voluntary programming, or (3) mixed. Committed to volume GPOs limit members from joining competing GPOs. Conversely, voluntary programming GPOs do not have contractual restrictions on members joining more than one GPO to procure items and services. Mixed GPOs organized on volume commitment used a blended format which, allowed for both committed and voluntary purchasers.

Saha et al. (2010) argued that committed volume GPOs offer the lowest price for products and services for purchasers due to their ability to negotiate with sellers and manufacturers by the number of committed purchasers. Weinstein (2006) further noted that GPOs are turning into a bilateral oligopoly, where GPOs are either "polyopsonist" (dispersion of independent buyers) or "oligopsonist" (limited number of buyers).

Additionally, Burns and Lee (2008) classified GPOs based on their ownership structure. GPOs were distinguished as for-profit, not-for-profit, or public. Health Trust Purchasing Group (HCA) and Tenet (BuyPower) are the largest for-profit GPOs in the United States while Vizient and the Veterans Administration are the largest not-for-profits and public GPOs, respectively (Burns and Lee, 2008). Healthcare organizations

that are part of a for-profit GPO are committed to group purchasing contracts. On the other hand, healthcare organizations that are part of a not-for-profit GPO join the alliance voluntarily (Burns & Lee, 2008)

Procurement strategic configuration of GPOs was the subject of several studies; these studies typically reported how GPO contracts are handled as a strategy for cost reduction (Anderson & Katz, 1998; Nollet & Beaulieu, 2003, 2005). Specifically, Anderson and Katz (1998) presented the following three models for procurement by providers: buy less, buy better, and use better. These models of procurement can generate cost reduction benefits in the areas of price, administrative, and utilization costs to purchasers. From the perspective of the GPO, however, Nollet and Beaulieu (2003, 2005) identified GPO structure based on a procurement strategy that was either superstructure or confederation.

Superstructure GPOs allow a separate and autonomous entity to manage the group's contracts with manufacturers while confederation structure contracts are negotiated and shared among members of the group. The authors subsequently noted that there are two dimensions in the structure of GPOs that deal with the geographic scope of GPOs (i.e., national or regional). The national scope of the GPO allows for the consolidation of volume, which provides purchasing groups with more clout in negotiations with suppliers. The regional scope GPOs allows for easier maintenance of close relationships between GPOs and providers (Nollet & Beaulieu, 2003).

From the providers' perspective, only a few articles emphasized the organizational structure of hospitals and its relationship to purchasing in healthcare (Burns, 2008; Oumlil, 2011). One study examined both individual and organizational

structures as related to the strategic alliance and organizational buying in healthcare (Oumlil & Williams, 2011). Specifically, this article reported on how roles and individual traits influenced buying behavior of organizations and led to a better understanding of the buying process in healthcare.

The article explored individual factors such as age, education, job title/position, and job tenure. Organizational factors were also examined including ownership structure (private hospital, religious group/alliance-affiliated, public-supported hospital, and others); size (based on total number of beds); strategic alliance configuration (association, consortiums, cooperative groups, federations, national groups, religious groups, government groups); alliance size; purchasing behaviors (centralized purchasing and control, decentralized purchasing and control, others); and purchasing methods used by the formed alliance (one-shot purchasing, standing order purchasing, annual requirement purchasing, others). Oumlil & Williams (2011) pointed out that the length of experience on the job and tenure of the purchasing manager was associated with strategic decisions to engage in group purchasing alliance. Overall, personal factors had a significant influence on strategic alliance effectiveness before, during, and after joining a purchasing alliance. In terms of organizational factors, large hospitals were associated with a centralized approach toward purchasing decision-making while small hospitals were more oriented towards a decentralized style. Additionally, larger hospitals had a greater likelihood of joining alliances.

Furthermore, based on a national sample of hospital materials managers, Burns and Lee (2008) examined hospital characteristics from the hospital perspective as related to hospital purchasing alliances and utilization, services, and performance. This study

presented a more robust examination of the relationship between purchasing alliances and hospitals. Even though none of the hospital characteristics they identified were associated with cost savings (i.e., teaching status, bed size, ownership, and services), alliance contracts, and satisfaction with alliance performance, it was the first study that examined the relationship between hospitals and their purchasing organizations.

Performance

Performance articles were similar to structure articles but focused on the results or outcomes of the relationship between GPOs and hospital. Likewise, performance articles were presented from the perspectives of GPOs or hospitals. Additionally, many of the articles from the GPO perspective examined how purchasing alliances saved the healthcare and hospital industry millions of dollars using purchasing models, but they lacked an empirical foundation, thereby creating more prescriptive knowledge.

Only a few studies examined the financial impact or perceived satisfaction of purchasing alliances by hospitals (Burns & Lee, 2008; Chakraborty, Bhattacharya, & Dobrzykowski, 2014). This finding is not uncommon given that healthcare organizations are often unwilling to share proprietary information about their purchases. The few studies that included financial information did not examine any financial performance indices (Burns & Lee, 2008; Chakraborty et al., 2014).

For example, Burns and Lee (2008) examined the utilization, services, and performance of hospital purchasing alliances based on a national sample of hospital materials managers. The authors found that hospitals were satisfied with the services of GPOs, as they perceived GPOs to produce cost savings and lower prices for supplies and

services. In addition, material managers were moderately satisfied with GPO services regarding contract convenience and multisource contracts.

Furthermore, Chakraborty and Dobrzykowski (2014) examined the impact of supply chain collaboration on a firm's performance and provided a conceptual framework with testable propositions that established supply chain collaboration as an antecedent to value co-creations, which acted as a mediator (value co-creations) between supply chain collaboration and a firm's performance. Firm performance was measured as either financial or clinical. Financial performance was conceptualized as return on investments (ROI), return on assets (ROA), net patient revenue per discharge, or market share. Clinical performance was conceptualized as length of stay, average mortality rate, and readmission ratio.

From the perspective of GPOs, performance studies commonly used models, forecasts, and nonproprietary data to create financial projections obtained from the GPO industry and extrapolated these data across the industry. For example, Hu et al. (2012) used a game-theoretic model to examine how the presence of GPOs affected hospital total purchasing costs. The authors concluded by noting that the presence of CAF from GPOs had no effect on total purchasing costs for hospitals. Rather, the presence of CAF contributed to lower administrative fees.

Similarly, Anderson and Katz (1998) estimated three cost-reduction benefits which purchasing organizations generated for hospitals using economic models. The cost-reduction benefits included: price reduction, administrative costs, and utilizations costs. The price reduction, administrative cost, and utilization cost savings were realized

by hospitals from GPOs through product standardization (Chapman, Gupta, & Mango, 1998; Tyndall, Gopal, Partsch, & Kamauff, 1998).

Performance measures (financial and non-financial indicators) in these studies were built on models, forecasts, and assumptions rather than actual organizational data. These examples reveal the limited depth of research that has been collected to investigate the relationship between purchasing alliances and their performance from the hospital perspective, which highlights a significant gap in the hospital purchasing alliance literature using institutional data.

Discussion

The purpose of this study was to review the current and most related peer-reviewed literature about hospitals and group purchasing alliances. In this review, we presented a synthesis of literature and identified strengths and weaknesses of the peer-reviewed literature for hospitals and group purchasing alliances. We presented the methodological approaches used to identify and study hospital group purchasing organizations literature, provided rich analyses based on emerging themes, and discussed how hospitals and group purchasing organizations can be studied. The themes developed in Table 1 introduce new considerations for the study of hospitals and group purchasing organizations.

We found that hospital and purchasing alliance literature were not well populated by robust statistical analyses. Specifically, the literature provides little to no research that measures the conditions that enable or hinder these alliances and their performance. Instead, most of the literature was based on purchasing models, industry averages, forecasts, and assumptions. Research findings of previous studies were largely a

reflection of industry- and proprietary-driven data sources intended for publication in trade journals rather than scholarly articles (Burns & Lee, 2008; Oumlil & Williams, 2011).

Additionally, research findings present a challenge for both managers and researchers because they do not provide a clear approach or standard for measuring antecedents, contextual factors, and performance of hospitals and their purchasing alliance relationships. Furthermore, the literature offers few specific models with which to conduct research and test findings related to hospitals and their purchasing alliances. The lack of models, however, provides researchers and scholars the unique opportunity to present different approaches and test models that are empirically driven to explore the relationship between hospitals and their purchasing alliances.

Implications and Future Directions

Healthcare managers wishing to utilize the services of hospital purchasing alliances have a limited literature base from which to draw to identify contextual factors and performance of purchasing alliances. GPOs provide an estimated $36 billion in annual direct price savings to hospitals (Schneller, 2009). Given the cost reductions and price protection benefits that hospital purchasing alliances provide further research is needed to understand the conditions that support or hinder the utilization of purchasing organizations by hospitals. Specifically, there is a need for further research to explore the market and organizational factors that influence hospital strategy choice to use GPOs in acquiring needed supplies and equipment. More than ever before, this is important as approximately 65% of hospitals are utilizing the services of GPOs (Burns & Lee, 2008).

Despite the fact that some of the studies we reviewed contained information on cost reductions (Anderson & Katz, 1998; Burns & Lee, 2008; Schneller, 2000, 2009); price protection (Schneller, 2000); rebates (Graf, 2014); reduced contracting cost (Chapman et al., 1998; Oumlil & Williams, 2011; Tyndall et al., 1998;); and potential savings with the utilization of GPO services, the lack of financial and economic metrics in the literature is an indication of an underdeveloped literature base. This underscores the need and opportunity for future research. Specifically, no studies have been conducted using established financial metrics from the hospital performance literature, such as return on assets, operating margin, total margin, and return on investments (Oner et al., 2016) when analyzing organizational characteristics or market characteristics associated with hospital purchasing alliances.

In light of this, future studies should examine the financial benefits associated with the utilization of GPOs by hospitals using previously established financial metrics from the hospital performance literature (Oner et al., 2016). In addition, future studies should detail the actual costs of utilizing GPOs services including the direct and indirect costs of personnel time and organizational resources associated with the utilization of GPO services.

Finally, future researchers should examine outside forces that may affect the relationship between hospitals and GPOs including government policies, industry developments, and economic factors that either enhance or inhibit this relationship. These considerations are important because the activities of GPOs directly affect the overall rising cost of healthcare (Burns & Lee, 2008; Chakraborty et al., 2014). For example,

future studies should examine the evolution of GPOs and how it affects healthcare supplies and equipment pricing.

This review has several limitations. The first limitation pertains to the number of articles retrieved, which may not necessarily be representative of the broader hospital and group purchasing alliance literature. The current review was specific to the environment in which this relationship has been studied, the structure of the relationship, and performance outcomes of the relationship. The second limitation of the review pertains to the keywords used in the selection criteria of the article search and the search engines used. Nevertheless, we attempted to reduce this bias by manually performing a hand search of all the references of identified articles. Furthermore, the focus on hospitals in this review does not reflect the wider purchasing and supply chain mechanisms of the healthcare industry.

Despite these limitations, this is the first review that attempts to summarize the literature on the relationship between hospitals and their purchasing alliances using the framework of the environment, structure, and performance. The review presented above sheds light on some important implications that may be useful for researchers and practices in the hospital purchasing alliance field.

***Figure 1*. Environment, Structure, Performance (ESP) framework**.

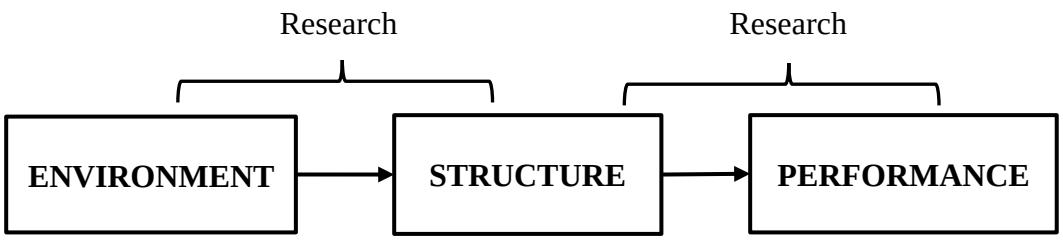

***Figure 2*. Steps to identify articles for review of hospital and GPOs relationship literature**

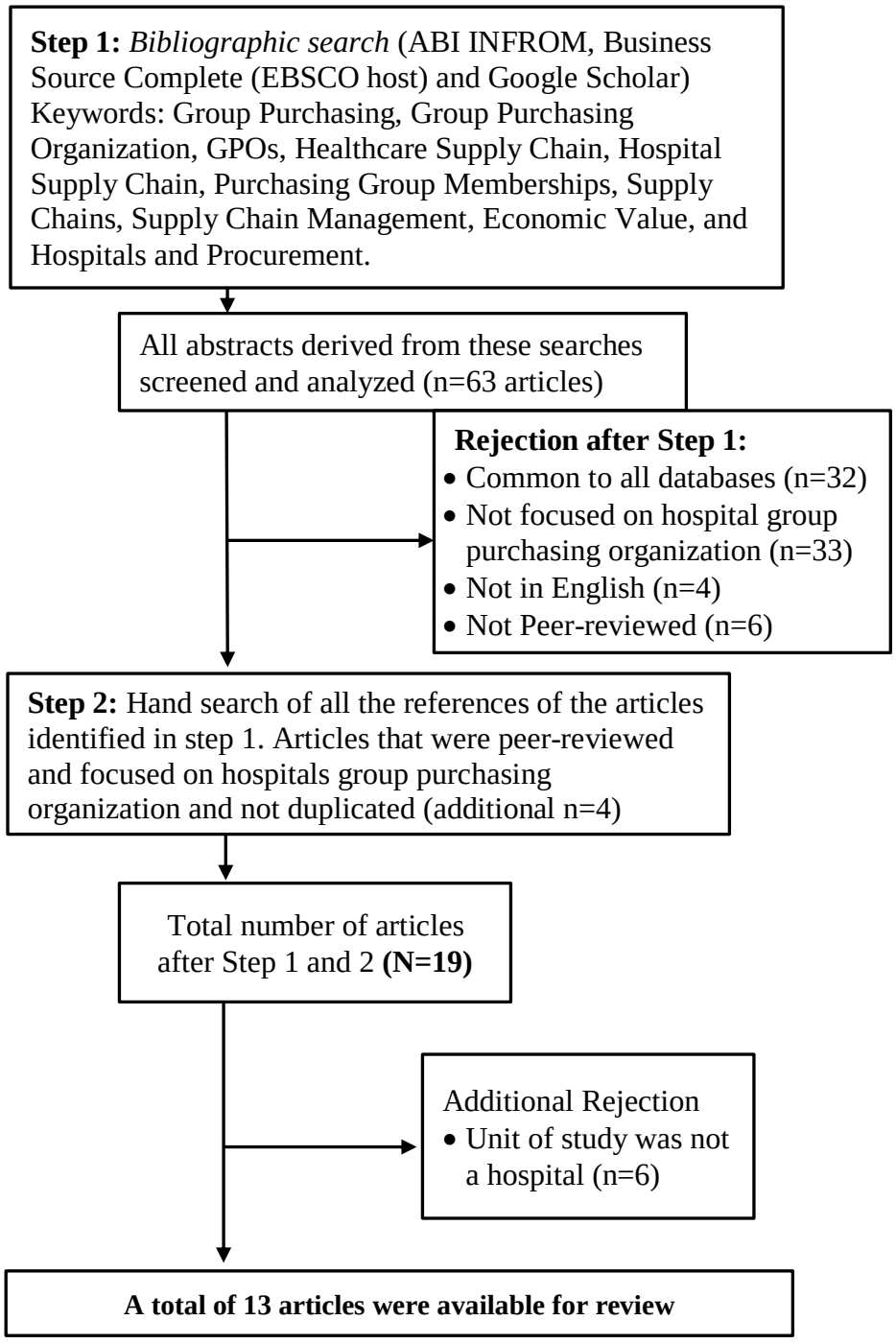

Table 1
Reviewed Studies on Hospitals and Group Purchasing Organizations (n = 13)

Reference	Journal	Study period/ Dataset	Theoretical /Conceptual applications	Purpose
Environment				
Nollet & Beaulieu, 2003	Journal of Purchasing and Supply Management	70 interviews of individual most of who work in healthcare sector	N/A	The article identifies the critical factors impacting on the development of purchasing groups
Nollet & Beaulieu, 2005	Supply Chain Management: An International Journal	literature/ interviews with healthcare managers	N/A	The article identified the different aspects of a relationship with a GPO. The paper evaluated the impacts of a GPO on a supply market. The issue related to the size of a GPO and its effects on the buyers and the suppliers were discussed. They further went on to discuss the member characteristics and the issues faced by them

Hu, Schwarz, & Uhan, 2012	Manufacturing & Service Operations Management	Single Product	Game-theoretic model	The article uses game-theoretic model, to examine questions about supply chain, including how the presence of a GPO affects the providers' total purchasing costs. The article also addresses the controversy about whether Congress should amend the Social Security Act, which, under current law, permits Contract Administrative Fees (CAFs). Among other things, the article concludes that although CAFs affect the distribution of profits between manufacturers and GPOs, they do not affect the providers' total purchasing costs.
Weinstein, 2006	Estudios de economía aplicada	Models	Oligopoly, poly, and oligopsony	The paper presents how the medical products market in the U.S. is turning into a bilateral oligopoly and how congressional hearings of 2002 and 2003 on GPOs and federal government oversight are influencing GPOs to modify their behaviors.
Saha et al., 2010	System Sciences (HICSS)			The study presents an overview of the existing literature, describe the emerging roles of GPOs beyond group purchasing, and then identify the overlooked research areas that invite further studies by the research community.

Hu & Schwarz, 2011	Production and Operations Management	Models	Hotelling model of horizontal differentiation	The paper examines the controversies with Contract Administration fees using a Hotelling, duopoly model. The paper concluded that GPOs increase competition between manufacturers and lower prices for healthcare providers. The paper also examined the consequences of eliminating the "safe harbor" provisions that permit healthcare GPOs to charge CAFs to manufacturers and concluded that it would not affect any party's profits or costs.
Johnston & Rooney, 2012	The Journal of Contemporary Health Law and Policy			Provides a general overview of how GPOs work, from bid and requests for information from suppliers and manufacturers, request for proposal, to evaluation and scoring of the proposal with non-financial criteria determinant (e.g., breadth of product) to selecting the best offer for the hospitals. Subsequently, arguing the benefit of using a GPO in terms of the reduced personal cost provided by GPOs.
Structure				
Anderson & Katz, 1998	International Journal of			The paper identifies three types of cost reductions for which purchasing can

	Logistics Management			generate benefits: price, administrative costs, and utilization costs.
Nollet & Beaulieu, 2003	Journal of Purchasing and Supply Management	70 interviews of individual most of who work in healthcare sector	N/A	The article identifies the critical factors impacting on the development of purchasing groups
Weinstein, 2006	Estudios de economía aplicada	Models	Oligopoly, poly, and oligopsony	The paper presents how the medical products market in the U.S. is turning into a bilateral oligopoly and how congressional hearings of 2002 and 2003 on GPOs and federal government oversight are influencing GPOs to modify their behaviors.
Nollet & Beaulieu, 2003	Journal of Purchasing and Supply Management	70 interviews of individual most of who work in healthcare sector	N/A	The article identifies the critical factors impacting on the development of purchasing groups

Nollet & Beaulieu, 2005	Supply Chain Management: An International Journal	literature/ interviews with healthcare managers	N/A	The article identified the different aspects of a relationship with a GPO. The paper evaluated the impacts of a GPO on a supply market. The issue related to the size of a GPO and its effects on the buyers and the suppliers were discussed. They further went on to discuss the member characteristics and the issues faced by them
Oumlil & Williams, 2011	International Journal of Procurement Management	23 hospital purchasing managers - Questionnaires		The research focuses on the various strategic alliance orientation in the organizational buying sector of healthcare institution, specifically examining the organizational factors (e.g., hospital size, type of hospital) and personal factors (e.g., number of years on the job, education level, gender, age) as they relate to strategic alliance decision-making.
Burns and Lee 2008	Health Care Management Review	All members of the seven alliances and individual members of the Association of Healthcare	Pooling alliances	To analysis alliance utilization, services and performance from the perspective of the hospital executives in charge of materials management.

		Resource and Materials Management. Survey of 644 Materials managers		
Hu, Schwarz, & Uhan, 2012	Manufacturing & Service Operations Management	Single Product	Game-theoretic model	The article uses game-theoretic model, to examine questions about supply chain, including how the presence of a GPO affects the providers' total purchasing costs. The article also addresses the controversy about whether Congress should amend the Social Security Act, which, under current law, permits Contract Administrative Fees (CAFs). Among other things, the article concludes that although CAFs affect the distribution of profits between manufacturers and GPOs, they do not affect the providers' total purchasing costs.
Performance				
Cost Reduction				

Anderson & Katz, 1998	International Journal of Logistics Management			The paper identifies three types of cost reductions for which purchasing can generate benefits: price, administrative costs, and utilization costs.
Chapman et al., 1998	McKinsey Quarterly,			
Tyndall et al., 1998	National Productivity Review			
Hu, Schwarz, & Uhan, 2012	Manufacturing & Service Operations Management	Single Product	Game-theoretic model	The article uses game-theoretic model, to examine questions about supply chain, including how the presence of a GPO affects the providers' total purchasing costs. The article also addresses the controversy about whether Congress should amend the Social Security Act, which, under current law, permits Contract Administrative Fees (CAFs). Among other things, the article concludes that although CAFs affect the distribution of profits between manufacturers and GPOs, they do not affect the providers' total purchasing costs.

Burns and Lee 2008	Health Care Management Review	All members of the seven alliances and individual members of the Association of Healthcare Resource and Materials Management. Survey of 644 Materials managers	Pooling alliances	To analysis alliance utilization, services and performance from the perspective of the hospital executives in charge of materials management.
Graf, 2014	The European Journal of Health Economics			
Satisfaction				
Burns and Lee 2008	Health Care Management Review	All members of the seven alliances and individual members of the Association of Healthcare	Pooling alliances	To analysis alliance utilization, services and performance from the perspective of the hospital executives in charge of materials management.

		Resource and Materials Management. Survey of 644 Materials managers		
Financial and Clinical Performance				
Chakraborty et al., 2014	Procedia Economics and Finance	N/A	Relational view and Service Dominant Logic	The study focuses on establishing supply chain collaboration as an antecedent to value co-creations where VCC act as a mediator in the relationship between SCC and firms' performance by introducing conceptual constructs.

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CHAPTER 3
ENVIRONMENTAL AND ORGANIZATIONAL FACTORS ASSOCIATED WITH HOSPITAL USE OF GPO SERVICES

by

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CHAPTER 3

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Abstract

Background: Given the potential benefits of Group Purchasing Organizations in cost-containment efforts for hospitals on supplies and purchased services, an important question relates to the conditions that support or hinder the utilization of GPOs by hospitals.

Purpose: To explore the relationship between GPO use by hospitals and market and organizational characteristics

Methods: Data on hospital GPO utilization and other organizational characteristics were combined with secondary hospital market characteristics. Panel logistic regression with random effects and state and year fixed effects analysis were used to examine the relationship between hospitals' utilization of GPO services and hospitals' organizational and market characteristics.

*Results***:** Data from 4,484 hospitals were available for analyses. Overall, the majority of hospitals utilized the services of GPOs. Specifically, the number of hospitals utilizing the services of GPOs increased slightly from 3,290 (72.2%) in 2004 to 3,337 (74.4%) in 2013. In regression analyses, hospitals utilizing the services of GPOs operated in an external environment with mixed levels of munificence, more dynamism, and less

competition. Specifically, hospitals operating in a less munificent environment are more likely to utilize the services of GPOs. Additionally, hospitals operating in a more dynamic environment will be more likely to utilize the services of GPOs

*Practice Implications***:** The major findings, in general, suggest that there is an association between the environment in which a hospital operates and its decision to utilize the services of GPOs. This association seemed more consistent across less munificent and more dynamic environments. The study findings provide organizational decision-makers and policymakers insights into how certain market and organizational factors influence hospital strategy choice, in this case, the use of GPOs.

Introduction

Healthcare costs are increasing rapidly at the same time hospitals are faced with providing quality care for their patients. This poses challenges to hospitals as they are confronted with what to do in the context of reduced reimbursement without passing on the extra cost load to patients. One outcome of this shift in reimbursement is that hospitals have increasingly directed their attention toward cost-containment strategies as a way to survive. In some cases this has involved the management of supply networks and relationships with other organizations (Burns & Lee, 2008). To counteract the reductions in reimbursement, hospitals are also joining alliances, specifically group purchasing alliances (organizations) as a cost-containment strategy.

Group purchasing organizations (GPOs) are organizations that typically leverage the collective purchasing power of healthcare providers (Blair & Durrance, 2014). In doing so, GPOs can negotiate discounted contracts for their clients (Schneller, 2009). As some scholars have noted, GPOs tend to focus on medical and surgical supplies, physician preference items, nutrition, pharmacy, laboratory, and other services (Blair & Durrance, 2014). According to Schneller (2009), GPOs provides an estimated $36 billion in annual direct price savings to hospitals. Moreover, some experts have argued that hospital channel about 75% of their purchases through GPOs, and these supplies and purchased services account for approximately one-third of a hospital's operating expenditures (Burns, DeGraaff, Danzon, Kimberly, Kissick, & Pauly, 2002; Schneller, 2009).

Given the potential benefits of GPOs in cost-containment efforts for hospitals on supplies and purchased services, an important question relates to the conditions that

support or hinder the utilization of GPOs by hospitals. While such a question is relevant for policy purposes, we do not know of any study that has investigated the links between participation in GPOs and a hospital's organizational and market profiles. Rather, existing studies about GPOs and hospitals have mainly focused on the structure and performance of GPOs (Burns & Lee, 2008; Hu, Schwarz, & Uhan, 2012) or the structure and function of GPOs (Burns et al., 2002; Schneller, 2000; Schneller & Smeltzer, 2006). Furthermore, these studies utilized qualitative analyses with little or no quantitative approaches.

This study attempts to fill this knowledge gap in our understanding of GPOs in the context of cost-containment and reduced reimbursement. Using the conceptual framework of Resource Dependency Theory (RDT), the study examined the relationship between GPO use by hospitals and market and organizational characteristics. Additionally, the study explored how market and organizational characteristics associated with hospital use of GPOs has evolved.

RDT has been employed in several healthcare research settings to examine the strategic choices by organizations based on the influence of their environment (McCue, Diana, & Hennum, 2007; McCue, Thompson, & Kim, 2015; McKinley & Mone, 2003; Yeager, Menachemi, Savage, Ginter, Sen, & Beitsch, 2014; Zinn, Weech, & Brannon, 1998). The current analyses will provide organizational decision-makers and policymakers insights regarding how certain market and organizational factors influence hospitals' strategy choice, in this case, the use of GPOs. This is important because more than 65% of U.S. hospitals reported using some form of GPO in acquiring needed supplies and equipment (Burns & Lee, 2008).

Conceptual Framework

Resource Dependence Theory (RDT) is one of the most commonly used theoretical perspectives to explain how hospitals participate in alliances (Alexander & Morrisey, 1989; Zinn, Mor, Castle, Intrator, & Brannon, 1999; Zinn, Proenca, & Rosko, 1996). It has been argued that the RDT model provides an open system perspective of organizations regarding the organization's resource dependence on its external environment (Aldrich & Pfeffer, 1976; Pfeffer & Salancik, 2003). RDT is a cyclic process with three major pieces: (1) the importance of a resource, (2) the abundance of the resource, and (3) who controls that resource.

To manage the cycle of resource dependence, there are six criteria that are interact with one another: Compliance, adaptation, avoidance, influence and negotiation, coordination, and established linkages (Pfeffer, 2005). Every organization needs resources to survive, and this leads to interdependence. Interdependence leads to uncertainty. To reduce uncertainty, organizations form coalitions, pool resources, and change their strategy to survive. Over time, when balances in the market shift, stability turns to instability and the cycle begins again (Nienhüser, 2008).

The environment in which resource dependence occurs entails three main things. First, resource dependence is dictated by the concentrations of resources. Second, resource dependence accounts for how resources change over time. The third and final aspect of the resource environment is the interconnectedness of organizations involved in the processes of resource supply and demand. For hospitals, this includes but is not limited to, patients, physicians, supplies, services, and capital. The environment, therefore, influences decision-making. Examples of the decisions that the external

environment influences include forming alliances and inter-organizational relationships in order to obtain the needed resources for the task environment with limited dependency (Alexander & Morrisey, 1989). In other word, hospitals engage in inter-organizational relationships and alliances only if they cannot acquire the needed resources on their own (Zinn, Proenca, & Rosko, 1996). An example of such an alliance is the GPO, which hospitals use as a strategy to obtain supplies and services at below-market value while still remaining autonomous.

Researchers have presented the resource environment from three different RDT perspectives: munificence, dynamism, and complexity (Dess & Beard, 1984; Ramamonjiarivelo, 2012). They varying perspectives may influence an organization's ability to acquire resources. Munificence pertains to the abundance and availability of resources in the external environment, dynamism pertains to the rate of change in the environment, and complexity reflects the interactions and interconnectivity with other organizations (e.g., other providers, patient groups, insurance companies, competing GPOs) in the external environment.

In general, higher levels of munificence and lower levels of dynamism and complexity reflect more stable and certain resource environments (Weech-Maldonado, Qaseem, & Mkanta, 2009; Zinn, Weech, & Brannon, 1998). Thus, we would expect hospitals to be less likely to utilize the services of a GPO in more munificent and less dynamic and complex environments. RDT has been applied in numerous empirical studies of healthcare organizationsincluding both environmental and organizational factors as determinants of strategic decisions and formulation such as adoption of innovation in clinical practices (Zinn et al., 1998); engaging in strategic partnership

(Alexander & Morrisey, 1989; Zinn et al., 1999); and delivery of specialized care (Banaszak-Holl, Zinn, & Mor, 1996; Campbell & Alexander, 2005; Goldberg & Mick, 2010; Weech-Maldonado et al., 2009).

Environmental munificence. Research findings have shown that organizations operating in a more munificent environment perform better financially than those in other contexts (Yasai-Ardekani, 1989). Having a better financial performance means less reliance on other organizations for resources. Researchers have measured munificence using the following criteria: per-capita income, overall population growth, growth rate of people over 65, growth in total sales growth in total employment, lower unemployment rates, and number of physicians in the county (Alexander et al., 1996a; 1996b; Dess & Beard, 1984; Trinh & Begun, 1999; Harrison, McCue, Wang, & Wolfe, 2003).

To survive, organizations try to maintain a munificent environment by engaging in inter-organizational relationship and alliances. Burns and Lee (2008) found that hospitals formed alliances with other hospitals to gain bargaining power or leverage when negotiating for the supply of goods and services from suppliers and manufacturers. Supplies and purchased services account for approximately one-third of hospitals' operating expenditures (Schneller, 2009).

Purchases through GPO contracts yield savings for hospitals at rates of approximately 10% to 15% compared to purchases on the general supply chain market (Hu et al., 2012). To some extent, GPOs can control healthcare costs through contract negotiations to obtain the best possible prices for hospitals and other healthcare providers. Hospitals in less munificent environments may use the services of GPOs to

obtain lower costs of supplies and services. Thus, they may explore a cost-containment strategy that utilizes the services of a GPO.

Hypothesis 1: Hospitals that operate in a less munificent environment will be more likely to utilize the services of GPOs.

***Environmental dynamism*.** Environmental dynamism represents the rate of change in an environment. In healthcare, dynamism has been measured using the number of managed care contracts (Menachemi, Mazurenko, Kazley, Diana, & Ford, 2012); change in unemployment rate (Menachemi, Shin, Ford, & Yu, 2011); change in poverty, Medicare and Medicare inpatient days as a share of total inpatient days by HSA (Hsieh, Clement, & Bazzoli, 2010; Yeager et al., 2014); and HMO penetration (Banaszak-Holl, Zinn, & Mor, 1996; Yeager et al., 2014).

The dynamism of the environment may cause difficulties in planning and obtaining needed resources by organizations because of the high rate of change. Additionally, the flux of resource supply due to environmental change makes it difficult to acquire resources (Ramamonjiarivelo, 2012). Organizations, specifically, hospitals try to address these uncertainties in the environment by implementing strategies such as vertical and horizontal integration as well as coalitions and alliances that allow them to acquire the needed resources for their survival.

Hospital use of GPOs may reduce the effects of environmental uncertainty by ensuring price protection and stability of critical resources. This is accomplished through GPOs negotiating pharmaceutical, laboratory, diagnostic imaging, and IT products. This price protection and price stability serve as an instrument for healthcare organizations to control the cost of medical services in an uncertain environment. Thus, we would expect

that hospitals would be more likely to utilize the services of a GPO in more dynamic environments.

Hypothesis 2: Hospitals that operate in a more dynamic environment will be more likely to utilize the services of GPOs.

***Environmental complexity*.** Environmental complexity reflects the number of interactions and levels of interconnectivity with other organizations. It measures the degree of heterogeneity of the environment. In other words, environmental complexity addresses the level of competition in the external environment in which an organization operates. Previous studies, specifically in healthcare, have measured environment complexity as market concentration, excess capacity, HMO penetration, state certificate of need, the number of hospitals per capita, and Hirschman-Herfindahl index (Hsieh, Clement, & Bazzoli, 2010; Ramamonjiarivelo, 2012; Weech-Maldonado et al., 2009).

Environmental complexity also relates to the amount of information available to organizations and measures the intricacies of the environment (Yeager et al., 2014). As environmental complexity increases, an organization's ability to understand how the environment evolves and its ability to predict the future becomes difficult (Yeager et al., 2014). Several researchers have argued that as competition in the environment increases so does the level of complexity in which hospitals and healthcare facilities must function (Ramamonjiarivelo, 2012; Yeager et al., 2014; Yeager, Zhang, & Diana, 2015).

An environment characterized by a higher level of competition results in organizations having to compete for scarce resources. In competing for scarce resources, organizations have to use key resources such as time and personnel to acquire these resources (Ramamonjiarivelo, 2012). GPOs help reduce this complexity in the

environment by providing hospitals a reliable, safe, stable, and consistent supply of products and services.

Higher competition in the healthcare environment may present an increased pressure to lower costs. GPOs can serve as a cost-containment strategy by providing stability in the pricing of products and services needed by hospitals. Additionally, GPOs provide the latest product information and updates to healthcare organizations to make them highly competitive in the very innovative healthcare environment. Thus, we hypothesize that hospitals in more competitive environments will be more likely to utilize the services of a GPO to control cost and provide innovative products and services.

Hypothesis 3: Hospitals that operate in a more complex environment will be more likely to utilize the services of GPOs.

Payer mix. Organizational characteristics are important from an RDT perspective. As with environmental factors, organizational characteristics such as payer mix, affect to some degree the strategic choices of hospitals. A hospital's organizational resources may be an important enabling factor in strategic choice because the organization's existing resources will either constrain or enable strategic options. For example, experiences from the hospital sector suggest that hospitals with a higher proportion of private payer mix command greater internal resources and may be more capable of accommodating engagement in strategic alliances and environmental changes. This higher proportion of private payer mix provides internal financial resources to hospitals. Several studies have demonstrated an association between payer mix and financial performance of hospitals (Jones, Scott, Anoff, Pierce, & Glasheen, 2015; Manary, Staelin, Boulding, & Glickman, 2015).

According to these authors, payer mix, represented by the percentage of patients with a particular insurance, influences the financial resources of hospitals. In the absence of mandated rate equalization, traditional research has also shown that private payer has higher rates compared to Medicare and Medicaid. This means that hospitals with a higher payer mix of Medicare and Medicaid patients tend to have a lower financial position due to the lower reimbursements associated with Medicare and Medicaid payment compared to other private insurance (Leleu, Moises, & Valdmanis, 2014).

Therefore, we argue that there is a direct relationship between hospitals with a higher proportion of Medicare and Medicaid payer mix and lower hospital financial revenue. To be able to improve their financial position, hospitals with a higher payer mix of Medicare and Medicaid patients will utilize the services of GPOs as they provide lower cost and price stability for products and services needed by hospitals.

Hypothesis 4: Hospitals with a higher proportion of Medicare and Medicaid payer mix will be more likely to utilize the services of GPOs.

Method

Source of Data

Data for this study come from several 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 Bureau of Labor Statistics (BLS). The AHA annual survey provides data about hospitals' use of GPOs and organizational characteristics such as health system member, size, and ownership type (AHA, 2012). The AHRF provides data regarding county-level market characteristics, and the RUCA codes provide location information of hospitals (Hart, Larson, & Lishner,

2005). The BLS provides data on the change in unemployment for a county. These datasets were linked together using 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 2013 with 45,383 hospital-year observations.

Measures

Table 1 provides a summary list of the variables used in the study.

Dependent variables. The dependent variable for this study was a binary variable that captures whether or not a hospital utilizes the services of a GPO. This variable was coded as "1" if the hospital utilized the services of a GPO and "0" if the organization did not use the services of a GPO.

Explanatory variables. The primary independent variables dealt with the three dimensions of the environment presented in RDT, munificence, dynamism, and complexity. Consistent with Yeager et al. (2014) and Ramamonjiarivelo (2012), environmental munificence was measured by per capital income, hospital location (urban vs. rural), managed care penetration rate, percentage of population over 65 years, and percentage of population without health insurance. Environmental dynamism was measured by change in unemployment, change in poverty level, and change in population size (Menachemi et al., 2011). Lastly, environmental complexity was measured using the Hirschman-Herfindahl Index (HHI) as a proxy for market competition.

Control variables. Research has shown that certain hospital characteristics and market characteristics influence hospitals strategic choice (Ramamonjiarivelo, 2012). We relied on the same set of hospital characteristics identified by Yeager et al. (2015)

including: size (measured as total number of beds), ownership status (not-for-profit, for-profit, or Public), payer mix, system member or affiliation, and teaching status as potential confounding variables that may influence hospitals utilizing the services of a GPO.

Analysis

Analyses were conducted at the hospital level. Univariate statistics and bivariate analyses are presented to demonstrate that the variables were appropriate. Multivariate relationships between hospital utilization of GPO services (Yes or No) and hospital organizational and market characteristics were examined using panel logistic regression with random effect, state and year fixed effects, and robust standard errors to address correlation of repeated observations (Allison, 2009). Random effects assume that individual specific effects are uncorrelated with the independent variables. A one-year lag between organizational and market-level variables and GPO utilization was established. The one-year lag allowed some time variance to see if the environment (organizational and market-level factors) were associated with hospital use of GPO services. All statistical analyses were conducted at 95% confidence interval ($p < 0.05$) in SAS 9.4 and STATA 13.

Random effects model:

$$\boldsymbol{ln}\left(\frac{\boldsymbol{P}(\boldsymbol{Y_{ij}}=\mathbf{1}|\boldsymbol{\chi_{ij}},\boldsymbol{u_j})}{\boldsymbol{P}(\boldsymbol{Y_{ij}}=\mathbf{0}|\boldsymbol{\chi_{ij}},\boldsymbol{u_j})}\right)=\boldsymbol{\alpha_1}+\sum_{\boldsymbol{k=1}}^{\boldsymbol{K}}\boldsymbol{\beta_k\chi_{kij}}+\boldsymbol{u_j}$$

$$\boldsymbol{U_j}\sim\mathbf{N}(\mathbf{0},\boldsymbol{\sigma^2})\ \ \boldsymbol{j}=\mathbf{1},\mathbf{2},\ldots..,\boldsymbol{J}\ \ \ \boldsymbol{i}=\mathbf{1},\mathbf{2}\ldots..,\boldsymbol{n_j}$$

Where;

Y_{ij} = GPO use (with Y_{ij} =1 if GPO use is yes and Y_{ij} =0 if GPO use is no) where *i*= individual hospital, *j*= time variable.

$\boldsymbol{\alpha_1}$= the intercept

$\boldsymbol{\beta_k}$ = k^{th} regression coefficient

$\boldsymbol{\chi_{ij}}$ = $(\boldsymbol{\chi_{1ij}}, \dots\dots, \boldsymbol{\chi_{kij}})$ covariates or explanatory variables

$\boldsymbol{u_j}$ = random effect representing the effect of the jth center. We assumed that $\boldsymbol{u_j}$ follows a normal distribution with mean 0 and variance$\boldsymbol{\sigma^2}$.

The coefficient $\boldsymbol{\beta_k}$ measures the effect of increasing $\boldsymbol{\chi_{kij}}$ by one unit on the log odds ratio (Li, Lingsma, Steyerberg and Lesaffre, 2011).

Results

Descriptive characteristics of the 4,557 hospitals at study baseline (2004) and 4,484 at final study year (2013) are displayed in Table 2. Overall, the majority of hospitals utilized the services of GPOs. Specifically, the number of hospitals utilizing the services of GPOs increased slightly from 3,290 (72.2%) in 2004 to 3,337 (74.4%) in 2013. In the final year of the study, the majority of hospitals were located in Metropolitan areas (58%) and monopolistic markets (60%). Additionally, 28% of participating hospitals were members of the Council of Teaching Hospitals in 2013, which had increased significantly from 23% in 2004.

The average hospital had 164 beds with a range of 12 – 2,170 in 2013, which was not significantly different from the 167 in 2004. The mean per capita income per 1000 was 29.6 and had significantly increased to 42.0 in 2013. Overall, among hospitals ownership-system memberships combination; 618 hospitals (13.8%) were for-profit system members, 143 (3.2%) were for-profit non-system members, 1,813 (40%) were not-for-profit system members, 903 (20%) were not-for-profit non-system members, and

1,007 (22.5%) were public non-federal hospitals in 2013, a significant difference from 2004.

Largely, bivariate analyses indicated that hospitals utilizing the services of GPOs operated in an external environment with mixed levels of munificence, more dynamism, and less competition (Table 3). Specifically, hospitals that utilized the services of GPOs operated in markets with a significantly higher average level of per capita income (42.6 vs. 40.4; $p < 0.001$), and were located largely in metropolitan areas (59.9 vs. 52.6; $p < 0.001$) a measure of high munificence. On the other hand, the external environment of hospitals that utilized the services of GPOs was characterized by significantly lower averages of percent population 65 years and older (15.6 vs. 16.1; $p < 0.001$) and percent population without health insurance (16.7 vs. 17.7; $p < 0.001$), a measure of low munificence.

With regards to the dynamism of the environment, hospitals that utilized the services of GPOs existed in a more dynamic environments with a significantly high average change in population size (4,696.4 vs. 5,561.4; $p < 0.046$) and percent change in unemployment (-1.4 vs. -1.7; $p < 0.001$). Lastly, hospitals that utilized the services of GPOs did not significantly operate in a more competitive market (40.8% vs. 37.7%; $p > 0.06$).

Generally, the organizational environment of hospitals that utilized the services of GPOs indicated that, on average, hospitals were larger regarding size compared to hospitals that did not utilize the services of GPOs (178.7 vs. 122.6; $p < 0.001$). Additionally, hospitals that utilized GPOs were significantly more likely to be teaching

hospitals (30.8% vs. 18.8%; p <0.001) and part of a not-for-profit system (45.9% vs. 23.4%; p <0.001).

Multivariable regression results of hospitals' GPO utilization status and environmental and organizational factors are presented in Table 4. We found partial support for Hypothesis 1 that hospitals operating in a less munificent environment are more likely to utilize the services of GPOs. Of the five variables measuring the munificence of the environment, per capita income per 1,000, Medicare managed care penetration rate, and percent of population 65 years or older were negatively associated with GPO utilization. Specifically, hospitals operating in an environment with a lower level of per capita income per 1,000 (OR=0.98, p<0.01), a measure of lower munificence, were two percentage points more likely to utilize the services of GPOs.

Likewise, hospitals operating in an environment with a lower level of percent of population 65 years or older (OR=0.96, p<0.05), a measure of lower munificence, were four percentage points more likely to utilize the services of GPOs. Furthermore, generally considered lower munificence, hospitals operating in an environment with lower level of Medicare managed care penetration rate (OR=0.98, p<0.01) were one percentage point more likely to utilize the services of GPOs.

Hospital location was positively associated with utilization of GPO services. Specifically, hospitals operating in a metropolitan (OR=1.77, p<0.05) and an urban (OR=1.85, p<0.01) environment, considered measures of higher munificence, were 61 percentage points and 57 percentage points, respectively more likely to utilize the services of GPOs compared with hospitals operating in a rural environment.

We found support for Hypothesis 2 that hospitals operating in a more dynamic environment will be more likely to utilize the services of GPOs. Of the two variables measuring dynamism of the external environment, percent change in unemployment was positively associated with GPO utilization. Specifically, hospitals operating in areas with higher levels of unemployment (OR=1.03, $p<0.05$) were three percentage points more likely to utilize the services of GPOs.

Lastly, we found no support for Hypothesis 3 that hospitals operating in a more complex environment will be more likely to utilize the services of GPOs. Specifically, hospitals operating in areas with no competition (OR=1.48, $p<0.01$) were 39 percentage points more likely to utilize the services of GPOs as compared to hospitals operating in more competitive areas. Likewise, we found no support for Hypothesis 4 that hospitals with a higher proportion of Medicare and Medicaid payer mix were more likely to utilize the services of GPOs.

In addition to these findings, three organizational control variables were significantly associated with hospital utilization of GPO services. In general, larger hospitals were two percentage points more likely to utilize the services of GPOs (OR=1.10, $p<0.001$). Hospital teaching status was positively associated with GPO utilization. Specifically, hospitals with teaching status were 23 percentage points more likely to utilize the services of GPOs (OR=1.33, $p<0.05$) compared with hospitals without teaching status.

In terms of the interaction between hospital ownership and system membership, for-profit system members (OR=0.16, $p<0.001$), for-profit non-system members (OR=0.14, $p<0.001$), and public non-federal (OR=0.71, $p<0.05$) hospitals were 84

percentage points, 96 percentage points, and 35 percentage points, respectively, less likely to utilize the services of GPOs compared with not-for-profit non-system members.

Discussion

Hospitals have been engaging the services of GPOs in recent years, and this engagement continues to increase. It is important to understand the factors that are associated with hospital utilization of GPO services, especially within the current healthcare environment. To our best knowledge, no previous study has examined the environmental and organizational characteristics associated with hospital use of GPO services. Therefore, this study provides a new contribution to the healthcare literature by examining environmental and organizational factors that relate to hospital utilization of GPO services using the RDT framework.

In general, our major findings suggest that there is an association between the environment in which a hospital operates and its decision to utilize the services of GPOs. This association seems more consistent across less munificent and more dynamic environments. The complexity (competition) of the environment in which a hospital operates seems to influence the decision to utilize the services of GPOs; this finding is contrary to what we expected.

The results provide partial support for the relationship between environmental munificence and hospital utilization of GPO services. Specifically, per capita income, percent of population 65 years or older, and Medicare managed care penetration rate were negatively associated with hospital utilization of GPO services. This suggests that hospitals located in less munificent markets are more likely to utilize the services of GPOs as some cost-containment strategies against fewer resources

Our findings are consistent with a previous study, which found that hospitals were more likely to engage in alliances (IOR) in a less munificent environment to gain control over resources (Zinn et al., 1999). Contrary to our prediction, we also found that hospitals operating in rural markets (a measure of lower munificence) were less likely to utilize the services of GPOs. One potential explanation for this finding relates to rural hospitals historically having a lower volume of patients and purchasing compared to metropolitan and urban hospitals (Chan, Feldman, & Manning 1999; DesRoches, Worzala, Joshi, Kralovec, & Jha 2012). This lower volume perhaps influences hospitals' decisions to utilize the services of GPOs.

On dynamism, the positive association with percent change in unemployment indicates that hospitals operating in more dynamic environments were more likely to utilize the services of GPOs. This is consistent with Hypothesis 2. We attribute these findings to decision-makers willing to pursue more cost-containment strategies or engage in alliances in the face of fluctuation of resource supply due to environmental changes. Previous research findings have attributed this fluctuation to unemployed, uninsured, and unable to pay for health services, consequently leaving providers with higher levels of uncompensated care and reduced revenues (Ramamonjiarivelo 2012; Weissman, Gaskin, & Reuter 2003). GPOs provide price stability and cost control on resources in a very fluctuating environment.

Our findings suggest that hospitals operating in monopolistic environments were more likely to utilize the services of GPOs. This is inconsistent with Hypothesis 3. Typically, one would expect hospitals located in competitive environments to engage in strategies and alliances that provide them with a competitive advantage. High

competition in the healthcare environment may present an increased pressure to lower costs.

Several findings related to organizational characteristics were also noticeable and associated with hospital utilization of GPO services. Larger hospitals were more likely to utilize the services of GPOs. This is likely due to larger hospitals providing a wider array of products and services and historically having a larger volume of purchasing. GPOs can provide economy of scale because of the sheer volume of products and services required by larger hospitals (Burns & Lee 2008; Nollet & Beaulieu 2003).

We also found a positive relationship between teaching status and utilization of GPO services by hospitals. One possible explanation is that teaching hospitals are historically larger and innovative in their delivery of care with cutting edge technology. GPOs are able to provide these innovative and cutting edge technologies to teaching hospitals when they became available (Bhattacharya, 2007). This finding is consistent with Burns and Lee (2008) who examined hospital purchasing alliances related to utilization, services, and performance. Study findings indicated that hospitals with teaching status were more likely to utilize the services of GPOs (Burns & Lee 2008).

Lastly, compared to not-for-profit non-system members, our results indicated that for-profit system members and for-profit non-system members were less likely to utilize the services of GPO. One possible explanation for this finding is that not-for-profit hospitals may perceive the utilization of GPO services as a cost-containment strategy that contributes to their overall financial performance. This finding lends some support to prior research which found that not-for-profit hospitals were more likely to engage in alliances in an uncertain environment (Guo & Acar, 2005; Zinn et al., 1999).

Furthermore, not-for-profit non-system member hospitals were also more likely to utilize the services of GPOs compared to public non-federal hospitals. This was expected as the organizational structure of public non-federal hospitals limits their ability to engage in alliances and inter-organizational relationships.

Our study presents many strengths. First, by using RDT framework this study is one of the first papers to explore how GPO utilization relates to environmental and organizational characteristics of a hospital. Second, this study relies on a validated and widely used AHA annual survey of hospitals that captures hospital utilization of GPO services, thus adding reliability to our findings. Third, we employed rigorous statistical analysis methods suitable for our study population over a 10-year period. Fourth, we examined a more heterogeneous national sample of hospitals compared to previous studies (Burns & Lee 2008; Hu, Schwarz, et al. 2012; Nollet & Beaulieu, 2003).

Despite the strengths of this research, our study is not without limitations. This study relied on secondary data, which were collected primarily for reporting rather than research purposes. This may limit the accuracy of the datasets. Additionally, our study was conducted over a period of 10 years. During this time, there were changes in the service delivery and operations of GPOs specifically in the healthcare industry. There were a great deal of mergers and acquisitions and consolidations of GPOs, which our study did not take into consideration. These industry changes may have affected the utilization of GPO services by hospitals. Finally, the study did not examine other factors that may have been pertinent to the utilization of GPO services, such as the presence of regulations in the environment that might promote or hinder the utilization of GPO services by hospitals.

This study provides several implications for policymakers, researchers, and practitioners. First, the study provides insights to policymakers on how differences in environmental and organizational characteristics can influence the utilization of GPO services. If GPOs have indeed provided lower costs of supplies and services to hospitals, then policies could be developed to encourage the use of GPO services for hospitals operating in environments that tend not to use GPO services. For example, policies may promote the use of GPOs in hospitals operating in rural areas.

Second, our research informs practice managers and consultants about organizational characteristics that they should consider when making strategic business decisions about the utilization of GPO services. The characteristics of their organizations may support or hinder their ability to utilize the services of GPOs.

Third, findings from this research provide areas for future researchers and academics to explore. More research is needed to understand hospital utilization of GPO services. To do so, a qualitative approach may be helpful to explore what types of GPOs are utilized and how usage relates to a hospital's environmental and organizational structure. Additionally, more research is needed to understand hospital cost-containment strategies in rural environments specifically GPO utilization. Future researchers should explore the overall financial benefits of utilizing the services of GPOs by hospitals. Lastly, further research can investigate the same phenomenon but include regulations and policies that might influence the utilization of GPO services by hospitals.

Table 1
Dependent, Independent and Control Variables

Variables	Measurement	Type of Variable	Data Source
Dependent Variable	The utilization of GPO services (1=yes, 0=No)	Dichotomous	AHA
Explanatory Variable			
	Per capita income (Total personal income of the residents in given area divided by the resident population in HSA per 1000)	Continuous	AHRF
	Percent of population 65 years or older (Percentage of total resident population age 65 years or older)	Continuous	AHRF
Environmental Munificence	Percent of population without health insurance (Total percentage of resident population has health insurance)	Continuous	AHRF
	Medicare managed care penetration rate (The ratio of Medicare Advantage Plan enrollees over eligible Medicare individuals multiplied by 100)	Continuous	AHRF
	Location (urban, largely rural and small rural) Census division of four category classification	Categorical	AHRF

Environmental Dynamism			
	Change in poverty level (Change in number of resident below poverty line compared to previous year)	Continuous	AHRF
	Change in population size (Change in total resident population compared to previous year)	Continuous	AHRF
	Change in unemployment (Change in unemployment from previous year)	Continuous	BLS
Environmental Complexity			
	Market competition (Hirschman-Herfindahl index) (HHI); HHI values ranged from 0 to 1; 1 = monopolistic markets; values 0.99 to 0 = highly competitive markets.	Continuous	AHA
Control Variables			
Organizational Characteristics	Hospital Size (Total licensed beds in the hospital)	Continuous	AHA
	Ownership status (‘For profit,' ‘not-for-profit, or Public non-federal)	Categorical	AHA
	System Membership (Hospital has system affiliated- ‘yes’ or ‘no’)	Dichotomous	AHA
	Teaching status (1=yes and 0=no)	Dichotomous	AHA
	Payer mix (Share of total inpatient discharge by Medicare and Medicaid)	Continuous	AHA

AHA- American Medical Association, AHRF – Area Health Resource File
RUCA- rural-urban commuting area codes data, BLS- Bureau of Labor Statistics

Table 2
Descriptive Statistics of Variables (N = 45,383 hospital year observation)

	Baseline (2004) n = 4557	**Endline (2013) n = 4484**	
Variables	**Mean (SD) or Frequency (%)**		***ρ***
The utilization of GPO services			
Yes	3,290 (72.2)	3,337 (74.4)	*0.017*
No	1,267 (27.8)	1,147 (25.6)	
Market Factors			
Environmental Munificence			
Per capita income per 1000	29.65 (8.52)	42.05 (10.94)	*<0.001*
Percent of population 65 year or older	13.89 (3.89)	15.76 (4.19)	*<0.001*
Percent of population without health insurance	17.24 (5.69)	16.97 (5.56)	*0.022*
Medicare managed care penetration rate	8.83 (12.47)	23.91 (14.44)	*<0.001*
Location			
Metro	2,557 (56.11)	2,600 (58.01)	
Urban	1,625 (35.66)	1,530 (34.14)	*0.190*
Rural	375 (8.23)	352 (7.85)	
Environmental Dynamism			
Change in population size	4,507.69 (15720.81)	4,917.77 (12672.71)	*0.172*
Percent change in unemployment	-0.43(0.73)	-1.44 (1.07)	*<0.001*
Environmental Complexity			
Market competition (HHI)			

Competitive markets	1,845 (40.49)	1,794 (40.00)	*0.643*
Monopolistic markets	2,712 (59.51)	2,690 (60.00)	
Organizational Factors			
Hospital Size	167.32 (179.09)	164.31 (193.06)	*0.442*
Teaching status			
Yes	1,063 (23.33)	1,244 (27.74)	*<0.001*
No	3,494 (76.67)	3,240 (72.26)	
Ownership Systems Types			
For-profit system membership	581 (12.75)	618 (13.78)	
For-profit non-system membership	112 (2.46)	143 (3.19)	
Not-for-profit system membership	1,221 (26.79)	1,813 (40.43)	*<0.001*
Not-for-profit non-system membership	1,537 (33.73)	903 (20.14)	
Public non-federal	1,106 (24.27)	1,007 (22.46)	
Payer mix			
Medicare payer mix	50.03 (19.15)	52.14 (18.99)	*<0.001*
Medicaid payer mix	19.54 (16.63)	18.93 (16.46)	*0.079*

**p ≤0.05; **p ≤ 0.01; ***p ≤ 0.001* HHI-Hirschman-Herfindahl index

Table 3
Bivariate Analysis of Variables 2013 (N=4482)

Variables	Hospitals utilizing the services of GPO	Hospitals not utilizing the services of GPO	
	Mean (SD) or Frequency (%)		*ρ*
Market Factors			
Environmental Munificence			
Per capita income per 1000	42.62 (11.04)	40.40 (10.48)	*<0.001*
Percent of population 65 year or older	15.63 (4.10)	16.12 (4.44)	*<0.001*
Percent of population without health insurance	16.71 (5.65)	17.73 (5.19)	*<0.001*
Medicare managed care penetration rate	23.99 (14.31)	23.66 (14.82)	*<0.504*
Location			
Metro	1997 (59.88)	603 (52.57)	
Urban	1125 (33.73)	405 (35.31)	*<0.001*
Rural	213 (6.39)	139 (12.12)	
Environmental Dynamism			
Change in population size	4696.4 (12300.5)	5561.38 (13682.95)	*<0.046*
Percent change in unemployment	-1.36 (1.03)	-1.65 (1.15)	*<0.001*
Environmental Complexity			
Market competition (HHI)			
Competitive markets	1362 (40.82)	432 (37.66)	*<0.06*
Monopolistic markets	1,975 (59.18)	715(62.34)	
Organizational Factors			

Hospital Size	178.65 (209.33)	122.57 (126.12)	*<0.001*
Teaching status			
Yes	1028 (30.81)	216 (18.83)	*<0.001*
No	2309 (69.19)	931 (81.17)	
Ownership Systems Types			
For-profit system membership	332 (9.95)	286 (24.93)	
For-profit non-system membership	73 (2.19)	70 (6.10)	
Not-for-profit system membership	1,533 (45.94)	280 (23.41)	*<0.001*
Not-for-profit non-system membership	695 (20.83)	208 (18.13)	
Public non-federal	704 (21.10)	303 (26.42)	
Payer mix			
Medicare payer mix	52.07 (19.95)	52.31 (15.85)	*<0.708*
Medicaid payer mix	18.77 (15.89)	19.38 (17.97)	*<0.279*

**p ≤0.05; **p ≤ 0.01; ***p ≤ 0.001*

HHI-Hirschman-Herfindahl index

Table 4
Logistic Regression Analysis with the Utilization of GPO Services as Dependent Variable

	Hospitals utilizing the services of GPO (N=45,383)‡	
Variables	**Odds Ratios**	**Margins**
Market Factors		
Environmental Munificence		
Per capita income per 1000	0.98**	-0.02**
Percent of population 65 year or older	0.96*	-0.04*
Percent of population without health insurance	0.99	-0.01
Medicare managed care penetration rate	0.98**	-0.01**
Location		
Metro	1.77*	0.57*
Urban	1.85**	0.61**
Rural	*Ref*	*Ref*
Environmental Dynamism		
Change in population size	1.00	0.02
Percent change in unemployment	1.03*	0.03*
Environmental Complexity		
Market competition (HHI)		
Monopolistic markets	1.49**	0.39**
Competitive markets	*Ref*	*Ref*

Organizational Factors		
Hospital Size	1.10***	0.02***
Ownership Systems Types		
For profit system membership	0.16***	-1.85***
For profit non system membership	0.14***	-1.98***
Not-for-profit system membership	1.25	0.22
Public non-federal	0.71*	-0.35*
Not-for-profit non-system membership	*Ref*	*Ref*
Teaching status		
Yes	1.33*	0.29*
No	*Ref*	*Ref*
Payer mix		
Medicare payer mix	1.00	0.04
Medicaid payer mix	1.00	0.01

p ≤0.05;* **p ≤ 0.01*;* ***p ≤ 0.001

‡ Hospital year observations (2004-2013)

HHI-Hirschman-Herfindahl index

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CHAPTER 4
HOSPITAL GROUP PURCHASING ALLIANCE AND FINANCIAL PERFORMANCE

by

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CHAPTER 4

HOSPITAL GROUP PURCHASING ALLIANCE AND FINANCIAL PERFORMANCE

Abstract

Background: Given the potential benefits of Group Purchasing Organizations in cost-containment efforts for hospitals on supplies and purchased services an important question relates to the financial performance difference between users and non-users GPOs by hospitals.

Purpose: To explore if there is any financial performance between users and non-users GPOs by hospitals.

Methods: Data on hospital GPO utilization and other organizational characteristics were combined with secondary hospital market characteristics. Panel ordinal logistic regression with facility and year fixed effects analysis were used to examine the relationship between operating margin and use of GPO controlling for organizational and market characteristics.

*Results***:** Data from 4,484 hospitals were available for analyses. 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 2013. In regression analyses, 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.

*Practice Implications***:** This paper contributes to the literature of strategic management and provides policymakers and researchers an avenue that identifies whether the utilization of GPOs by hospitals has any financial bearing. The major findings suggest 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.

Introduction

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

Group purchasing organizations (GPOs) are organizations that typically leverage the collective purchasing power of healthcare providers (Blair & Durrance, 2014). GPOs allow hospitals and healthcare providers to reduce their costs through group purchasing, where hospitals pool their resources together through negotiating and buying power to obtain lower pricing on drugs, supplies, services, and medical devices. GPOs serve as a vehicle to purchase supplies at below-market prices.

Several studies have examined the effectiveness of GPOs in reducing the pricing cost of equipment and materials for hospitals with equivocol results (Burns & Lee, 2008; Litan & Singer, 2010; Litan, Singer, & Birkenbach, 2011; Yang, Cheng, & Ding, 2015). Burns and Lee (2008) 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 (Burns & Lee, 2008).

Two additional studies found that GPOs saved hospitals approximately $36 billion

a year (Schneller, 2009) and saved the U.S. government about $64 billion in both public healthcare programs and incentives to hospitals (Goldenberg & King, 2009). Other studies, however, found that GPOs may actually result in higher costs. For example, a study by the Government Accountability Office (GAO) in 2002 found that hospitals paid as much as 1% to 5% higher prices on safety syringe modes and pacemakers using GPOs compared to what they would have paid on the general market.

Similarly, a recent study that used a game-theoretic model concluded that even though the presence of GPOs lowered total purchasing costs for hospitals, hospitals still faced higher unit prices than if they had negotiated directly with vendors on certain products and services, specifically for hospitals with smaller purchasing requirements (Hu, Schwarz, & Uhan, 2012). The smaller purchasing requirements presented lower total purchasing cost in the presence of a GPO but higher per-unit price on certain products and services (Hu et al., 2012). With these mixed results about the effectiveness of GPOs, few studies have examined whether hospitals that use the services of GPOs perform better financially than hospitals that do not. Therefore, this study attempts to fill the gap in the literature by examine whether hospitals that use GPOs perform better financially than hospitals that do not.

The purpose of this study is to examine the impact of GPO use by hospitals in the United States based on their financial performance. 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 any impact on the financial performance of hospitals. For this study, we draw from the strategic alliance literature, specifically pooling alliance and value-chain alliance theoretical perspectives. This paper

contributes to the literature of strategic management based on the pooling alliance and provides policymakers and researchers rigorous data regarding whether or not the utilization of GPOs by hospitals has any financial bearing.

Conceptual Framework

Group Purchasing Organizations (GPOs) play an important role in the hospital industry. The number of GPOs has increased from 40 in 1970 to over 600 in 2010 (Blair & Durrance, 2014; Saha, Seidmann, & Tilson, 2010). GPOs may enable hospitals to obtain large quantities of certain goods and services at below-market value (Nollet & Beaulieu, 2003, 2005). GPOs also afford hospitals a steady flow of resources needed for their day-to-day operational tasks without intermittent operational disruptions (Nollet & Beaulieu, 2003) and without committing dedicated staff to handle the activities of the supply chain (Litan & Singer, 2010). This can result in hospitals securing a constant flow of needed supplies and services from GPOs at below-market value.

Hospitals adapt to their ever-changing environments by engaging in strategies that help to improve their overall financial position. To survive, all organizations must have relatively positive financial performance (Yasai-Ardekani, 1989). In the past hospitals developed multiple strategies to improve their financial performance. Thus, hospitals may use GPOs as a strategic alliance to improve their financial performance by reducing their cost in the acquisition of needed supplies and services.

The conceptual model used in this paper is grounded in the strategic alliances literature. Specifically, the conceptual model draws from the pooling alliances and value-chain alliances perspectives (Burns & Lee, 2008). 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 (Swayne, Duncan, & Ginter, 2012). This definition includes inter-organizational relationships such as purchasing groups/strategic alliances as a mean to negotiate with suppliers (Nollet & Beaulieu, 2003).

In healthcare, alliances are formed mostly voluntarily by hospitals for the primary purpose of achieving economies of scale in purchasing. Organizations that form alliances benefit from being part of a larger system yet retain their existence as free-standing, self-governing institutions (Burns & Lee, 2008; Nollet & Beaulieu, 2003). Pooling alliances in healthcare represent purchasing groups, where members pool their supply activities together to reduce their dependencies on common products from manufacturers and reduce risk.

Pooling alliances gain joint influence over supplies and services (Burns & Lee, 2008; Schneller & Smeltzer, 2006; Zajac, D'Aunno, & Burns, 2011). These types of inter-organizational relationships do not necessarily mean equal participation as members can choose their level of participation. Rather, they represent a voluntary agency federation (Burns & Lee, 2008) that relinquishes certain functions to a central management entity (Burns & Lee, 2008; Oliver, 1990).

The utilization of GPOs varies across hospitals regarding the percentage of purchases routed through them and the use of specific contracting services (Schneller & Smeltzer, 2006). Furthermore, Schneller (2009) argued that GPOs are not only pooling alliances but also value-chain alliances for hospitals. These value-chain alliances represent inter-organizational linkages between hospitals and manufacturers from which hospitals acquire products and services (Montgomery & Schneller, 2007). Inter-

organizational linkages lead to improvements in efficiencies and result in value creations for each stakeholder or entity (Porter, 1985).

Some researchers have noted that hospital use of GPOs is one of the few strategic vehicles left for cost-containment (Burns & Lee, 2008). A hospital's purchasing and supply activities account for approximately one-third of its operating expenditures, but it has not received the same level of cost-containment attention as staffing dynamics, work restructuring, lean systems, and total quality management.

Participation in GPOs primarily depends on the needs and levels of confidence in what members feel is the most competitive pricing negotiated by their GPOs. 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 GPO as a strategy rather than a tactic as argued by some researchers in the operational research, logistic, and industrial engineering realms (Burns & Lee, 2008). Thus, GPO utilization is important because it represents a different type of strategic alliance and serves an important function in hospital cost-containment.

Previous researchers have also demonstrated that organizations that can adopt a cost-containment strategy have better financial performance (Sethi, 2006; Zsidisin, Ellram, & Ogden, 2003). As such, organizations use these cost-containment strategies to increase their overall profitability. 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 utilizes GPOs services have better financial performance than hospitals that do not utilize GPOs 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 (Bhattacharya, 2007; Chan, Feldman, & Manning, 1999). 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. Thus, we theorize that larger or national GPOs will result in lower costs of purchasing 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 a regional or local GPOs.

Method

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) (AHA, 2012). Additionally, the AHA survey provides data about organizational characteristics including health system member, size, and ownership type (AHA, 2012).

The AHRF provides data regarding county-level market characteristics of hospitals (Hart, Larson, & Lishner, 2005). Finally, Healthcare Cost Report Information System (HCRIS) from the Centers for Medicare and Medicaid Service (CMS) provides data on financial performance measures. The HCRIS dataset contains hospitals utilization, cost, and charge data (Kane & Magnus, 2001). 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 2013 with 41,971 hospital-year observations.

Measures

Table 1 provides a summary list of the variables used in the study.

***Dependent variable*.** The dependent variable, which captures the financial performance of a hospital's utilization of GPO services is the operating margin. This is the most commonly used financial performance indicator in the healthcare literature that addresses cost strategy (Gapenski, 2014). 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 (Gapenski, 2014). The operating margin was divided into quartiles, providing four levels of

profitability with the lowest quartile as the reference group (De Smet, Loch, & Schaninger, 2007).

Explanatory 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 other independent variable is the reach of the GPO as a proxy for the size of the GPO (0=small scale, 1=large scale).

Control variables. Researchers have shown that certain hospital and market characteristics influence hospitals' financial performance (Bazzoli, Fareed, & Waters, 2014; Menachemi, Burkhardt, Shewchuk, Burke, & Brooks, 2006). We relied on the same set of hospital characteristics identified by prior research including size (measured as total number of beds), ownership status (not-for-profit, for-profit, or public), payer mix, system member or affiliation, and teaching status, as well as market characteristics such as Hirschman-Herfindahl Index (HHI) using system level share of hospital inpatients days and the location of hospital (urban, metropolitan, and rural). We obtained these characteristics from the RUCA codes. The HHI variable was created using the Health Service Area (HSA) as the relevant market.

Analysis

Analyses were conducted at the hospital level. Univariate statistics and bivariate analyses are presented to demonstrate that the variables were appropriate. 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 (Allison, 2009).

Facility fixed effects control for unobserved, time-invariant characteristics of hospitals that may influence their overall financial performance (Allison, 2009). The year fixed effects adjust for unmeasured time trends which could affect hospital financial performance in a given year (Allison, 2009). A one-year lag between organizational and market-level variables and hospital operating margins was established. The one-year lag allowed some time variance to see if the utilization of GPOs had any effect on succeeding years operating margins. 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.

Fixed effect equation for the dependent variable:

$$\boldsymbol{ln}\left(\frac{\boldsymbol{P}\left(\boldsymbol{Y_{ij}}\middle|\boldsymbol{\chi_{ij}},\boldsymbol{u_j}\right)}{\boldsymbol{P}\left(\mathbf{1}-\boldsymbol{Y_{ij}}\middle|\boldsymbol{\chi_{ij}},\boldsymbol{u_j}\right)}\right)=\boldsymbol{\alpha_1}+\sum_{\boldsymbol{k=1}}^{\boldsymbol{K}}\boldsymbol{\beta_k\chi_{kij}}+\boldsymbol{u_j}+\boldsymbol{\varepsilon_{it}}$$

$$\boldsymbol{U_j}\sim\mathbf{N}(\mathbf{0},\boldsymbol{\sigma^2})\ \ \boldsymbol{j}=\mathbf{1},\mathbf{2},\ldots..,\boldsymbol{J}\ \ \boldsymbol{i}=\mathbf{1},\mathbf{2}\ldots..,\boldsymbol{n_j}$$

Where;

Y_{ij} = Operating margin (with Y_{ij} =1 highest first quartile, Y_{ij} =2 the second highest quartile, Y_{ij} =3 the third highest quartile) where *i*= individual hospital, *j*= time variable.

$\boldsymbol{\alpha_1}$= the intercept

$\boldsymbol{\beta_k}$ = k^{th} regression coefficient

$\boldsymbol{\chi_{ij}}$ = $(\boldsymbol{\chi_{1ij}},\ldots\ldots,\boldsymbol{\chi_{kij}})$ covariates or explanatory variables

$\boldsymbol{\varepsilon_{it}}$ =is the error term

$\boldsymbol{u_j}$= fixed effect representing the effect of the j^{th} center. We assumed that $\boldsymbol{u_j}$ follows a normal distribution with mean 0 and variance$\boldsymbol{\sigma^2}$.

The coefficient $\boldsymbol{\beta_k}$ measures the effect of increasing $\boldsymbol{\chi_{kij}}$ by one unit on the log odds ratio (Li, Lingsma, Steyerberg, & Lesaffre, 2011).

Results

Descriptive characteristics of hospitals that were available for analysis are recorded in Table 2 stratified by baseline (2004) and final year (2013) of the study period. The number of hospitals utilizing the services of GPOs increased significantly from 3,027 (72.9%) in 2004 to 3,128 (75.2%) in 2013. Likewise, the majority of hospitals significantly utilized the services of larger GPOs (68% in 2004 to 71% in 2013) as compared to smaller GPOs (32% in 2004 to 29% in 2013).

The mean per capita income per 1,000 was 29.7 in 2004 and had significantly increased to 41.9 in 2013. Also, the percent of population 65 years or older increased significantly from an average of 13.92 in 2004 to 15.84 in 2013. Hospital location distribution in 2013 was not significantly different from 2004. Generally, the majority of hospitals were located in metropolitan areas (58%) and monopolistic markets (61%) in 2013. Additionally, 28% of hospitals were members of the Council of Teaching Hospitals in 2013 which had increased significantly from 23% in 2004. The average hospital had 165 beds with a range of 12 – 2,170 in 2013; this finding was not significantly different from the 172 in 2004. Across hospitals ownership-system memberships combination, 580 hospitals (13.9%) were for-profit system members, 113 (2.7%) were for-profit non-system members, 1,709 (41%) were not-for-profit system members, 857 (20%) were not-for-profit non-system members, and 901 (21.7%) were public non-federal hospitals in 2013, a significant difference from 2004. Lastly, Medicare payer mix on average increased significantly from 50.2 in 2004 to 52.3 in 2013.

On financial performance, the average operating margin for the first, second, and third quartile groups increased significantly from 2004 to 2013. Contrary, the average

operating margin for the fourth quartile group (the best financially performing hospitals) did not significantly change from 2004 to 2013.

Bivariate analyses indicated a significant association between the quartiles of operating margin and all other independent variables except Medicare payer mix (Table 3). Specifically, there was a statistically significant relationship between the quartiles of operating margin and GPO utilization ($p < 0.01$) and GPO scale ($p < 0.01$). Similarly, there was a statistically significant relationship between the operating margin quartiles and hospital location ($p > 0.01$) and market competition ($p < 0.01$). Additionally, hospital bed size, higher percent of population 65 years or older, higher Medicaid payer mix, and higher per capita income were significantly associated with higher quartiles of financial performance.

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 are detailed in Table 4. 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. On the other hand, we found no support for Hypothesis 2, that hospitals that utilize the services of larger GPOs did not have better financial performance compared with hospitals that utilize the services of smaller GPOs.

In addition to these findings, several markets and organizational control variables were significantly associated with hospitals' higher quartiles of operating margin. In general, hospitals operating in areas with lower 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, $p<0.001$). Also, 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 metropolitan environments were not significantly different from hospitals operating in rural environments regarding their financial performance. Likewise, larger hospitals were one percentage point more likely to belong to the middle and upper quartiles of operating margin (OR=1.00, $p<0.001$). 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. Lastly, hospitals with a higher proportion of both 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.

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 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 (Burns et al., 2002; Burns & Lee, 2008; Jayaraman, Taha, Park, & Lee, 2014).

Our major findings suggest 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. While there are no prior studies examining 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 healthcare costs by reducing product prices (Burns & Lee, 2008). In addition, hospitals were highly satisfied with the contract convenience and multisource contracts provided by GPOs.

Our findings suggest that hospitals that utilized the services of larger GPOs did not perform financially better than hospitals that utilized the services of smaller GPOs. This is inconsistent with Hypothesis 2. 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 that larger GPOs may provide. These economies of scale would, in

turn, translate to a better financial position. However, our findings are consistent with those of Bhattacharya (2007) who suggested that smaller GPOs are able to focus on regional healthcare organizations, which helps them consolidate their resources and can occasionally provide better product prices than larger GPOs.

Several findings related to organizational and market characteristics were also noticeably 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 Medicare and Medicaid reimbursements to hospitals are traditionally lower compared to other private and third party payers.

Second, larger hospitals were more likely to have a better financial performance. This is likely because large hospitals typically have more bed size and provide more products and services than small hospitals (Kim, Glover, Stoskopf, & Boyd, 2001; Oner, et al., 2016). 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 a better financial performance. This finding could be attributed to hospital membership in multi-hospital systems. Traditionally, system hospitals exhibit higher financial performance due to access to system resources. The results here regarding higher financial performance by system members are consistent with earlier studies of multi-hospital system hospitals (Bazzoli, Chan, Shortell, & D'Aunno, 2000; Clement et al., 1997; Gloede et al., 2013).

With respect to 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. 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 (Oner et al., 2016).

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 location of hospital and financial performance (Younis, 2012). Generally, urban hospitals generate higher revenue than rural and metropolitan hospitals due to several factors such as higher Medicare and Medicaid patient volumes, which translates to higher disproportionate hospital share payments and economies of scale due to larger size and lower overhead cost (Younis, 2012).

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, over the course of this 10 year study period, there were many changes in the service delivery and operations of GPOs. These changes included mergers, acquisition, 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 innovative products, warranty details, product features, manufacturers' details, and models are crucial to conduct a realistic analysis of the financial performance of hospitals which use the

services of GPOs. Finally, the classification of large scale and small scale GPOs were 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 (Burns & Lee 2008; Hu, Schwarz, et al., 2012; Nollet & Beaulieu, 2003).

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 utilization of GPOs when making strategic business decisions about purchasing. Third, findings from this research provide areas for future research for academics. More research is needed to understand hospital 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 a first step towards future research to understand the mechanisms by which GPOs may influence financial performance.

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Table 1
Dependent, Independent and Control Variables

Variables	Measurement	Type of Variable	Data Source
Dependent Variable			
Financial Performance	Operating Margin = ((Total operating revenue-Total Operating cost))/Total operating revenue (Quartiles)	Categorical	Medicare Cost Report
Exploratory Variable			
GPO utilization	Hospital utilizations of GPO services? (1=Yes, 0=No)	Dichotomous	AHA
	GPO reach (reach of the GPO as a proxy for the size of the GPO: 0=small scale, 1=large scale).	Categorical	AHA
Control Variables			
Organizational Characteristics	Hospital Size (Total licensed beds in the hospital)	Continuous	AHA
	Ownership status (‘For-profit,' ‘not-for-profit, or public non-federal)	Categorical	AHA
	System Membership (Hospital has system affiliated-‘yes’ or ‘no’)	Dichotomous	AHA
	Teaching status (1=yes and 0=no)	Dichotomous	AHA

Market Characteristics	Payer mix (Share of total inpatient discharge by payer)	Continuous	AHA
	Market competition (Hirschman-Herfindahl index) (HHI); HHI values ranged from 0 to 1; 1 = monopolistic markets; values 0.99 to 0 = highly competitive markets.	Categorical	AHA
	Location (urban, largely rural and small rural) Census division of four category classification	Categorical	AHRF
	Per capita income (Total personal income of the residents in given area divided by resident population in HSA)	Continuous	AHRF
	Percent of population 65 years or older (Percentage of total resident population age 65 years or older)	Continuous	AHRF
	Percent of population 65 years or older (Percentage of total resident population age 65 years or older)	Continuous	AHRF

Table 2
Descriptive Statistics of Variables (N = 44,048 hospital year observation)

Variables	Baseline (2004) n = 4152	Endline (2013) n = 4160	
	Mean (SD) or Frequency (%)		***ρ***
Financial			
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)	*0.114*
The utilization of GPO services			
Yes	3,027 (72.9)	3,128(75.2)	*0.017*
No	1,125 (27.1)	1,032 (24.8)	
GPO Scale			
Large Scale	2,809 (67.65)	2,932 (70.48)	*0.005*
Small Scale	1,343 (32.35)	1,228(29.52)	
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)	*0.518*

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)	*0.392*
Monopolistic markets	2,493 (60.04)	2,536 (60.96)	
Organizational Factors			
Hospital Size	172 (181)	165 (191)	*0.131*
Ownership Systems Types			
For-profit system membership	535 (12.89)	580 (13.94)	
For-profit non-system membership	86 (2.07)	113 (2.72)	
Not-for-profit system membership	1,427 (34.37)	1,709 (41.08)	*<0.001*
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)	*0.446*

**p ≤0.05; **p ≤ 0.01; ***p ≤ 0.001* HHI-Hirschman-Herfindahl index

Table 3
Bivariate Analysis of Variables and Operating Margin (2013) (N=4,482)

	Operating Margin				
Variables	**Mean (SD) or Frequency (%)**				
	1st Quartile	**2nd Quartile**	**3rd Quartile**	**4th Quartile**	***p-value***
The 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)	
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)	
Urban	432(42.86)	302(35.40)	350(34.97)	349(26.93)	*<0.001*
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)	
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)	*0.179*
Medicaid payer mix	19.46(16.83)	20.86(22.04)	18.75(14.24)	17.71(13.16)	*<0.001*

**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**
The utilization of GPO services		
Yes	1.19	0.17**
No	*Ref*	*Ref*
GPO Scale		
Large scale	1.08	0.08
Small scale	*Ref*	*Ref*
Market Factors		
Per capita income per 1000	1.00	0.00
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*
Organizational Factors		
Hospital Size	1.00	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***

*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$*
‡ Hospital year observations (2004-2013)
HHI-Hirschman-Herfindahl index

CHAPTER 5

SUMMARY

Collectively, the purpose of the three papers included in this dissertation was to provide empirical evidence on the contextual factors that influence hospital utilization of services of group purchasing organizations and how utilization of group purchasing organizations impacts hospitals' financial performance. The findings of these studies are important both to researchers, and managers as they sheds insights on the relationship between hospitals and group purchasing organizations. Hospitals are using group purchasing organizations as one strategy to reduce the cost of purchasing as well as overall health expenditures and operational costs in the wake of rising costs for healthcare and decreasing reimbursements. GPOs may allow hospitals and healthcare providers to reduce their costs through group purchasing, where hospitals pool their resources together through negotiating and buying power to obtain lower pricing on drugs, supplies, services, and medical devices. GPOs serve as a vehicle to purchase supplies at below-market prices. Given the potential benefits of GPOs in cost-containment efforts for hospitals on supplies and purchased services, this dissertation investigated the links between participation in GPOs and a hospital's organizational and market profiles and subsequently explored if there are any financial benefits to using the services of GPOs by hospitals. The findings of each paper are outlined in the following paragraphs.

Paper 1 (Chapter 2): A Systematic Review of Hospital Group Purchasing Organizations and Strategic Alliance Performance Literature in Healthcare

The study presented a synthesis of the literature and identifies strengths and weaknesses of the peer-reviewed literature in hospitals and group purchasing alliances from 1995 to 2014. The paper presented the methodological approaches used to identify and study the hospitals' group purchasing organizations literature and provided a rich analyses based on emerging themes of how hospitals and GPOs can be studied. The themes developed in the review introduce new considerations in the study of hospitals and GPOs. The hospital and group purchasing organization alliance literature were organized along the themes of the environment, structure, and performance, and subsequently presented from either the hospital or GPO perspective.

Overall, the review process resulted in 13 journal articles. Twelve of the 13 articles were published in non-health-related journals. Additionally, all of the reviewed articles were unfunded studies with approximately half-using conceptual purchasing models and half-using interviews and questionnaires. Articles that focused on the environment were less research-intensive and tended to focus on the enacted environment that influenced GPO activities rather than the hospital environment. Articles that focused on structure explored a wide variety of mechanisms by which GPOs are organized and classified (e.g., types, models of contracting) and how these configurations of GPOs help to provide better prices for hospitals (e.g., reduced unit prices on capital equipment, tier pricing, procurement strategies). Lastly, articles that focused on performance identified how hospitals evaluated their alliances with GPOs in terms of the overall benefit of the

alliances in cost-containment as well as how GPOs measured their contribution towards cost-containment of hospitals' supply management. Given these findings, healthcare managers wishing to utilize the services of hospital purchasing alliances have a limited literature base from which to draw to identify contextual factors and performance of purchasing alliances. Therefore, further research is needed to explore the market and organizational factors that influence hospital strategy choice to use GPOs in acquiring needed supplies and equipment. This is important as approximately 70% of hospitals are utilizing the services of GPOs.

Paper 2 (Chapter 3): Environmental and Organizational Factors Associated with Hospital Use of GPO Services

This study attempts to fill the knowledge gap in our understanding of GPOs in the context of cost-containment and reduced reimbursement. Using the conceptual framework of Resource Dependency Theory (RDT), the study examined the relationship between GPO use by hospitals and market and organizational characteristics. Additionally, the study explored how the market and organizational characteristics associated with hospital use of GPOs have evolved. The relationships between hospitals' utilization of GPO services and hospitals' organizational and market characteristics were examined using panel logistic regression with random effect and state and year fixed effects.

This study provides a new contribution to the healthcare literature by examining environmental and organizational factors that relate to hospital utilization of GPO services using the RDT framework. The major findings, in general, suggest that there is

an association between the environment in which a hospital operates and its decision to utilize the services of GPOs. This association seemed more consistent across less munificent and more dynamic environments. The study findings also provide organizational decision-makers and policymakers' insights into how certain market and organizational factors influence hospital strategy choice, in this case, the use of GPOs. This is important because more than 70% of U.S. hospitals used some form of GPO in acquiring needed supplies and equipment.

Paper 3 (Chapter 4): Hospital Group Purchasing Alliance and Financial Performance

The purpose of this study was to examine the impact of GPO use by hospitals in the United States on their financial performance. Specifically, providing answers to whether there are financial performance differences between users and non-users of GPOs. The study also focused on whether the size of the GPO had any impact on the financial performance of hospitals. The study draws from the strategic alliance literature specifically tenets from the pooling alliance and value-chain alliance theoretical perspectives. The relationships between the operating margin and use of GPO were examined using panel ordinal logistic regression with facility and year fixed effects.

This paper contributes to the literature on pooling alliances in strategic management, and provides policymakers and researchers an avenue that identifies whether the utilization of GPOs by hospitals has any financial bearing. The major findings suggest 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.

The results of this dissertation suggest that better financial performance is associated with hospital utilization of group purchasing organizations. Additionally, some measures of environmental munificence and dynamism are associated with hospital utilization of group purchasing organizations. Specifically, the association seemed more consistent across less munificent and more dynamic environments. Taken together, the findings of these studies will be beneficial to hospital leaders as they make decisions about strategies on group purchasing organizations.

In sum, this study regarding the effect of GPO utilization on the financial performance of hospitals should be considered a first step towards future research to understand the mechanisms by which GPOs may influence financial performance.

APPENDIX A

ARTICLES IN THE LITERATURE REVIEW

Articles in the literature review

1. Anderson, M. G., & Katz, P. B. (1998). Strategic sourcing. The International Journal of Logistics Management, 9(1), 1-13.

2. Chakraborty, S., Bhattacharya, S., & Dobrzykowski, D. D. (2014). Impact of supply chain collaboration on value co-creation and firm performance: A healthcare service sector perspective. Procedia Economics and Finance, 11, 676-694.

3. Chapman, T. L., Gupta, A., & Mango, P. D. (1998). Group purchasing is not a panacea for US hospitals. The McKinsey Quarterly, 1, 160-166.

4. Graf, J. (2014). The effects of rebate contracts on the health care system. The European Journal of Health Economics, 15(5), 477-487.

5. Hu, Q. J., & Schwarz, L. B. (2011). Controversial role of GPOs in healthcare-product supply chains. Production and Operations Management, 20(1), 1-15.

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7. Johnston, C. A., & Rooney, C. D. (2012). GPOS and the health care supply chain: Market-based solutions and real-world recommendations to reduce pricing secrecy and benefit health care providers. J. Contemp. Health L. & Policy, 29, 72-88.

8. Nollet, J., & Beaulieu, M. (2003). The development of group purchasing: an empirical study in the healthcare sector. Journal of Purchasing and Supply Management, 9(1), 3-10.

9. Nollet, J., & Beaulieu, M. (2005). Should an organization join a purchasing group? Supply Chain Management: An International Journal, 10(1), 11-17.

10. Oumlil, A. B., & Williams, A. J. (2011). Strategic alliances and organizational buying: An empirical study of the healthcare industry. International Journal of Procurement Management, 4(6), 610-626.

11. Saha, R. L., Seidmann, A., & Tilson, V. (2010). A research agenda for emerging roles of healthcare GPOs and their evolution from group purchasing to information sharing to strategic consulting. Paper presented at the System Sciences (HICSS), 2010 43rd Hawaii International Conference.

12. Tyndall, G., Gopal, C., Partsch, W., & Kamauff, J. (1998). Ten strategies to enhance supplier management. National Productivity Review, 17(3), 31-44.

13. Weinstein, B. L. (2006). The role of group purchasing organizations (GPOs) in the US medical industry supply chain. Estudios de economía aplicada, 24(3), 789-802.

APPENDIX B

IRB APPROVAL

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Institutional Review Board for Human Use

DATE: 9/28/15

MEMORANDUM

TO: William Opuku-Agyeman
Principal Investigator

FROM: Cari Oliver, CIP
Assistant Director
Institutional Review Board for Human Use (IRB)

RE: Request for Determination—Human Subjects Research
IRB Protocol N150914007 – Hospital Purchasing Alliance: Contextual Factors and Financial Performance

A member of the Office of the IRB has reviewed your Application for Not Human Subjects Research Designation for above referenced proposal.

The reviewer has determined that this proposal is **not** subject to FDA regulations and is **not** Human Subjects Research. Note that any changes to the project should be resubmitted to the Office of the IRB for determination.

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