The Ailing Healthcare Supply Chain: A Prescription for Change

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SUMMARY

Despite well-documented evidence of significant competitive advantage and cost reduction resulting from supply chain management (SCM) practices, the healthcare industry has been extremely slow to embrace these practices. This article, through literature review and case studies within the healthcare industry supply chain, explores the barriers to implementation of SCM practices. These barriers include: lack of executive support; misaligned or conflicting incentives; need for data collection and performance measurement; limited education on supply chain; and inconsistent relationships with group purchasing organizations and other supply chain partners. Practical recommendations are made for hospitals and supply chain partners struggling to implement workable SCM solutions.

INTRODUCTION

Today's business literature is rife with supply chain management (SCM) models, theories, and more importantly, stories of successful application of SCM principles. Embedded in that literature are reasonably well-understood definitions of supply chain components, practices and objectives. Considerable improvements have been made in supply chain management in many industries, but there has been limited success in making systemwide SCM improvements in the healthcare industry. Yet, there is significant evidence that this industry is in need of broader changes.

Research by the Center for Studying Health System Change found that hospital spending accounted for 47 percent of the overall 7.2 percent increase in healthcare costs during 2000 (Struck et al. 2002). With the supply chain costing as much as 40 percent of the typical hospital's operating budget, the strategic importance of hospital supply chain management is evident. Current estimates of the potential benefit of an efficiently managed healthcare supply chain range from 2 percent to 8 percent of hospital operating costs (Haavik 2000; EHCR 1996; CAP Gemini 2001). An efficient, user-friendly supply chain can also impact the hospital's revenues by engendering physician loyalty and staff retention and providing better customer service (Computer Services Corporation 1999).

Despite the recognized importance of managing the hospital supply chain, tremendous variability exists in execution and measurement. There has also been limited academic research that helps to identify barriers to successful implementation or to recommend best practices. This article attempts to bridge the gap between practice and research. Based on a review of the literature and interviews with healthcare supply chain professionals, this study identifies the key barriers to healthcare supply chain execution, makes recommendations for improvement, and highlights the need for additional research.

This article first reviews the literature to identify the challenges or barriers for hospital supply chain initiatives. Then the methodology, including the case study protocol and the execution of the research, is discussed. Next, the analysis of the data is followed by a discussion of the

managerial implications, the research limitations and future research opportunities.

LITERATURE REVIEW

The Evolution of Supply Chain Management

During the last two decades, the scope of supply chain management has greatly expanded. Early supply chain efforts focused on the material and service inputs from suppliers and their impact on an organization's ability to meet customer needs. During those early efforts, much of the attention was placed on cost reduction. Gradually, organizations have understood the importance of looking at the entire supply chain — from raw materials to manufacturing to distribution to retailers and to the final customer — and its impact on the customer. The focus has shifted to overall profitability of the supply chain — increasing revenues by having the right product at the right time — and decreasing costs through more efficient material and information flow (Handfield and Nichols 1999; Simichi-Levi et al. 2002).

Nelson et al. (2001) described the characteristics of a successful supply chain: top management understands the importance of supply chain management; benchmarking is used to assess and guide; an organizational culture of shared knowledge prevails; the participants' view of the supply chain includes the entire chain; and best practices are institutionalized. By taking a system-wide approach, organizations have led their competition and proven that "supply chain mastery provides an effective means of achieving market share gains, customer intimacy and enduring advantage" (Copacino and Byrnes 2001). Fine (1998) concluded that competitive advantage is lost or gained by how well a company manages the dynamic relationships throughout its chain of suppliers, distributors and alliance partners.

Challenges to Developing an Effective Hospital SCM Strategy

While literature validating the importance of strategic SCM is plentiful, there is limited academic literature that addresses the challenges unique to the healthcare industry. Burns (2001), however, provided an excellent description of the challenges inherent in the healthcare industry. A variety of obstacles to effective supply chain management exist, including:

- Constantly evolving technology resulting in short product life cycles and high cost for physician preference items
- Difficulty in predicting frequency, duration and primary diagnoses for patient visits and the associated product requirements
- Lack of standardized nomenclature/coding for healthcare products and commodities
- Lack of capital to build a sophisticated information technology infrastructure to support supply chain management efforts
- Inadequate business education and SCM capabilities among hospital-based buyers

Everard (2001) suggested that the lack of change in the supply chain could be attributed to the lack of strong managers. He offered the following characteristics of the successful supply chain manager: the ability to learn from best practices in other sectors, a broad business education, an understanding of the supply chain drivers and influencers, and the capability to engage in strategic thinking and to influence the organization. Stimson (2002) offered a profile of procurement performance leader skills, which includes: consistent application of performance metrics; aptitude for leadership; ability to apply strategic and governance principles; understanding of and ability to navigate organizational structure; capability to integrate across the enterprise; commitment to procurement resource management and development; and the potential to analyze and influence stakeholder relationships. As Fawcett and Magnan (2001) highlighted, "supply chain education and training is one of the singular requirements for implementation success."

Finally, Everard (2001) attributed the lack of progress in SCM to the fact that each link in the healthcare supply chain operates solely in its own best interests. Although most healthcare professionals generally agree that change is necessary, fear of making the first move limits progress.

Inter-Organization Effectiveness

The organizational literature also provides some guidance on the issue of supply chain management in the healthcare industry. Lawrence and Lorsch's (1967) organization and environmental perspective is supported by others, including Lawrence (1981), Thompson (1967), Van de Ven and Drazin (1985), and Gresov and Drazin (1997). Lawrence and Lorsch placed the organization in the context of its environment and recognized that an organization must interact with its environment, obtain resources from it, and transform them into products (or services) in order to survive.

To investigate these environmental issues, this study examines the critical players within the hospital supply chain — group purchasing organizations (GPOs), distributors and hospitals — and their role in enabling or inhibiting supply chain efforts. This research examines the perceived value of GPOs, buying consortia that leverage the combined product volume of member organizations to achieve more aggressive contract pricing than could be negotiated by a single hospital. Despite recent Senate hearings into specific business practices, GPOs are an integral part of the healthcare supply chain and, according to the Health Industry Group Purchasing Association, produce contracts that cover 72 percent of all products purchased by hospitals (Werner 2002).

Another relevant research stream takes a more micro perspective of the organization. Campbell (1974, 1990) presented the concept of a nested organizational hierarchy, where higher levels of an organization inhibit

or enable lower levels of an organization. Fawcett and Magnan (2001) also argued that corporate and organizational cultures often impede rather than facilitate change in the supply chain. This theory suggests that a program at the operational level of a hospital, such as materials management or purchasing, may be influenced by the larger organization or hospital in which it operates. These theories indicate that SCM programs can be hindered or enabled by the organization in which they are being implemented. Therefore, this study considers the hospital executives and the strategies and goals that they set for supply chain management implementation. The study also explores both the purchasing professionals and clinicians within the hospital, whose goals are not always in alignment with each other or with hospital business objectives. A comparison is made between the responses of the professionals at the operational level and those at the executive level of the organization to draw conclusions about effective SCM practices.

Table I represents supply chain barriers reported in the literature relative to the environmental (GPOs and distributors), organizational (hospital) and operational (program) levels. Based on the analysis, recommendations will be made for each level of the supply chain.

METHODOLOGY

This research involved a qualitative study employing in-depth interviews of hospital executives and materials managers, GPO executives, distributors and industry experts from November 2002 to June 2003. To obtain more accurate assessments of the supply chain, each participant was assured of individual and organizational anonymity. Study participants were selected to represent a range of organizational sizes and a variety of positions within the organizations. The initial study called for four individuals to be interviewed for each category of participants: distributors, GPOs, hospital executives, hospital materials managers, and industry experts. After conducting these interviews, three additional materials manager and three additional industry expert participants, those who worked with all of the studied groups, were interviewed to gain additional information regarding the operational, organizational and environmental levels of the supply chain. See Table II for a summary of the 26 interview participants.

This research started with a literature review, examining the barriers to implementing supply chain management and the role of GPOs in key supply chain improvement efforts. This review supported the creation of the case study research protocol. The case study protocol, of which excerpts can be found in Appendix A, was created prior to data collection. The case study protocol provided the investigators with a guide for conducting the interviews and helped to increase the reliability of the case study research (Yin 1994). An outline of the protocol was also distributed in advance so that the interviewees were properly prepared (Voss et al. 2002).

Based on the literature review, the interview questions were focused on four key areas: (1) characteristics of successful supply chains, (2) barriers to implementation of successful supply chains, (3) key competencies required of supply chain managers, and (4) the GPOs' ability to deliver against their value proposition. The questions were used as a framework to guide discussion. As seen in Appendix A, there were both general and participant-specific questions, since not all questions were appropriate for every group of professionals. In addition, discussions were occasionally redirected to gain additional information regarding an area of expertise.

The investigators conducted in-depth interviews in person or via phone. The interviewing was structured in that the interviewer covered all of the questions in the protocol with each respondent, but unstructured in that questions were open-ended and very general: respondents were encouraged to follow their own thoughts and give information as it occurred to them.

Interviews were approximately one hour in length. Initial interviews were conducted in teams to ensure a common approach was used at all sites and to allow inter-rater reliability to be checked. Subsequent interviews were conducted in teams or by an individual who had participated in all of the team interviews. All interviews were audiotaped and transcribed. The interview data were entered into Atlas ti (1997) to assist in reporting recurrent

Table I

OPERATIONAL, ORGANIZATIONAL AND ENVIRONMENTAL BARRIERS FOR SCM

ENVIRONMENTAL
• Competing incentives
• Role of GPOs and distributors
• Lack of standard coding
• Minimal information sharing
ORGANIZATIONAL
• Unclear executive commitment
• Inadequate IT resources
• Lack of training/education
• Fragmented decision making
• Evolving technologies
OPERATIONAL
• Unclear link to organizational strategy
• Narrow scope of influence
• Lack of industry metrics/inconsistent performance metrics
• Limited use of data/IT
• Price focus vs. product value focus (i.e., physician preference)
• Minimal training and skills
• Variable patient requirements

themes and supporting conclusions. Upon completion, the interview data were coded and analyzed so that a comparative method of analysis could be used (Strauss and Corbin 1998; Miles and Huberman 1994). Coding the data helped to break down the interview data to analyze, conceptualize and develop categories (Yin 1994).

In the first phase of coding, the research team coded four of the interview transcripts — one from each type of participant. The research team then reviewed and updated the codes in order to capture the breadth and depth of the topics discussed in these interviews. As the coding proceeded, an iterative approach to developing and refining the code definitions was taken. Atlas ti allowed the research team to retrieve passages from the interviews by codes and to create tables for comparison for later analysis. As the team analyzed the data, they asked questions to address any differences or unexplained variances. See Appendix B for the codes that were used for the analysis and findings of this article.

INTERVIEW FINDINGS

The focus in this research was to identify barriers to supply chain efforts. However, at the start of the interview session, study participants were asked to identify the key characteristics of successful supply chains. Stated characteristics closely paralleled those documented by Nelson et al. (2001). Four key characteristics were consistently mentioned across interview groups: (1) communication within the organization; (2) executive support for supply chain managers and processes; (3) information systems for data collection, analysis and sharing; and (4) measurement systems to assess total supply chain costs and performance.

Study participants were also requested to describe characteristics that impede implementation of supply chain practices. As anticipated, many of the identified barriers were ineffective systems to develop and provide the four characteristics mentioned above. The most commonly mentioned barriers were: *lack of executive support; misaligned incentives* within the organization and throughout the supply chain; *lack of education,* both at the materials management and executive levels; and *data collection and measurement*. In addition, there were inconsistent findings about the *value of GPOs*. These barriers align with those described in the literature review and summarized in Table I. However, two barriers were mentioned in the literature review — evolving technologies and variable patient requirements — that were not found in the interview data.

Table III summarizes the interview data, providing the percentage of participants from each category — industry experts, distributors, GPOs, hospital executives, and materials managers — that commented about a specific topic. This section provides details of the interview comments and mentions specific quotations that illustrate the key findings. Areas for further investigation are highlighted.

Table II

DESCRIPTION OF PARTICIPANTS IN THE STUDY

Interviewee	Description
Distributor 1	Regional distributor
Distributor 2	Regional distributor
Distributor 3	National distributor
Distributor 4	Worldwide distributor
GPO 1	Regional, serving approx. 800 sites
GPO 2	Regional, serving approx. 800 sites
GPO 3	National, serving over 1,500 hospitals
GPO 4	National, serving over 200 sites
Hospital Exec 1	Nonprofit, acute care
Hospital Exec 2	Teaching hospital, general hospital
Hospital Exec 3	Community-based, multi-site
Hospital Exec 4	Tertiary care hospital, private, multi-site
Hospital MM 1	General hospital, multi-site
Hospital MM 2	Nonprofit, multi-site, acute care
Hospital MM 3	Nonprofit, multi-site
Hospital MM 4	Teaching hospital
Hospital MM 5	Private, nonprofit, teaching
Hospital MM 6	Community-based, multi-site
Hospital MM 7	Public, military
Expert 1	Executive, materials management association
Expert 2	Executive, materials management association
Expert 3	Journal editor
Expert 4	Professor, author
Expert 5	Professor
Expert 6	Consultant
Expert 7	Author

Lack of Executive Support

Lack of executive support for SCM efforts was mentioned by members from each group of participants. (See Table III.) All of the executives and board members who were interviewed emphasized that the focus of their efforts was to develop business and increase the revenue base rather than control costs. One hospital board member of two years indicated that specific issues of supply chain management had never been raised at a board meeting and cost control responsibility was left to the individual departments within the hospital. There was "limited discussion on the actual control of what goes on operationally inside the organization" (Hospital Executive 1/19/03). The study participants felt that the lack of attention to supply chain management was due to the fact that many senior managers have not identified the opportunity that efficient supply chain management can provide. As previously mentioned, SCM improvements not only can reduce costs but also can help retain

good doctors and subsequently increase patient volume and total revenue.

In several hospitals, the executives approved GPO usage as an avenue to reduce costs. However, in many cases, the use of the GPO was simply not enough and did not fully address the challenges and opportunities in the supply chain. One industry expert (1/14/03) underscored the importance of executive involvement beyond the selection of a GPO, stating "they [hospital executives] can't remove themselves from responsibility for supply chain management ... and defer to the GPO." To drive changes in the hospital, "there has to be a topdown philosophy with a CEO interested in tackling the supply chain issues" and metrics put in place to measure and evaluate supply chain costs and overall performance.

In 80 percent of the hospitals in this study, the purchasing or materials manager was the highest SCM executive level and the board of directors and/or executive team lacked a representative with any SCM knowledge or responsibilities. As House (1996) emphasized in his path-goal theory, the leader should be involved in the development of subordinates and serve as a role model from which followers can learn appropriate behavior. Without any supply chain leadership at the executive level, it is difficult for materials managers to drive change in the organization.

These interview findings suggest a need for further investigation into the following proposition:

- Hospitals with high levels of executive commitment to supply chain management — as demonstrated by strategic priorities and the level of authority held by supply chain managers — have higher levels of supply chain performance.

Misaligned Incentives

Misaligned incentives among key players in the hospital supply chain — manufacturers, distributors, GPOs and hospitals, including materials management professionals, doctors and other clinicians — contribute to discontinuities in the healthcare supply chain. In this study, all players emphasized the challenges of misaligned incentives within hospitals and across the supply chain. (See Table III.)

The manufacturers are obviously looking to push their products into the supply chain to increase revenues and gain additional market share. The GPOs were initially introduced as "a way of helping hospitals achieve lower prices by aggregating volume. However, in the 1970s, the suppliers began paying administrative fees to the GPO ... and the GPOs became a de facto marketing arm of the manufacturers" (Industry Expert 1/12/03). The GPOs offer the manufacturer's product(s) to the hospitals that

Table III

SUMMARY OF INTERVIEW RESULTS

Interview Results: Percentage of Participants Who Commented by Topic

	Materials Manager	GPOs	Distributor	Expert	Executive
Executive Support	75%	50%	25%	57%	80%
Misaligned Incentives					
Conflicting goals/incentives within hospital	14%	25%	0%	29%	50%
Conflicting goals/incentives across supply chain	0%	25%	25%	17%	75%
Data Collection and Measurement					
Lack of data and/or performance measures	75%	50%	75%	57%	25%
Availability of IT systems	13%	0%	50%	57%	0%
Need for Education					
Need for education of materials managers/supply chain professionals	28%	50%	0%	14%	25%
Need for education of executives	71%	50%	75%	86%	50%
GPO Role					
GPO practices that support hospitals	100%	50%	100%	43%	50%
GPO practices that hinder hospitals	100%	25%	100%	43%	25%

they serve, and take fees from the manufacturer of about 3 percent, although some fees are reportedly as high as 18 percent (GPO Manager (a) 1/06/03; Industry Expert 1/14/03). The GPOs tend to favor large manufacturers since they have a wider variety of products and are financially capable of paying the fees. Taking fees from both hospitals and manufacturers, which have conflicting goals, creates the potential for GPOs to favor the group that provides the largest financial return. Some study participants expressed concern that high manufacturer fees could motivate the GPO to promote specific products, whether or not they serve the best interest of the hospital. Also, the GPOs' tendency to use large manufacturers may limit the availability of new technologies from smaller firms, an important issue in recent Senate hearings (Scanlon 2002). As one distributor (1/22/03) stated, "the benefits [from the GPO] will accrue to the people who pay."

Distributors have tried to reduce overall costs by implementing Just-In-Time practices and managing the supplier and hospital inventory levels. By instituting supplier-managed inventory and stockless systems, the distributors attempt to control the flow of materials through the supply chain. Manufacturers, of course, would prefer the distributor to hold more of its inventory and to push product to the hospitals. The hospitals, with limited room for storage, encourage the management of the inventory but also must give up valuable data to the distributors.

The materials managers are typically responsible for reducing supply costs. On the commodity side, roughly 28 percent of the hospital's supply spend, the materials managers can have good control over product selection. However, for the other 72 percent of the supply spend, the challenge is to balance the costs with the preference of physicians and other clinicians (GPO Manager (b) 1/6/2003). The involvement of clinicians in product selection, although critical in helping to identify product, adds complexity since most lack any formal training in supply chain practices. In addition, physicians perceive maximizing inventory as beneficial since product (patient) demand is so uncertain (Bettinfer 2003). Because failure to rapidly meet that demand may have an adverse impact on patient outcomes, a natural tension results as the physicians and purchasing professionals take positions that may view patient welfare and fiscal responsibility as mutually exclusive. This tension is magnified by the fact that many physicians are not employed by the hospitals that purchase the products and can move their practices and patients to other hospitals (GPO 1/6/03; Materials Managers 1/19/03 and 2/6/03).

These findings are consistent with House's 1996 path-goal theory of work unit leadership. House (1996) proposed that:

> Leader behavior will enhance work unit performance to the extent that such behavior (a) facilitates collaborative relationships among unit members, (b) maintains positive relationships between the unit and the larger organizations in which it is embedded, (c) ensures that adequate resources are available to the work unit, and (d) enhances the legitimacy of the work unit in the eyes of other members of the organization of which the work unit is a part.

These findings suggest that the lack of executive support and the misaligned incentives lead to poor work performance. Changes need to be made to facilitate collaborative relationships, provide resources and increase the legitimacy of the supply chain improvement efforts. Pintro et al. (1993) and Nutt (1986) both suggested that cross-functional teams are vital to the successful implementation of projects and to the effective performance of an organization as a whole. Supply chain efforts driven *only* by mid-level materials managers are unlikely to lead to organizational change.

To address these issues, one hospital (Hospital Executive 2/6/03) in the study took a collaborative approach to improving the supply chain. With executive support, the role of supply chain management, typically the responsibility of the purchasing department, became the responsibility of the entire organization. When supply chain initiatives developed, department heads and managers from all areas of the hospital became involved. Rather than managers working within their own departments, they were asked to work outside their areas of expertise. The hospital found that when people worked outside their areas, they asked basic questions that challenged the way things were done. This led to radical changes within the organization and eventually helped to eliminate the barriers between departments.

Another hospital (Hospital Executive 7/16/03) recognized that clinicians' scheduling demands did not allow time for cost-cutting activities. In response, they provided time away from the patients to meet to discuss best procedures and supplies. They also put a portion of the savings initiated by the clinician groups into a clinician gain-sharing fund. This fund allowed the clinicians to make improvements in the hospitals, to make their world a better place. These two steps have provided the time, resources and incentive for clinicians to participate in supply chain cost reduction efforts.

These interview findings suggest a need for further investigation into the following propositions:

- The fees and structure of GPO contracts are key determinants of the cost and variety of products offered by GPOs.
- Cross-organizational involvement in supply chain efforts leads to higher levels of supply chain performance.

Data Collection and Measurement

While the availability of information systems was mentioned as a barrier at some hospitals, most participants were more concerned with the limited use of the data that was available. (See Table III.) First, as highlighted by one distributor (1/6/2003), "there is not a consistent

way of measuring performance of the supply chain." Therefore, it is nearly impossible to make changes and to assess whether or not the changes are working. Second, many of the information systems are not sophisticated enough to assist with tracking and monitoring costs, managing inventory or communicating with business partners. Third, the lack of standard UPN codes makes it difficult to track products or to share information throughout the supply chain. Finally, many healthcare professionals lack the analytical skills to draw conclusions from the data and the communication skills to share the information with others.

Leggat et al. (1998) emphasized the need for performance indicators for improving operational effectiveness, ensuring accountability, monitoring management and/or fostering collaboration. Without the collection and use of data, these hospitals often are making decisions without concrete data and instead are constrained by a variety of occupational and professional standards to which the various hospital members prescribe.

Several hospitals had seen the benefits from using data to aid in decision making and gaining buy-in from the clinicians. Some hospitals used Six Sigma or value management processes to add rigor and structure to their improvement processes. As one manager said, "the biggest reason [for being data-driven] is that utilizing data and having a clear methodology of how you reached your decisions [allows] you to get people to change their behavior … the data keeps reinforcing that they need to change their behavior"(Industry Expert 2/5/03).

One materials manager (2/10/03) illustrated the successful use of data to change behavior. A concerned clinician insisted that different (more expensive) products were required to manage their patient population, which was described as having a very high acuity (level of illness). Managers were able to respond with detailed data that demonstrated their patients' acuity was consistent with 90 percent of U.S. hospitals, helping to convince the clinician that cost savings need not sacrifice the quality of patient care. In another case, the data validated clinicians' concerns about the ability of the proposed product to meet patients' clinical needs. An alternative contracting strategy was employed — instead of standardizing the product, the hospital negotiated a standardized price from multiple suppliers — satisfying the dual goals of providing quality care and meeting financial objectives.

One of the GPO managers (12/17/02) felt strongly that additional data measurement and analysis was needed in the healthcare supply chain and said, "There's a place in healthcare for a supply chain manager that doesn't control anything in the supply chain. This person looks at the data, analyzes the data, educates people, and facilitates decision making and collaboration."

These interview findings suggest a need for further investigation into the following propositions.

- Hospitals that use clear metrics and a have a formal review process for supply chain management have stronger supply chain performance than those that do not.
- The use of information systems for decision making will lead to higher levels of supply chain performance.

Need for Education

Another barrier to implementation is the lack of skills and knowledge about supply chain management practices, both at the operational and executive levels. (See Table III.) As previously mentioned, many executives do not understand the importance of the supply chain and fail to track and monitor critical performance measures. Executives often lack the basic skills needed to drive changes in SCM. An examination of the case histories of 10 high-performance supply chains led Nelson et al. (2001) to conclude that "training, education and persistence — and occasionally luck — are the talents that made all the difference." The study participants also focused on the need for the materials managers and supply chain managers to gain more knowledge of supply chain management and other business processes.

While most hospitals emphasize education for their clinicians, many materials managers do not receive any formal training (Materials Managers 1/20/03 and 1/15/03; Distributors 1/22/03 and 1/20/03; Industry Expert 2/26/03). The participants emphasized the need to develop the following skills: understanding of the end-to-end supply chain; good communication and relationship management skills; ability to develop contracting strategies; and financial and business skills. Background as a clinician to facilitate change across the entire organization and an understanding of process management (such as Six Sigma) were also repeatedly mentioned as helpful. Many of the industry experts stressed the need for a rigorous program for managers to gain information about the supply chain and best practices, perhaps leading to a formal certification.

The implementation of SCM practices has been reported to be dependent on successful implementation of employee training and human resource development (Goldstein and Ford 2002; Gowen and Tallon 2003). Gowen and Tallon's (2003) research suggested that organizations that direct more resources toward managerial and employee support, as well as employee training, can achieve greater competitive advantage. It is therefore critical to have stronger supply chain training at both the executive and managerial levels.

One hospital provided details of their materials management training program (Executive 1/19/03). First, they try to select people who have significant clinical experience. Then they provide mandatory one-day CQI (Continuous Quality Improvement) training during their orientation to the hospital. During the first year, the employees also

take a weeklong course on team leadership and team membership. They are also encouraged to participate in professional organizations to learn about best practices. Their clinical experience, commensurate with this quality training and materials management experience, allows them to understand the gap between normal hospital operation and leading-edge practices, which enables them to better drive change.

These interview findings suggest a need for further investigation into the following propositions:

- Hospitals with higher levels of supply chain training/certification for materials managers have higher levels of supply chain performance.
- Hospitals with executives who have high levels of supply chain knowledge/experience have higher levels of supply chain performance.

Value of GPOs

Within the hospital supply chain, contracting practices are clearly an important area of focus and generally include membership in group purchasing organizations. The actual benefits that result from GPO participation have been widely debated — in healthcare literature as well as in government investigations. Much of that debate has centered on industrywide supply chain issues and relationships among GPOs, manufacturers and distributors. In this study, materials management and distributor participants were asked to validate GPO performance against nine specific aspects of the value proposition (Appendix A). The rationale for GPO participation included pricing, greater breadth of contracted products, economies of scale and reduced head-count requirements. Nearly all participants validated the effectiveness of GPO contracts for commodity products (such as gloves and dressings).

Not all participants, however, had favorable experiences with GPOs. One Integrated Delivery Network (IDN), a network of hospitals, eschewed GPO participation and has moved all contracting efforts in-house, reporting lower prices and greater flexibility and speed in responding to changing market conditions (Materials Manager 3/5/03). Other participants (Materials Manager 1/20/03; Hospital Executive 3/5/03; Industry Expert 11/11/02) indicated that hospitals used GPO contract pricing to negotiate better pricing directly with suppliers. Fifty-seven percent of materials managers regarded GPO contracting strategies for high-cost, high-volume physician preference items (such as heart valves and orthopedic implants) as less than optimal. The GPOs' typical multiyear contract terms were cited as one reason for poor performance; in deflationary markets, a multiyear pricing contract could prove costly. In addition, the GPOs' efforts to standardize products often limited the availability of certain preference items. One hospital (Materials Manager 1/20/03), for example, regretted a recent decision to move away from the incumbent supplier of pacemakers, with which they had a strong relationship, to comply with the GPO product selection. Six months after making the decision, the GPO changed the contract portfolio to include the original supplier but did not provide the same low level of pricing.

Several of those interviewed indicated that larger GPOs had moved away from their core competency of contracting, offering more value-added services, for which there was mixed demand. One hospital looked to the GPOs to do a better job with assisting the purchasing function and in training both the materials managers and the executives (Materials Manager 7/17/03). Another hospital spoke highly of their collaboration with a GPO to reduce hip and knee reconstruction procedure costs (Materials Manager 1/20/03). One GPO indicated that it provides good data on how individual hospitals compare to their peer group and shares best practices that it sees from its work with multiple hospitals (GPO 1/6/03). However, one GPO executive (1/6/03) and several hospitals (Materials Managers 1/19/03 and 7/17/03) asserted that the price contracts ultimately drive the membership decision and that value-added services are desirable only after the price hurdle has been cleared. Recent efforts to divest extraneous business interests may be an indicator that GPOs are getting back to the basics of contracting.

The perception of GPOs' delivery against value proposition was clearly mixed and inconclusive, but in general, participants indicated that GPO participation yielded some level of pricing and contracting benefit. Small rural hospitals seem to benefit the most from the GPO relationships since they do not have the volume to demand lower prices directly from the supplier and often lack the internal resources to investigate all products, suppliers or best practices in hospitals.

These interview findings suggest a need for further investigation into the following propositions:

- The hospital characteristics — size, locations, and type of care — are key determinants of the level of benefits hospitals receive from GPOs.
- The structure and terms of the GPO contracts are key determinants of the level of benefits hospitals receive from GPOs.

MANAGERIAL IMPLICATIONS

The following quote highlights the fact that efforts are being made for improvements to the hospital supply chain, but significant changes still need to take place.

> *"A lot of people are saying that the supply chain's broken — I don't think it's broken as much as it is a runaway train. The train is derailed but running along on its railroad ties. It is still moving forward but there are serious flaws in the system." (Rick Barlow, editor of* First Moves *and contributing writer to* MDSI*)*

There is significant opportunity for change within the healthcare supply chain. While there is no simple prescription for treating the ailing hospital supply chain, definite themes emerged from this research. The recommendations for management in the healthcare industry

are summarized below and are divided into three levels of the hospital supply chain: the environmental level (GPOs and distributors), the organizational level (hospital executives) and the operational level (materials and supply chain managers). Table IV summarizes the desirable supply chain characteristics, barriers to success, and recommendations for improvement across the three levels — environmental, organizational and operational. The last column in the table refers back to the section of the article that discusses the specific barriers to success.

Environmental Level

At the environmental level, the study primarily focused on the GPOs. Group purchasing organizations provide a mechanism for hospitals to gain access to a broad array of contracts, which leverage membership volume to reduce costs. Based on participants' recommendations to focus on contracting as a core competency, GPOs need to articulate a clear, consistent contracting strategy. That strategy must incorporate mechanisms to address contracting for physician preference items and for responding to deflationary markets that are sometimes associated with rapidly evolving technology.

Leveraging information systems to standardize, measure, analyze and report performance metrics is a necessary step to streamlining the healthcare supply chain.

Table IV

ASSESSMENT OF THE HEALTHCARE SUPPLY CHAIN

Level	Desired Characteristics	Barriers to Success (Based on Literature)	Recommendations for Improvement (Based on Interviews)	Discussion in *Interview Findings*
Environmental (GPOs and Distributors)	• Responsive and efficient • Value-driven approach • Collaborative approach • Information sharing		• Clear, consistent GPO strategy • Focus on contracting • Promote industry standards • Add value only to help partners (education, data)	• Misaligned incentives • GPO role
Organizational (Hospital Executives)	• Clear missions and organizational support • Continuous process improvement • Strong IT support • Hire/train well-qualified SC professionals	• Unclear executive commitment • Inadequate IT resources • Lack of training/ education • Fragmented decision making • Evolving technologies	• Executive mandate for SCM • Executive SC representative • SC solutions beyond GPO selection • Performance measurement • Human resource training	• Lack of executive support • Need for education • Limited use of data and measurement
Operational (Materials Managers, Supply Chain Managers)	• Data-based decision making • Clear purchasing/SC strategy • Collaboration among managers, clinicians and doctors • Internalize best practices	• Unclear link to organizational strategy • Narrow scope of influence • Lack of industry metrics/inconsistent performance metrics • Limited use of data/IT • Price focus vs. product value focus (i.e., physician preference) • Minimal training and skills • Variable patient requirements	• Clear, consistent strategy for selecting products • Benchmarking and performance measurement to support decision making • Staff formal training and development • Total organizational involvement in SC improvements	• Misaligned incentives • Limited use of data and measurement • Need for education

For organizations with limited internal information systems capabilities, GPOs and distributors can add value by providing accurate and timely data to enhance decision making and planning.

GPOs, as the link between manufacturers and hospitals, have the potential to influence and promote industry standards for nomenclature and UPN, which will provide their members with the ability to better analyze purchase data. GPOs also have the potential to play a pivotal role in supply chain education for materials management professionals and hospital executives, creating deeper customer relationships and partnerships that are characteristic of a successful supply chain. Of course, GPOs' incentives often do not encourage them to share information with other supply chain players. For example, common product identification would allow customers to easily compare prices across competitors.

Organizational Level

The interviews and literature review validated that benchmark institutions exhibited similarities in leadership commitment to the SCM process. It is important to have visible and sustained organizational commitment for advancing effective SCM processes. Critical to that commitment are alignment of the SCM strategy with the organizational mission; allocation of appropriate human, technological and informational resources; and the measurement of performance through balanced scorecards or other structured metrics.

Supply chain managers must acknowledge that good sourcing and supply chain practices are more than just cost reduction activities and can lead to more satisfied doctors and better patient care. Therefore, supply chain efforts must go beyond GPO selection and instead establish processes for making sourcing decisions. Critical performance metrics must be identified and tracked to understand the impact of supply chain efforts.

To drive change in the supply chain, it is also critical to have supply chain management representation at the executive level. The supply chain leader must have a deep understanding of SCM practices, to be able to effectively communicate across the organization, to elicit support from clinicians (through project teams or cross-functional hiring) and to lead change efforts. To further support SCM efforts, it is important to have the right resources to support the effort throughout the organization. A structured training program for executives and materials managers must be established to develop good decision-making and planning capabilities.

Operational Level

While some materials managers suggested that executive support is the critical driver for crafting a successful SCM strategy, others had demonstrable success in creating the strategy and then obtaining executive endorsement. Irrespective of the path chosen, the necessity of articulating a clear, consistent SCM strategy and linking it to the organizational mission was a recurrent theme. The strategy needs to detail a contracting approach that is appropriate to the organization, to identify guidelines for GPO selection and participation, and to specify tools, such as balanced scorecards, that will be used to support purchasing decisions.

One of the frequently referenced obstacles to managing the healthcare supply chain is the lack of widely accepted standards for benchmarking and performance improvement. It is critical for materials/supply chain managers to define measures that track not only product cost but also other costs (inventory, delivery and ordering) and supply chain performance (delivery performance, clinician and patient satisfaction, etc.). Once appropriate measures are identified, the results must be reported at defined intervals. In this way, the measurement system can be the foundation of the organizational SCM strategy.

At the core of effective SCM is the collective knowledge and skills of those involved in developing and implementing supply chain processes. Those involved in day-to-day supply chain operations require proficiency in internal processes as well as a broad understanding of best practices, in and out of the healthcare industry. Hiring practices should be based upon specific competencies and educational standards, which may include advanced business degrees, professional certifications or clinical experience. Ongoing education in the areas of supply chain best practices, data analysis, and negotiation will elevate collective supply chain competence. Training in managing change, leading teams and communicating effectively will facilitate cross-functional participation in SCM efforts.

As internal processes are developed and aligned, supplier selection decisions will transition from those based on price to those best able to produce additional supply chain value. To understand the value of particular decisions within the hospital, it is important to involve clinicians and doctors as well as materials managers in the buying decision. Also, strategic alliances will provide a venue to align internal supply chain processes with supplier, distributor and GPO processes and the opportunity to leverage the relationships for transfer of skills, knowledge and technology.

These research results, summarized in Table IV, help to bridge the gap between practice and academic research. This study has identified key barriers to implementation based on a cross-sample of supply chain partners. These recommendations address practices that impact individuals and their specific organization but also call for broader, industrywide changes. While the barriers to implementation can seem overwhelming, the success stories of a number of study participants offer encouragement and practical recommendations for hospitals beginning the transformation effort.

RESEARCH LIMITATIONS

While this research has provided some insights into the healthcare supply chain, the research has some limitations. First, the sample size is relatively small with only 26 participants. Due to the small sample size, conclusions about specific hospital types could not be made reliably. Second, there are a limited variety of organizations. For example, the hospitals in this study were in or near large cities rather than rural areas. The current sample size does not allow this study to reliably differentiate by the types of hospital. A more comprehensive investigation should consider a larger number of participants and a wider variety of different sizes and types of organizations. This type of research would allow the authors to draw conclusions about different types of organizations and supply chains. Finally, this research was qualitative and inductive in nature. It has provided a foundation upon which to build a more empirical research study, perhaps using survey-based research, to gain additional insight into the best practices and performance of the healthcare supply chain.

FUTURE RESEARCH

Several areas for future research have been developed from this study. First, the GPOs' delivery against the value proposition was clearly mixed and inconclusive. Future research should investigate GPO characteristics and the hospital circumstances that make GPO participation successful. For example, the size, the location as well as the nature of the hospital care (acute care or general care) may be good determinants of the value of the GPO — it is likely that smaller general hospitals in rural locations will receive the most benefits from the GPOs since they lack the buying power and need fewer high-end health supplies.

Second, this research indicates that the incentives for GPOs do not encourage them to share information and can limit the services and products that are offered to hospitals. Research that explores the form of the GPO contracts and assesses their impact on the overall costs of hospital spending and the quality of patient care would help to better define the role of the GPO. For example, GPOs that receive higher fees from manufacturers than hospitals will likely provide fewer benefits to the hospital.

Third, there appears to be variability in the availability and use of data and information systems at manufacturers, GPOs, distributors and hospitals. Research to define best practices and identify opportunities for developing, implementing and utilizing information systems would help to improve the supply chain capabilities.

Fourth, the lack of executive support for supply chain management limits the potential for improvements in this area. Research that assesses the impact of the organizational structure and goals on overall supply chain performance would help to identify best practices. Finally, it will be important to identify specific needs for supply chain training and to assess the benefits from executing the training.

These research efforts will help to address key issues at the environmental, organizational and operational levels and contribute to the development of a healthcare supply chain that is more efficient, less costly, and more responsive to patient and clinician requirements.

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Appendix A

EXCERPTS FROM CASE STUDY PROTOCOL

Background:

I'm sure you are well aware of the economic pressure on the hospital sector (challenging reimbursement structures, evolving nursing shortage, and an increasingly expensive technology base). With the supply chain comprising roughly 40 percent of a hospital's operating budget, the strategic importance of hospital supply chain management cannot be easily overstated. At the same time, there is considerable variability in performance levels achieved within individual systems. This variability apparently motivates a substantial number of hospital executives to express dissatisfaction with their materials management performance. However, there does not seem to be consensus among hospital executives regarding what constitutes good performance (Kowalski 2002).

Open-Ended Questions:

In this discussion, we would like to: describe a successful SC, identify competencies critical to successful performance and ask for your perspective of the GPO value proposition.

- What do you consider to be the most important characteristics of successful SCM?
- What characteristics of the hospital industry may impede implementation of SCM best practices?
- What do you believe are the core competencies required by hospital SCM professionals?
- What practical steps should hospitals take to create a more responsive and efficient SC?

Specific Questions for GPOs

- Validate components of value proposition
- Identify GPO role in SCM

Specific Questions for Distributors

- How many hospital customers?
- How many GPO relationships?
- How many hospitals require GPO participation as part of relationship?

Specific Questions for Purchasing/Materials Management Leaders

- Identify GPO membership and participation (shareholder/non-shareholder; committed membership/use prices as starting point for supplier negotiations)
- Identify reasons for GPO use/non-use

Specific Questions for Purchasing/Materials Management and Distributors

- Determine perceived value of GPOs to the organization and delivery against value proposition:
  a. Lower prices (improved margin)
  b. Price protection
  c. Assistance with product comparison analysis
  d. Product standardization
  e. Improved quality control
  f. Reduced contracting costs
  g. Monitoring market conditions
  h. Performance metrics
  i. Increased sales

  A number of sources (Schneller 2000; Burns 2001; Scanlon 2002) have detailed key elements of the GPO value proposition for members, which are: lower prices, price protection, improved quality control programs, reduced contracting costs, monitoring market conditions, assistance with product comparison analysis, and product standardization.
- Are there additional benefits derived from GPO participation?
- Are there additional services/values that are desired from GPOs?
- Clearly, professional certification programs such as AHRM, ISM and APICS exist to promote and support professional development. How effective do you believe these programs are in demonstrating professional competence? Do you see any opportunity for these programs to become the foci of skill/knowledge exchange? Is hospital purchasing certification valued by healthcare executives? Opportunity to increase this value?

Appendix B

THE PRIMARY CODES USED TO ANALYZE THE INTERVIEWS*

CODE		DEFINITION
Misaligned Incentives		
	1.	Conflicting goals/incentives within hospital
	2.	Conflicting goals/incentives across supply chain
Limited Use of Data and Measurement		
	3.	Lack of data and/or performance measures
	4.	Availability of IT systems
Need for Education		
	5.	Need for education of materials managers/supply chain professionals
	6.	Need for education of executives
Executive Support		
	7.	Level of executive involvement in supply chain efforts
GPO Role		
	8.	GPO practices that support hospitals
	9.	GPO practices that hinder hospitals (i.e., pricing and selection)

*Other codes were used in the initial interview analysis. However, the data from the above codes were used for the analysis and conclusions of this article.