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Supply Chain Management in Healthcare – An Assessment

***Dr. Sameer Sharma,**Dr. Abhilasha Jain**

*** Professor & Director, Bhopal Institute of Technology & Management-MBA, Bhopal.**

**** Professor, PIMR, People's University, Bhopal.**

Abstract

Supply Chain Management (SCM) is a critical aspect of various industries, including healthcare, where it plays a crucial role in logistics, pharmaceuticals, and patient care. This study examines the significance of SCM in the healthcare sector, particularly in hospitals and nursing homes in Bhopal, India. The research explores SCM practices, challenges, and areas for improvement in healthcare supply chains.

The study highlights that while SCM has evolved from a manufacturing-centric approach to a broader application across service industries, healthcare supply chains remain complex due to their dynamic nature and reliance on human interactions. Hospital Supply Chain Management (HSCM) aims to integrate suppliers, transportation, and hospital services to enhance efficiency and ensure quality care. However, challenges such as inefficient inventory management, supplier reliability issues, irregular demand, and lack of modern technological adoption persist.

Primary data from 40 hospitals and nursing homes in Bhopal reveal that over 70% of respondents perceive their SCM practices as inefficient or somewhat efficient. Key issues include inadequate demand forecasting, lack of strategic inventory management, and an over-reliance on emergency procurement. Furthermore, advanced technologies such as RFID, barcoding, and blockchain remain underutilized, leading to inefficiencies in tracking and managing medical supplies.

Despite these challenges, respondents recognize the potential impact of Artificial Intelligence, Robotics, and Automation in optimizing SCM. There is a growing need for improved transparency, collaboration among stakeholders, and sustainable practices in healthcare SCM. The study underscores the importance of data analytics, predictive capabilities, and regulatory compliance in strengthening SCM frameworks. By addressing these issues, healthcare organizations can enhance service quality, reduce costs, and improve overall patient satisfaction.

Keywords: Supply Chain Management, Healthcare Supply Chain, Hospital Supply Chain Management, Logistics, Inventory Management, Patient Care.

Supply Chain Management (SCM) involves a network of businesses working together to move products to the end consumer, including suppliers, manufacturers, retailers, and transport companies, collectively known as the supply chain. Another view of SCM includes the movement of goods, services, and information from raw materials to the end user. The increasing importance of SCM is well-documented in academic literature. However, measuring performance in complex, multi-vendor supply chains, whether on a global or local scale, remains challenging due to the difficulty in establishing relevant performance metrics. SCM enhances the collaboration between local and global entities, improving process management and interaction among all members of the supply chain.

In healthcare, SCM is crucial for managing logistics, pharmaceuticals, and patient satisfaction, striving to elevate service quality above other industries. The fast-paced developments in healthcare demand improved SCM

methods and strategies, despite industrial challenges. Efficient SCM directly affects healthcare quality in both public and private sectors.

This study aims to evaluate the role and growing significance of SCM in the healthcare industry.

Literature Review

SCM is fundamental to operational excellence across various industries. Initially introduced by Keith Oliver in 1982, SCM involves the strategic planning, execution, and control of supply chain activities to meet customer needs efficiently. It covers all movements and storage of raw materials, work-in-process inventory, and finished products from origin to consumption. Over time, SCM has expanded from manufacturing to service industries, providing a competitive edge by optimizing processes and satisfying stakeholders.

Initially, SCM was primarily utilized in manufacturing as a strategic process rather than a support function. Over the years, its scope broadened to encompass the management of all activities within a supply chain. By the 1990s, research in SCM began addressing global competition and its applications in the service sector, including healthcare and education. This evolution is depicted in an SCM timeline by Habib and Hasan (2019), showing its shift from a manufacturing-focused concept to a comprehensive approach applicable across various sectors.

Service Supply Chain Management (SSCM) focuses on the planning, movement, and repair of materials to support after-sales services. Unlike manufacturing supply chains, SSCM involves more human interaction and local decision-making, leading to greater variability and complexity. SSCM is prevalent in industries like healthcare, aviation, and financial services, where effective management can significantly enhance service delivery and stakeholder satisfaction.

Hospital Supply Chain Management (HSCM) is essential for optimizing healthcare service delivery. It integrates suppliers, transportation, and hospital services to achieve Total Quality Management (TQM) in healthcare. Kazemzadeh et al. (2012) define HSCM as approaches to efficiently manage hospital resources and activities to improve patient care quality and safety. With increasing competition, regulatory pressures, and rising costs, effective HSCM is crucial for healthcare organizations to provide better services and maintain stakeholder satisfaction.

Healthcare supply chains face numerous challenges, especially in developing countries like Bangladesh. These include customer dissatisfaction, high healthcare costs, inadequate service levels, lack of modern technology, and insufficient medical supplies (Al-Saa'da et al., 2022). Addressing these challenges requires a robust SCM system to enhance operational efficiency and service quality. Pervez, Mahmud, and Bachar (2016) emphasize the need for effective SCM in hospitals to mitigate customer dissatisfaction and improve societal service levels.

The term "Supply Chain Management" (SCM), introduced in 1982, involves the integration of key business functions and processes both within and across companies to form a unified and high-performing business model. According to the Council of Supply Chain Management Professionals, SCM encompasses planning and managing all activities related to sourcing, procurement, conversion, and logistics management. It also includes the coordination of processes across marketing, sales, product design, finance, and information technology. Additionally, SCM requires collaboration with channel partners, including suppliers, intermediaries, third-party service providers, and customers. Its growing importance in the global market highlights its role in shaping business strategies and operational frameworks (Medows, 2011).

SCM's complexity and significance are particularly notable in the healthcare sector, one of the world's largest and fastest-growing industries, which includes pharmaceuticals, medical equipment, supplies, and services. Managing the healthcare supply chain is crucial given the sector's size and rapid growth. The Economist Intelligence Unit (EIU) estimated that global healthcare spending would average 10.5% of GDP in 2014, with notable regional variations: 17.4% in North America, 10.7% in Western Europe, 8.0% in Latin America, 6.6% in Asia/Australasia, and 6.4% in the Middle East/Africa. In developed countries, healthcare is the second-largest government expenditure category after social protection (World Healthcare Outlook, 2013).

Kumar, Ozdamar, and Zhang (2008) explored cost reduction techniques for medical suppliers in Singapore, concluding that just-in-time (JIT), reengineering, and outsourcing can be cost-efficient despite high initial IT implementation costs. Meijboom, Schmidt-Bakx, and Westert (2011) highlighted organizational deficiencies

affecting patient care and proposed SCM practices to address these issues, focusing on lead time, integration, and IT practices. Kumar, Swanson, and Tran (2009) examined the cost-reductive potential of RFID in healthcare SCM, despite high implementation costs. Attaran (2012) discussed the success factors and challenges of RFID in healthcare SCM, identifying both the advantages and drawbacks.

Uthayakumar and Priyan (2013) proposed an inventory model integrating pharmaceutical and hospital supply chains, optimizing lead time and lot size. Settanni, Harrington, and Srai (2017) evaluated pharmaceutical supply chains, noting a focus on production-centric definitions that overlook patient consumption. Aronsson, Abrahamsson, and Spens (2011) analyzed healthcare supply chains through the lenses of agility and lean manufacturing to enhance effectiveness. Shah et al. (2008) investigated work design improvements in healthcare SCM to enhance patient treatment quality across various organizations.

Sinha and Kohnke (2009) identified gaps between demand and high-quality supply in healthcare, proposing a framework of affordability, awareness, and access for continuous improvement. Cook et al. (2001) assessed whether SCM in healthcare improves quality, reduces costs, and shortens lead times as effectively as in manufacturing. An Australian e-commerce project demonstrated improved data integration in pharmaceutical SCM, enhancing efficiency. Chandra and Kachhal (2004) presented an SCM model incorporating e-commerce and various optimization methods. Kim (2004) showed that B2B e-commerce enhances healthcare SCM through internet-based integration.

McKone-Sweet et al. (2005) identified constraints in implementing SCM in healthcare, such as lack of education, team operations, leadership, and data evaluation, impacting performance. Kim's practical study at a hospital revealed a 30% reduction in inventory levels through improved SCM systems. Langabeer (2005) discussed challenges in healthcare SCM and recommended adopting new technologies to enhance efficiency. Zheng et al. (2006) proposed an e-adoption framework for healthcare SCM based on the English National Health Service. Baltacioglu et al. (2007) introduced a supply chain model applicable to the service sector, including healthcare, focusing on capacity, demand, and relationship management. Kitsiou et al. (2007) analyzed healthcare SCM information systems, suggesting technological improvements.

Sousa et al. (2011) developed a dynamic programming model to optimize pharmaceutical supply chains by maximizing net present value considering distribution and production costs. Rahimnia and Moghadasian (2010) examined the need for agile and lean systems in hospital SCM. Walker et al. (2008) studied the implementation of green SCM practices in healthcare, focusing on environmental barriers and local supplier contributions. Bhakoo and Choi (2013) investigated the complexity of IOS implementation in healthcare SCM. Kwon et al. (2016) analyzed SCM's impact on patient costs and readmission rates, highlighting strategic areas for improvement.

Kogan et al. (2014) examined collaboration in healthcare SCM, noting that uncertain demand and operational costs can hinder provider consolidation. Ishii et al. (2017) emphasized the cost reduction and quality improvement potential of integrated healthcare SCM. Imran et al. (2018) proposed a multiperiod model for pharmaceutical SCM, addressing time, quality, and cost objectives. Syahrir et al. (2015) surveyed SCM topics in healthcare and disaster settings, focusing on inventory control and service quality. Zepeda et al. (2016) studied logistics services and demand uncertainty in hospitals, emphasizing the impact of internal regulations on inventory costs. Rossetti (2011) analyzed factors affecting pharmaceutical SCM and logistics evolution in healthcare.

Moons et al. (2019) reviewed hospital SCM logistics performances based on recent studies. Dobrzykowski et al. (2014) conducted a structured analysis of SCM studies in healthcare from 1982 to 2011. Narayana et al. (2014) provided insights into pharmaceutical SCM through a content analysis focusing on performance improvement. Chen et al. (2013) empirically tested factors influencing hospital SCM performance, such as IT integration and knowledge flow. Bishara (2006) highlighted key aspects of pharmaceutical SCM, particularly in the context of cold supply chains.

Bagchi et al. (2014) used Boolean-based analysis to assess supply competency effects on foreign direct investments, advising strategic planners on attracting investors. Kelle et al. (2012) proposed a multi-item inventory model for hospital pharmaceutical SCM, evaluating service levels and ordering systems. Stecca et al. (2016) focused on optimizing hospital pharmacy inventory costs using mixed integer linear programming.

The healthcare sector faces significant challenges, including legislative and regulatory obstacles, globalization, and rising operating costs. Executives strive to reduce supply costs while maintaining quality standards, yet many healthcare organizations fail to consider total delivered costs, focusing instead on lowering acquisition prices (Kumar et al., 2008). Research has identified various issues within healthcare services, such as communication barriers, patient safety concerns, waiting times, and integration problems (Meijboom et al., 2011). Improving supply chain performance is seen as essential for enhancing operational efficiency and reducing costs across healthcare organizations worldwide (Chen, 2013).

Efficient logistics and SCM systems are increasingly critical in the healthcare sector due to globalization and competitive pressures. These systems represent a paradigm shift in business operations, emphasizing collaboration over conflict in networked environments. Consequently, researching and analyzing SCM in healthcare is a promising area with significant practical implications. Key considerations include regulation and reform, cost management, global perspectives, and technology investment.

Research on SCM's impact on healthcare highlights the sector's complexity and the need for multidisciplinary approaches focusing on critical performance issues. The healthcare supply chain includes not only clinics and hospitals but also wholesalers, pharmaceutical manufacturers, medical supply companies, pharmacies, regulatory agencies, private health insurers, technology providers, and IT vendors. Logistics and SCM are crucial across this interconnected industry.

For instance, Ritchie et al. (2010) discussed reverse logistics in the National Health Service (NHS), emphasizing financial and operational benefits from effective recycling of pharmaceutical stock. Similarly, Kumar et al. (2008) noted that healthcare executives often focus on reducing acquisition prices rather than total delivered costs, advocating for process reviews to eliminate non-value-added activities.

Meijboom et al. (2011) identified major problems in healthcare organizations, including communication issues, patient safety, waiting times, and integration. They argued that SCM could effectively address these problems by enhancing information quality and integration across functional and organizational boundaries.

Implementing effective SCM practices faces barriers such as lack of top management support, inadequate performance measurement systems, conflicting incentives, limited SCM education, and inconsistent relationships with group purchasing organizations (McKone-Sweet et al., 2006). Cost reduction, while challenging, is necessary given governmental pressures and the tendency of purchasing managers to prioritize quality over low prices (Lambert et al., 2006).

The global nature of healthcare suppliers necessitates collaboration and trust for successful SCM implementation (Bhakoo and Chan, 2011). Efficient inventory management is also critical, as hospitals must balance the need for emergency supplies with cost control. IT integration between hospitals and suppliers can lower inventory costs while meeting patient demands (Chen, 2013).

Technological advancements, alongside management and business considerations, are crucial for optimizing supply chains (Lillrank et al., 2011). Decomposing business processes into manageable service events within a supply chain framework is another key factor.

Shortcomings in healthcare supply chains can severely impact human health, exemplified by drug shortages that increase costs and risk patient safety, even in developed countries like the US (McKinsey & Company, 2013). Thus, efficient SCM in healthcare is vital for operational success and patient welfare.

Components of Hospital Supply Chain

The hospital supply chain includes both medical and non-medical products. Medical products encompass clinical and pharmaceutical items such as stretchers, anesthesia machines, patient monitors, and surgical tools. Non-medical products include administrative supplies like aprons, skeleton models, and medical books. Effective management of these components is crucial for maintaining hospital operations and ensuring patient care.

Objectives of the Study

This study involves a survey of SCM practices in hospitals and nursing homes in Bhopal city. The aim is to demonstrate how applying SCM approaches in hospitals can improve service levels for patients and contribute to

operational excellence.

Research Methodology

The literature review on SCM and Hospital SCM covers these areas to provide a theoretical base for the study. A primary survey of 40 hospitals and nursing homes in Bhopal was conducted using a structured questionnaire with 25 questions. While the population and sample may not be ideal, they are quite representative of a B-class metropolis in India.

Data Analysis and Findings

Primary data was collected from 26 hospitals and 14 large nursing homes to gauge the status of SCM in Healthcare. Over 60% of the respondents were Procurement/ Purchase Officers and balance were others including the owner, the Chief Medical Officer, Administration Manager or Hospital Manager.

The perception of the current state of HSCM in their organization was generally poor with over 70% calling it either inefficient or somewhat efficient. Inventory management issues and supplier reliability were perceived to be the major challenges along with irregular demand. Most of the respondents believed in safety stock maintenance to ensure availability, while some had faith in collaborative relationships with suppliers. Ironically, no one was doing regular forecasting and demand planning. Over 70% of the respondents did not have any strategy to optimize inventory management and reduce stock outs. Only a few admitted to setting reorder points and safety stock levels. Handling of procurement process was generally centralized or decentralized, but also done as emergency procurement in many cases.

Price was the major selection criteria of procurement, very few were focused on quality and reliability. All the hospitals resorted to internal distribution system for distribution of materials within the facility. None of the technologies like RFID, Bar coding, GPS Tracking or Block chain were being used to track and trace the movement of materials within the supply chain. Chain of custody documentation was the only known way of ensuring quality and safety of the medical products throughout the supply chain. Expired or obsolete medical inventory was largely disposed of according to regulations and in a few cases returned to the supplier.

To handle disruptions or emergencies affecting the healthcare supply chain(HSC), emergency response protocols were predominantly used in addition to alternative sourcing arrangements.

Most of the respondents did not evaluate the performance of their HSC or were not aware of it. Negotiating discounts with suppliers and implementing cost saving initiatives were the main strategies employed to reduce costs in the HSC. Secure storage and access control measures were the main methods employed to ensure the security of medical supplies and equipment.

There was no knowledge or awareness of role of data analysis in HSCM. There was no knowledge or awareness of sustainability concerns in HSCM. There was no knowledge or awareness of collaboration with other stakeholders in HSCM.

Most of the respondents see Artificial Intelligence and some see Robotics & Automation as having the greatest impact on the future of HSCM. There was no awareness or knowledge of ensuring transparency and accountability in HSCM. More than half the respondents agreed to regulatory compliance for controlled substances for addressing the unique challenge of managing pharmaceuticals within the HSC while the rest were unaware.

Respondents generally agreed that sharing critical information in real time and building trust and relationships have an important role to play in HSCM. While many respondents could think of rapid response teams in case of changes and disruptions in the healthcare landscape, many others were unaware of it. Regarding desirable future improvements, respondents wanted advanced analytics and predictive capabilities and sustainable environment friendly practices.

Conclusion

Effective SCM is essential for enhancing operational efficiency and service quality in various industries, including healthcare. By addressing the unique challenges faced by healthcare supply chains, especially in developing countries, SCM can play a crucial role in improving patient care and stakeholder satisfaction. This

study provides insights into the current state of hospital SCM in Bhopal and gives insights for achieving better outcomes.

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