Effect of Supply Chain Practices on Supply Chain Performance in Health Care Industries

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Abstract-- **The rising requirement of providing better healthcare safety at affordable costs is a concern to health care providers. As such, Supply chain management is currently having an important impact on reducing costs and improving performance in healthcare organizations. The measurement of its performance in health care will enable competitive advantage and provide a framework for continuous improvement. The objective of this paper is to provide a conceptual framework showing the relationship between the components of supply chain management and healthcare performance for Indian health care industries. It also provides an overview of the range of current approaches and plans for further development in the health sector. The study shows that there are various components of supply chain management that have significant effect on the overall performance of the healthcare industries.**

Index Terms-- **Performance Measurement, Supply Chain Management, Health care industries**

1. Introduction

The Indian health care industry has been growing at a pace comparable with the other Indian key industries. Over past decades healthcare sector is continuously facing the challenges of increasing costs. Xiao et al. (2012) state that healthcare industry has always been criticized due to their high cost and low efficiency. This is because of ever growing population, increasing government expenditure on health and growing per capita income. With this scenario healthcare industries are challenged with finding ways to meet ever-rising customer expectations at a manageable cost. Therefore, it is necessary to look for innovative solutions and appropriate modern ways to ensure that the changing needs for health care and health systems are met. Although originating in the manufacturing industry, supply chain management is a concept that is easily applicable in healthcare industries. Supply chain management is more complex in healthcare industry as it directly deals with patient care (Musttaffa & Potter, 2009; Turhan & Vayvay, 2009). Moreover, also because a healthcare industry includes number of goods and services designed to promote health, which integrates and combines people, processes, and products (Tien and Goldschmidt-Clermont 2009). Because of these complex system healthcare industries in India faces various critical issues on medical error, excessive wastage of stocked inventory, increase in demands of service delivery, lack of information sharing and data inconsistency.

According to the literature it shows that most of the research in healthcare supply chain is done on medicines and pharmaceuticals and a few attentions are given to the supply chain of medical devices in comparison. Further, this area has become increasingly important due to current demographic trends and increasing population. Demand for medical products is expected to rise as the population grows (O'Keeffe, 2011). This leads to major expenses for such management as it requires specialized personnel, sophisticated technologies and control procedures that increase the cost. Despite the importance of supply chain practices on supply chain performance there is a lack on studies that link supply chain management practices and supply chain performance effectiveness. Hence, it becomes inevitable to address the deficiencies encountered by the healthcare industry in their SCM front to search out which components of the supply-chain process are not competitive so as to rapidly implement necessary improvements. Hence, this paper attempts to gain a better understanding of supply chain practices and the relationships between SCM practices and supply chain performance effectiveness in Indian healthcare industry.

2. Literature review

2.1 Supply Chain Management

Supply Chain Management (SCM) is a set of integrated processes that enable production of valuable products from raw materials and provide it to the ultimate customers through proper distribution channel. It can be defined as a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. The relative importance of SCM is on the rise, as it includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, service providers, and customers. (Turhan & Vayvay, 2009), explained that effective co-ordination along the supply chain plays an important role in innovation, flexibility and speed of an organization which is necessary for their survival in a competitive business. Supply chain management is more complex in healthcare industry as it directly deals with patient care (Musttaffa & Potter, 2009; Turhan & Vayvay, 2009). Hence, it has a significant importance and calls for serious research attention. The study identifies the research gap existing in Indian healthcare industries by providing a theoretical framework regarding the various components related to SCM of medical device in Indian healthcare and their impact on the organizational performance.

2.2 General Overview of Performance Measurement System

Performance Measurement System (PMS) may be defined as a balanced and dynamic system that enables support of decision-making processes by gathering, elaborating and analyzing information (Neely & Kennerley, 2002). (Taticchi, et.al, 2009) further elaborated this definition by commenting on the concept of 'balance' and 'dynamicity'. Performance measurement is one approach and is an established concept that has acquired a renewed importance in varieties of organizations (Camarata & Camarata, 2000) which ensures that an organization pursues strategies that lead to

the achievement of overall goals and objectives of the organization. The performance measurement depends on the readiness of the organization and its culture (Bititci, et.al, 2010). Performance Measurement systems are also conceptualized in multiple ways with many synonyms including "organizational performance assessment system", 'outcomes management system" and even the more general "continuous measurement process". Several definitions were introduced in the literature by different contributors representing different operational areas in an attempt to resolve this confusion and simplify the complexity of the PMS definition. These are tabulated in Table 1.

2.3 Importance of Performance Measurement of Supply chain management in healthcare

In general, healthcare supply chains are very complex and fragmented. Inequity in healthcare provision and complexities in the healthcare systems persist across the globe. The main concern about healthcare supply chain management is on its performance. For healthcare supply chain management, a key measure is quality of the goods & services, to increase customer service/responsiveness, to reduce waste and non-value-added activities (i.e. cost reduction) including excess inventory, to improve supply chain communication (speed/timeliness, accuracy of information, information sharing), reduce cycle time (supply lead time) and the most important element i.e. the satisfaction of the ultimate customer. Further, (Dobrzykowski & Vonderembse, 2009) studied that still there is lack of coordination and knowledge sharing affects the performance of the supply chain. (Gibbons 2009) studied that effective information environment is an important aspect for quality performance of healthcare supply chain and safer healthcare. (Ritchie, et.al, 2010) focuses on the concept of reverse logistics and recycling of medical products to improve operational performance of healthcare industry. Further, (Meijboom, et al. 2011) discussed over major problems occurred due to ineffective supply chain in healthcare organization is communication, patient safety, waiting times, and integration and methods to minimize such problems. Further, (McKinsey & Company, 2013) in his recent research discussed that problem of drug shortage due to supply chain problems are increasing constantly and leads in increasing additional costs for healthcare industries. Due to this increasing complexity, the healthcare professionals are facing problems. It is thus important to identify areas of SCM aspects in healthcare. Healthcare SCM processes have three types of flows: physical product flow, information flow, and financial flow. The physical product flow manages customized products and services for the treatment of patients and their needs. Information and financial flows are related to supply chain design decisions for effective product flow and improved organizational performance. The major partners of supply chain of healthcare include manufacturers, distributors, healthcare providers and payers (Musttaffa & Potter, 2009). Manufacturers are producers that include pharmaceutical

companies, medical surgical products companies, device manufacturers, and manufacturers of capital equipment and information systems. Distributors are purchasers that include grouped purchasing organizations (GPOs), pharmaceutical wholesalers, medical surgical distributors, independent contracted distributors, and product representatives from manufacturers. Providers include hospitals, systems of hospitals, integrated delivery networks (IDNs), and alternate site facilities (Toba et al, 2008) and finally payers are the end users of the supply chain such as individual patients, healthcare employees and employers. The basic health care supply chain network is shown in Figure 1.

2.3 Supply Chain Practices

Although the healthcare supply chain is one of the oldest and most complex, it remains immature in its level of collaboration, driven by a lack of data standardization, longer lead time, stock outs, drug/device condition, product traceability, inaccurate delivery time, smaller inventories etc. It is thus become significant that the factors influencing the various dimensions of supply chain management (SCM) practices are looked into in order to improve overall organizational performance of the focal firms. SCM practices refer to complete set of action which is done in organizations towards to improve the overall organizational performance. SCM practices are defined also as approaches applied in managing integration and coordination of supply, demand and relationships in order to satisfy consumers in effective and profitable manners. Effective practices in healthcare supply chain management proved to bring back result such as improvement in organizational performance and reduce costs. The focus of this paper is to study the supply chain of medical device and identify various supply chain practices that improves the overall organizational performance of healthcare industry. In this study the four dimensions of supply chain practices such as Lean Manufacturing, Top Management Commitment, Inventory visibility and Supplier integration were determined to have significant relationship with supply chain performance and healthcare. Thus the focus of this paper is on defining standards and components of supply chain practices that would help hospitals to assess and improve their supply chain performance in the healthcare context and the overall organizational performance.

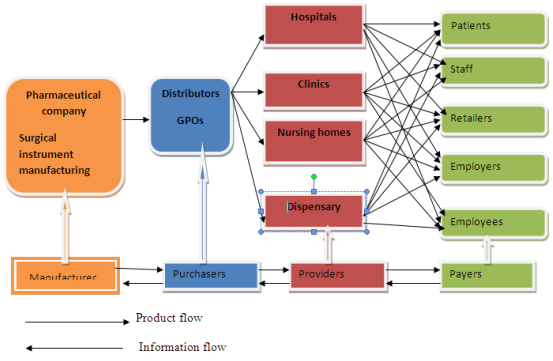

Figure: 1. Basic Supply Chain Healthcare Network

2.4 Medical Device Supply Chain

Medical devices play an increasingly important role in healthcare as it is used for diagnostic and/or therapeutic purposes. Medical device covers an extensive range of

healthcare products such as equipment, devices and consumable products that helps in improving patients' health and the quality of life (Sorenson and Drummond, 2014). The global market for medical devices is expanding rapidly, as demand from end markets are steadily growing (Wang, 2013). Wood (2008), states that the medical device industry is expanding at a high rate, and that there is foreseeable continued growth in the future. Because of such large variety of products the medical device becomes an integral part of the healthcare supply chain (Burns et al., 2002). Therefore medical device manufacturers and their design engineers require a well-organized network of subcontractors and suppliers, who have the capacity and proficiency to supply quality materials, in order to meet regulatory standards and also keep pace with global market demands (Koepfer, 2010). The overview of supply chain processes can be divided into two main levels of distribution channels. Level 1 is the chain between medical device manufacturers and medical device suppliers. Level 2 is the chain between medical device supplier and the focal firms that can be hospitals, healthcares, clinics, nursing homes etc. The study concentrates on the different healthcare as the customers for the medical device supply chain and as the focal firms for the study. The Figure: 2 show the supply chain of a medical device in healthcare industry. The changing market demands make the production of medical equipments more complex. The study identifies the research gap existing in Indian healthcare industries by providing a theoretical framework regarding the various components related to SCM in India and their impact on the organizational performance. The study thus, delves into how organizational performance of health care can be improved by implementing supply chain practices in medical device supply chain.

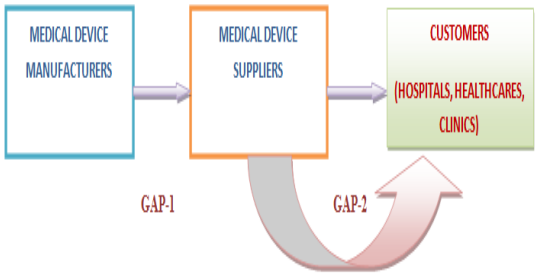

Figure 2: Medical Device Supply Chain and focus of study

3. Research Methodology

3.1 Materials and Methods

A literature search was carried out consulting the databases PubMed, MEDLINE, Science Direct and Psych INFO. Initially a Google Scholar search was also conducted with the terms used as: Performance Measurement, Healthcare, supply chain, supply chain practices. Search was conducted to measure supply chain performance and organizational performance in healthcare settings; abstracts were reviewed, papers selected, references searched, websites visited, and authors contacted. Further search includes full text English-language peer-reviewed journal articles, including reviews, experimental studies, observational studies, case studies, commentaries, concept papers, and validation studies.

In addition, a hand search was conducted based on the references of the identified articles. We further select articles that show clear relationship with supply chain practices and measures and their impact on organizational performance.

3.2 Research Problem

Hospitals, healthcares require variety of medical devices and equipments for diagnostic and/or therapeutic purposes. It is thus becomes a customers for medical device distributors or suppliers. Medical device products are prone to a number of supply chain disruptions that increase costs, create potential patient safety issues, and damage brand reputation. Thus a relative importance of SCM is on the rise, as it includes coordination and collaboration with channel partners in order to avoid gap between the partners of the supply chain. Thus the aim is to implement different supply chain practices and investigate the impact of supply chain practices on organizational performance. Thus the research objective is:

- To identify various supply chain practices of healthcare industry.
- To identify various supply chain performance measures.
- To develop a conceptual framework for healthcare supply chain performance.

4. Proposed Framework

The independent variables are the supply chain practices which include top management commitment, inventory visibility, lean practices and supplier integration that have an impact on the supply chain performance which is the dependent variable.

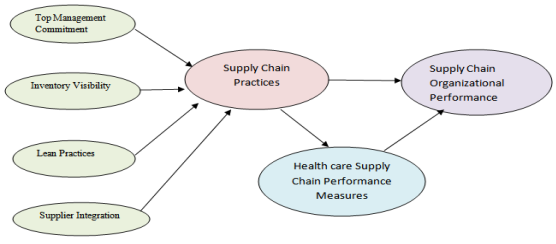

Figure: Theoretical Framework Design

4.1 Top Management Commitment

Top management should be understood here as a function, which has decisive impact on a healthcare supply chain performance. From a SCM viewpoint, its role is to influence and link the physical flow of medical products with the overall strategic content in the healthcare.

4.2 Inventory Visibility

Maintaining the right inventory is a challenge for any healthcare organization. It was estimated that a hospital could reduce its total expenses by at least two percent through better inventory management and distribution of finished medical materials (Schneller, 2006). It is nearly impossible to easily track which medications should be used and in what quantities. On top of this, doctors often have preferred equipment, which can lead to several brands of similar supplies being needed. To this end, many hospitals are beginning to abandon the just-in-time methodology in favor of using remote warehouses and managing their own inventory distribution. For these regional warehouses systems are started that holds inventory of products that are more applicable to regional demand.

4.3 Lean Practices

(Gordon, 2008) strongly support lean practices as lean supply chain is a continuous improvement processes to focus on the elimination of waste or non valued added functions. These waste and non value-added stops across the supply chain and reduce set of times to allow for the economic production of small quantities. A lean organization optimizes the flow of products and services to its customers. It delivers customer value by: Reducing lead times, improving quality, eliminating waste and reducing the total costs.

4.4 Supplier integration

Supply chain integration is a continuous process that can optimize manufacturers, customers and suppliers work together to improve their

relationships and when all participants are aware of key activities at all levels in the chain.

5. Conclusion

Supply chain management practices in the healthcare sector are designed to include best practices of the sector to streamline entire processes from the ordering to supply through delivery processes. These processes encompass efficient management and distribution for the flow of products for on time delivery of high-quality medical care.
The findings suggested that effective SCM impact positively on the organizational performance as a whole. The study also established that encouraging evidence for an organizational competence construct, mediating the relationship between SCM and the several dimensions of organizational performance. This operational competence is influenced by SCM, but also by other factors. Drawing from the resource-based view, it can be thought to be an encompassing resource summarizing the impacts of several operational initiatives.

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