

A Research Agenda for Emerging Roles of Healthcare GPOs and Their Evolution from Group Purchasing to Information Sharing to Strategic Consulting

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Abstract

The Group Purchasing Organizations (GPOs) facilitate group buying on a large scale by aggregating the demands of several buyers. The GPO negotiates a lower purchase price with the seller by using the collective purchasing power of the buyers and lowers the buyers' procurement cost further by reducing the unit search costs and the unit transaction costs through scale. The role of healthcare GPOs has evolved noticeably in the last few years. The technology has enabled them to add substantial value to the supply chain by using information. In addition to group purchasing, today's healthcare GPOs act as informational powerhouse and empower the buyers with strategic information, technology, and consulting services to identify opportunities of cost savings and prevent possible revenue leakages.

The early literature on GPOs has mainly focused on the different aspects of group purchasing, e.g. power of group buying, allocation of cost savings among members, group formation and member commitment, pricing of GPOs' intermediary services, and the issues regarding competition and anti-trust. However, not much research has been done analyzing the economic consequences of GPOs' new roles as information powerhouses and strategic consultants. In this paper, we present 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.

1. Introduction

Since the beginning of the nineteenth century, the concept of group purchasing has existed in different

forms, e.g. as co-operative purchasing in public sector, group purchasing in healthcare [6,15], consortium purchasing in industrial companies, in education, in retail [25,4], etc. A Group Purchasing Organization (GPO), as its name suggests, is an entity or organization that primarily facilitates group buying on a large scale. Purchasers, also known as GPO members, join a GPO to negotiate a lower price from the sellers using higher bargaining power as a group. The GPOs further lower the procurement cost by decreasing the search and transaction costs through exploiting the commonalities in demands among members as GPOs usually serve members belonging to the same sector and sharing similar needs.

Though originally formed with the sole motivation of group buying, healthcare GPOs have transformed themselves into more strategic entities in the supply chain. The formation and evolution of the healthcare GPOs may be a result of the unique structure of expenditure and the pressure on cost savings in healthcare institutions. Labor and supplies constitute a major part of total expenditures, of which the cost of labor is more or less fixed. Hospital reimbursements are specified by the Diagnosis Related Group (DRG) and are not necessarily same as the costs of supplies and care, i.e. expensive supplies and care don't result in higher DRG reimbursements. Personnel and staffing ratios are either mandated by government or cannot be increased due to safety and quality reasons. One of the few ways hospitals can increase profitability (or control expenses) is by lowering the procurement cost, making procurement a critical component in hospitals' survivability.

The healthcare GPOs originally benefited healthcare institutions by aggregating the demands of several healthcare institutions. However, mounting pressure on cost control has motivated the GPOs to

play a more strategic role than mere group purchasing in the supply chain. The GPOs provide to both buyers and sellers crucial information appropriate for their respective goals, and enable decision makers to use information more strategically with the help of technology. The GPOs also help healthcare institutions by providing them with spend and revenue management solutions consisting of information, technology, and consulting services.

However, the existing literature on GPOs has not progressed much beyond studying the aspect of mere group purchasing. Any study on GPOs will be incomplete without analyzing the economic impact of GPOs' new roles as strategic consultants and information powerhouses. This motivated us to do a study on the existing literature on group purchasing and identify the gap between the existing literature and the current state of GPOs. In this paper, we present to the research community an overview of the existing literature on group purchasing, the current state of GPOs, and the potential research issues in this area.

Hereafter, we present our study as follows - in section 2, we describe the costs and price structure of buyers and sellers in a supply chain without a GPO. In later sections, we will use this case as benchmark to evaluate value creation by GPOs; in section 3, we introduce the GPO as an intermediary between buyers and sellers and describe the pricing structure of GPOs' intermediary services; in section 4, we present some analytical approaches in modeling the GPO as an intermediary in the supply chain; in section 5, we present the study of group buying and its value proposition in the supply chain in detail; in section 6, we present the study on member commitment in group purchasing and its implication on group stability; in section 7, we present the study on competition and anti-trust issues related to group buying; in section 8, we discuss the value proposition of GPOs as information powerhouse and strategic supply chain consultant; in section 9, we present a gap analysis between existing research and current state of GPOs and identify potential research areas; in section 10, we list the references.

2. Supply chain without a GPO

In the absence of an intermediary like GPO, the total cost of procurement for a buyer is primarily driven by the following cost components – 1. Negotiated or promised purchase price of the product (before any rebate or discount) 2. Search costs: the cost of finding out the list of qualifying products 3. Transaction costs: the cost of price discovery through

negotiation, reverse auction, etc., the process of product and seller selection, and finally establishing the contract. 4. Logistics costs, if borne by the buyer. 5. Cost of monitoring the contract or the price actually paid in absence of monitoring. In the absence of monitoring, the actual price paid may not be same as the contract price as it has been observed in the healthcare industry. 6. Rebate or discount based on realized demand of the buyer.

A seller's cost is primarily driven by production costs, marketing costs, distribution costs, and the costs arising from demand uncertainty.

The price that a buyer pays to a seller in exchange of the product is driven by the relative bargaining power of the two. The bargaining power of a buyer is limited by its own purchasing power. Whereas, the seller's bargaining power is driven by the industry and consumer concentration and the information it has about buyers' willingness to pay. Sellers can also engage in price discrimination against individual buyers by preventing them from sharing price information with each other.

3. GPO's role as an intermediary

GPOs primarily act as an intermediary in purchasing transactions between buyers and sellers. The purchasing goes as follows - once the members disclose their demand information and product preferences, the GPO selects one or more sellers as suppliers with an objective to minimize the total cost of procurement and also satisfy the members' collective product preferences [14].

In addition, GPOs also serve as a platform for informational and consulting services to both buyers and sellers.

The GPOs charge both buyers and sellers (manufacturers/suppliers) for using the platform's services.

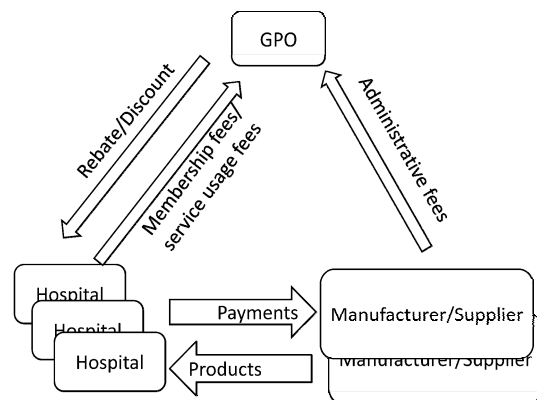


Figure 1: price structure

GPOs collect administrative fees, mostly as a percentage of total sales, from the sellers to conduct business operations. They may share the surplus after operating expenses with the members in the form of volume discount, rebate check, discounted bundle prices, or coupons or credits that can be redeemed for services from GPO's non-purchasing related services, such as consulting. GPOs also collect fees from buyers in exchange of information and consultation services. Fees are in the form of annual or shareholder fees. Fees are based on purchase amount and/or annual flat rate, or usage of information and consulting services.

4. Analytical approaches of modeling group purchasing

In the literature, the GPO markets are mostly modeled as horizontally differentiated markets described by the Hotelling model. Marvel and Yang [14] assume – in the presence of GPO, both sellers simultaneously offer a nonlinear tariff schedule, instead of a constant unit price to maximize profit. The GPO makes the purchase decision to maximize the aggregate surplus of the buyers, i.e. to minimize the total payment to seller and the aggregate disutility of the buyers.

Hu and Schwarz [11] take a different approach. They assume that sellers continue to choose constant unit price to maximize profit even in the presence of a GPO. However, when the transactions are made through GPO, the contracting cost is no longer borne by the buyers and the sellers; rather, it is borne by the GPO and the GPO incurs unit contracting cost lower than what the aggregate contracting cost for buyers and sellers would have been in the absence of a GPO. The GPO collects administration fee from the seller as a percentage of the sellers' revenue. The GPO's objective is aligned with the consumers' interest and the administration fees collected is just enough to cover cost.

Several mechanisms of allocation of cost savings among members have been proposed and scrutinized in terms of different evaluation criteria. The general practice has been to compare the marginal contribution to the cost savings with allocation of cost savings after assuming an exogenous price schedule that takes care of volume discount.

5. Value creation from group purchasing

5.1 Value proposition to buyers

A GPO helps buyers by driving down the

procurement cost in several ways, the most tangible benefit being the reduced purchase price [17]. By aggregating the demands, the GPO attains a mass bargaining power [2,12,13] in the supply chain and negotiates a lower price than what each purchaser would have negotiated individually from the seller. The lower price also results from economies of scale and economies of scope. The GPOs further lower the procurement cost by decreasing unit transaction cost through scale [8] and improved relationships among the supply chain entities [10]. The GPOs also provide buyers with comprehensive portfolio from a larger supplier base so that buyers do not need to shop in multiple places, thus avoiding unnecessary search cost. Search cost is also lowered through reduced workload [19], and cost avoidance. Sometimes, a purchasing consortium also offers shared warehousing, inventory management and distribution facility. The sharing results in reduction in distribution and other overhead cost.

Cost savings, however, are not uniform across all products. The testimony¹ by United States General Accounting Office (GAO), 2003 revealed that GPOs didn't lead to cost savings consistently across different healthcare products. The GAO study found that small and medium size hospitals were more likely than large hospitals to realize price savings on pacemakers through GPO contract; compared to smaller GPOs, use of large GPOs yielded price savings for needles – less often for pacemakers; Commodity products, like I.V. solutions, dressings, gloves, generic drugs, food products, etc., attribute to the 60 % of the procurement cost. Burns and Lee [1] find that hospital purchasing group alliances succeed in reducing health care costs by lowering product prices, particularly for commodity and pharmaceutical items. The commodity products are more standardized, and hence can be sourced in higher quantities from fewer manufacturers, keeping the unit transaction cost low. GPO transactions involving physician-preference items like medical devices, orthopedic implants, pacemakers, etc., are not as effective as they are less standardized and are ordered in fewer quantities. Buying such products would require more strategic relationship between buyers and sellers and hence would be best done through direct negotiation and information sharing between both parties.

Buyers get different levels of rebates and discounts based on their demand and penetration level. The motivation behind that is that the total gains (cost savings) should be allocated among

¹ <http://www.gao.gov/new.items/d03998t.pdf>

buyers based on their purchasing contribution. Prices also vary based on the level of commitment by the buyers.

The GPOs operate under different contractual regimes related to volume commitment. 1) Committed volume: These GPOs limit its members from joining competitive GPOs as part of committed volume program. 2) Voluntary programming: These GPOs do not have contractual restrictions as above and members can join one or more GPOs to procure items. 3) Mixed: These GPOs work in mixed fashion allowing both committed and voluntary purchasers. GPOs require the purchasers to make substantial volume commitment (as specified in the contract) to enjoy more favorable price. The effective price that buyers pay depends on the level of their commitment, purchase volume, and participation.

Due to higher commitment from buyers, committed volume GPOs have more purchasing power in the supply chain and can negotiate with the seller a lower price compared to prices in other regimes. Most of the for-profit healthcare organizations subscribe to these GPOs. Voluntary programming GPOs are less effective in cost savings because they cannot guarantee volume to manufacturers and have less bargaining power compared to the other two types. These GPOs thrive mostly on serving the role of purchasing arms of small businesses and providing consulting services.

5.2 Value proposition to sellers

GPOs' higher purchasing power leaves sellers at a disadvantage. In the presence of GPO contract, sellers can no longer engage in discriminatory pricing. Furthermore, the demand anticipated or projected by the GPO is not always realized over the course of time. It happens mainly due to two reasons - 1) realized demands of individual purchasers not always match anticipated demand; 2) not all GPO members honor committed volume. Even though sellers can secure a higher volume by winning a GPO contract, they still face the diversity in distribution requirements, and, more often than not, the diversity of requirements of different sellers cannot be anticipated exactly at the time of the contract.

However, GPOs are not seen as 100% foe by the sellers. GPOs serve as a single point of contact for all purchases and eventually lower sellers' marketing costs. Furthermore, sellers also benefit from GPOs' sales force that markets the sellers' product to the members. Sellers benefit through the GPO by securing larger volume. However, it should be noted that the large volume doesn't always result in economies of scale beyond a certain point. All

transactions have costs attached to them and, beyond a certain size, these costs increase due to operational complexity, bureaucratic controls, and multiple layers of management [23]. Sethi [23] argues that if economies of scale were always achievable, we would have observed one GPO serving a whole industry.

5.3 Value proposition to the supply chain

In addition to creating unique values to buyers and sellers, GPOs also add value to the supply chain by decreasing overall transaction costs, increasing information transparency, and adopting product and process standardization.

However, GPOs suffer from increasing complexity of the purchasing process [24], loss of flexibility and control [19], and increased coordination costs.

GPOs are not seen favorably by all small manufacturers or suppliers as it is very difficult for small companies to win a contract with a national GPO. GPOs are accused of curbing innovation as they make it difficult for the small companies to compete against big players.

However, regional GPOs are seen as an opportunity for small companies as the small companies largely benefit from GPOs' marketing force and also face lower entry cost. Some GPOs procure from more than one seller to diversify supply chain risk, to cater to members with different product preferences, and to promote diversified supplier base.

6. Stability of GPOs

In a purchasing consortium, member commitment or compliance plays a critical role in the stability and the performance of the group.

Commitment of other members and exchange of information among GPO and GPO members positively influence individual member's commitment, whereas, suitability of alternatives influence member commitment negatively [6]. However, members are reluctant to share sensitive and competitive information and are also afraid of free-riding organizations and anti-trust issues. Traditional purchasing groups overcome these issues by limiting the group activities to non-strategic purchases and restricting membership [10]. In the United States, the member hospitals share supplier-pricing with the GPO and the GPO, in turn, shares the aggregate price and usage information with all its members. This information helps buyers to negotiate

a better price with the seller for physician preference items.

In a coalition, disagreement arises from the differences in the organization size [20]. A comprehensive study of several purchasing consortia in Europe by Schotanus [21] shows that over a quarter of coalitions are acutely aware of inherent unfairness in allocations of cost savings. Equal pricing may under-reward organizations causing lower commitment or their leaving the group [5]. Equal pricing policy ignores the marginal contribution of each member to other members of the purchasing group [22] and the policy may allocate the largest share of consortium savings to members with the least leverage [9]. Nagarajan, Sasic, and Zhang [16] suggest allocating the gains on the basis of the marginal value of a member's contribution when facing heterogeneous contributions in a purchasing consortium. Game theoretic concepts, such as compromise value, should be preferred as they give reasonable solutions to this allocation problem [9]. A study of GPOs by Cleverley and Nutt [3] suggest that the enforcement of written contracts among the plan's members and the percentage of plan member participation appear to explain the effectiveness of the GPOs. Size of the plan and volume of the purchases didn't influence the percentage of savings realized by the group.

Typically, GPOs do not distribute surplus after operating expense equally among all buyers, i.e. the effective unit product price that a buyer pays after rebate or discount from the GPO is not the same across all members. GPOs not only distribute surplus among the members based on purchase contribution, but also reward loyal customers and punish non-committed members through different types of discounts and rebate checks. Level of commitment, participation, and purchase volume together decide a buyer's effective price of procurement.

7. Competition and anti-trust issues with group purchasing

The concept of collecting administration fees from sellers as percentage of sales revenue has attracted lots of controversies in the past. Although revenue-sharing contracts are commonly used elsewhere (e.g., real estate, mutual funds), such revenue sharing in healthcare has been specifically outlawed under the "anti-kickback" statute of the Social Security Act. However, in 1987, partly to facilitate the growth of GPOs, the Social Security Act was amended to create "safe-harbor" provisions that protect healthcare GPOs from prosecution under the

anti-kickback statute. In brief, these provisions require GPOs to limit administration fees to an average of 3% or, in the case of exceptions, to inform members of the amount or percentage of any administration fees in excess of 3%, the products to which they apply, and the manufacturers who receive them. It is argued that the anti-kickback safe harbor and the antitrust safety zone have created incentives for the GPOs to maximize their revenues that conflicts with the GPOs' primary goal of creating cost effectiveness for members. However, Hu and Schwarz [11] show that eliminating administration fees and having providers pay for GPOs' contracting services would have no effect on any party's profit or costs.

The role of GPOs is seen as both pro-competitive and anti-competitive by different people. Hu and Schwarz [11] show that the existence of a GPO increases competition between the manufacturers and lowers prices for healthcare providers. If the manufacturers can choose to sell on-contract or off-contract, then, at equilibrium, two cases can arise: either both sell on-contract or one manufacturer sells on-contract and the other sells off-contract. In the latter case, the off-contract price might be lower than the on-contract price. O'Brien and Shaffer [18] show that buyers can obtain lower prices through both nonlinear pricing and sole sourcing, which intensifies competition between the rival suppliers. Marvel and Yang [14] show that while nonlinear tariffs are an effective way for a monopolist to extract consumer surplus, when two sellers compete using such schedules, the results are far more competitive in comparison to simple Bertrand-Nash competition with linear tariffs. Competing in nonlinear tariffs removes the allocative inefficiency that can result from single price competition. By enabling rival suppliers to compete in nonlinear tariffs, GPOs generate efficient product allocations that nonetheless leave substantial surplus in the pockets of consumers.

GPOs are often blamed for curbing technical innovation. Hu and Schwarz [11] analytically show that GPOs lower the manufacturers' incentive to innovate their products. Some GPOs (e.g. Premier) have "breakthrough technologies exception" to make way for entrant superior technology. However, the effect of that is debated. The risks and uncertainty created about whether a new product will be approved under this exception will itself deter investments and this approval process may substantially delay the entry of new products causing a higher entry barrier [23].

GPOs are also arguably considered anti-competitive for practicing exclusivity agreement with buyers. The congress recently has initiated an

investigation on hospital purchasing to further analyze the role of GPOs and their practices.² Dana [4] shows that if the GPO commits to purchasing exclusively from one seller, then the buyers obtain a lower price, one that is equal to the seller's marginal cost. The paper also shows that even a small group of buyers with heterogeneous preferences can increase price competition among rival sellers by forming a buyer group and committing to buy exclusively from a single seller. O'Brien and Shaffer [18] also show that the buyer can obtain a lower price through an exclusive commitment to a seller. However, the exclusive commitment comes with inefficiency as the buyers do not receive their desired allocation of the sellers' goods. Furthermore, direct exclusivity agreement between GPO and hospital members or indirect exclusivity implemented through loyalty rebates, even though applied at less than 100% penetration level, denies rival sellers the benefit of economies of scale [7].

8. GPOs beyond group purchasing

Lately, the GPOs have gone beyond group purchasing. They act as strategic consultants and assist both buyers and sellers with strategic information and technology solutions. They help healthcare institutions make purchase decisions, control procurement costs, and improve revenue with valuable information, tools, and guidance. They provide market guidance to the sellers. They also improve supply chain efficiency by promoting product and distribution standards.

8.1 New value proposition to buyers as claimed by GPOs

GPOs claim to offer a combination of strategic information, technology and consulting services to reduce costs and improve cash flows in healthcare institutions. Cost savings are believed to be achieved through proper supplier and contract management, and seller negotiation, and improvement in cash flows - through process and revenue cycle management.

For example, the GPOs assert that their cost reduction tools automatically identify and maximize cost savings and find new contract opportunities by comparing current spend data with cost and contract information available with the GPO. That essentially

reduces buyers' search costs. The industry-wide resources regarding prices of physician preference items (PPI) and clinical information provided by the GPO are believed to help buyers negotiate a better price with the seller, especially when it comes to PPIs.

The GPOs claim to offer different optimization, statistical and monitoring tools. This paragraph enumerates the benefits of these tools as exacted by the GPOs. The optimization tools automatically analyze contract/seller performances, identify purchasing trends, find new contract opportunities, and facilitate making better purchase decisions. They optimize processes by identifying cost-driving factors and recommending corrective actions. These tools also reduce buyers' transaction cost as well as lower procurement costs by cost avoidance. The statistical tools predict expected supply costs, gauge supply expense performance, and identify opportunities for improvement, taking into consideration the variability of different cost driving factors. These tools essentially improve supply chain efficiency. The monitoring tools perform automated daily audits, detect missing or incorrect charges, and monitor pricing throughout the term of contract. They lower buyers' monitoring costs and enforce contract prices. The GPOs claim to facilitate cost reduction through product standardization, inventory management, seller price negotiation, and higher product utilization. GPOs offer to improve supply chain efficiency, increase patient's safety, and help achieve quality goal through information and promotion of adoption of data standards.

It is believed that by informing patients of the amount of copayments statically increases the likelihood of payment by the patients and improves hospital's revenue. The GPOs' statistical tools are meant to estimate patients' copayments upfront by analyzing historical claims data, current list pricing, and contracted managed care reimbursement terms. The GPOs' decision support systems analyze and utilize operational information to improve financial performance. Revenue management tools reduce collection time of account receivables, identify unbilled charges, and improve cash flow, etc.

8.2 New value proposition to sellers as claimed by GPOs

Sellers also benefit from the informational aspect of their relationship with GPOs. It is believed that GPOs help sellers with market guidance and reference through strategic information like demand growth, competition, market share, etc. This

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<http://www.nytimes.com/2009/08/14/health/policy/14/purchasing.html>

information largely benefits sellers in capacity planning and pricing thus reducing the cost arising from uncertainty in demand.

8.3 New supply chain benefits as claimed by GPOs

Lately, group purchasing organizations have started facilitating hospitals and their suppliers in adopting universal standards for identifying and tracking of medical products across the supply chain through the standard known as GS1. GS1 includes, for example, members having global location number (GLN), products having global trade identification numbers (GTIN), and global data synchronization network (GDSN) that registers and aligns trade-partner information.

Novation's "New Technology" program constantly accepts and evaluated new and innovative products and keeps the buyers updated with all the technology information. It is believed that it improves the supply chain efficiency in two ways – 1) more cost effective and innovative products find a market place; 2) buyers find products that better match their cost and quality requirements.

9. Gap Analysis and conclusion

The existing literature on GPOs has mainly focused on the group buying aspects (purchasing power of group buying, allocation of cost savings among members, group formation and member commitment, pricing of GPOs' intermediary services, and the issues regarding competition and anti-trust) of the GPOs but has overlooked the evolution of healthcare GPOs as more strategic (information powerhouse, technology provider, and consultant) entities in the supply chain.

9.1 Existing study on group purchasing

The extensive literature on group buying reveals that it often helps buyers lowering procurement costs. GPOs can negotiate a lower price by using their higher bargaining power and by exploiting suppliers' economies of scale and economies of scope. GPOs can also lower the unit search cost and transaction cost of the buyers through scale. However, the cost savings from group buying aren't equally attractive across all products. Commodity products seem to be better candidates for group buying because of their commonality in demands.

Member commitment plays a critical role in the stability and cost effectiveness of the GPOs. The

higher the commitment of the members the higher the bargaining power of the GPO. Therefore, the higher level of commitment results in lower contract prices. GPOs reward commitment with preferential pricing. Disappointment among buyers arises from unfair allocation of surplus. GPOs distribute surplus based on buyer's demand and penetration level, the closest estimator of a buyer contribution to cost savings.

Although GPOs are arguably believed to promote competition, some of the GPO practices have raised concerns among suppliers and the anti-trust community. The practice of exclusivity agreement with buyers, sourcing from one or very few sellers, and collection of administrative fees from sellers are not seen favorably by the anti-trust community and GPOs are often accused of curbing innovation.

9.2 Current state of healthcare GPOs

Healthcare GPOs have evolved noticeably in the last few years and there hasn't been enough study analyzing the economic impact of such evolution on the supply chain. Recent business articles and analyst reports show that GPOs have gone beyond group purchasing and gradually positioned themselves as providers of strategic information and consulting services. They enable healthcare institutions to lower procurement cost and improve cash flows by providing them with solutions consisting of strategic information, technology, and consultations. The GPOs decrease hospitals' search and transaction costs by providing them with industry-wide product and contract information and tools that automate finding cost improvement opportunities. The GPOs assist hospitals negotiate better prices by empowering them with strategic pricing information. GPOs give hospitals optimization tools to improve processes by analyzing internal data and industry-wide benchmark information. GPOs also provide tools to improve cash flows by automated contract monitoring. The GPOs' statistical tools and decision support systems improve cash flows. The GPOs contribute to the supply chain efficiency by promoting product and distribution standards, making way to new technology though constant evaluation and adoption of quality standards.

9.3 Potential research areas

This shift of product positioning by the GPOs opens up a new area for study. The study of supply chain dynamics will not be complete without taking into account GPOs' new strategic roles.

We identify three different drivers that add new dimensions to the dynamics of healthcare supply chain – 1) the value of information and the informational advantage of GPOs, 2) the technological capabilities of GPOs and their impact on buyers, sellers, and the supply chain, 3) hospitals' readiness in terms of their supply chain structure to appropriate the benefits of information and technology.

GPOs are gradually gathering more and more market and product information and transactions data that would play significant role in the decision making of buyers. The information and the tools will not only help reduce transaction and search costs further but also alter the quality of decisions. Their tools would have favorable impact on the cost of monitoring existing contracts and spending. The cost implication of information and new technology on the supply chain will grow more significant as more information is processed and the processing capability is improved. What buyers, sellers, and GPOs learn from the information can create new dynamics in the relationship among the supply chain entities. It will be worth exploring the optimal information-sharing strategies of buyers, sellers, and GPOs and the impact of information on their relationships. The impact of information may be significantly different across procurement of commodity products, physician preferred items, and services.

However, it is also true that the value generated from information will be as good as the available technology and readiness of hospitals and GPOs to embrace them. The readiness of hospitals, their self sufficiency in processing information, and reliance on GPOs will introduce further heterogeneity among healthcare institutions. This heterogeneity may result in further diversification in GPOs' offerings to its members.

To conclude, the informational and the technological aspects of group purchasing organizations introduce a new dimension in the supply chain beyond group buying and invite further research and understanding of the area.

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