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A Review on the Healthcare Supply Chain Management in Transforming Hospital Services

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Abstract

The aim of this paper is to present a novel idea to revolutionize hospital services by integrating healthcare supply chain management principles. By using a web application which enables hospitals to establish a real-time connection and streamline patient transfers. Many sectors focus on supply chain management optimization and qualifications to construct a better network of suppliers for their end consumers. Especially in healthcare sector, not only for pharmaceutical products but also for hospital materials, supply chain management gets importance for service quality and patient satisfaction. Thus, there are many studies about supply chain management in healthcare to emphasize its importance. In this study it is aim to put forward more review of existing solution on healthcare management system and patient transfer.

Keywords- Supply Chain Management, Healthcare Service Delivery, MERN stack web application, Real-time data processing, Patient Transfers, Predictive Analytics, Patient-Centric Care, Efficiency, Seamless Coordination, Fast Connectivity

INTRODUCTION

Supply chain management (SCM) can be defined as a set of companies which transfers the product to the end user via suppliers, product assemblers, merchandisers and transportation companies which are the parts of a supply chain [11]. Another definition of a supply chain can be extended as the flow of goods, services and information starting from raw materials and going finally to the end user [3]. The importance of Supply Chain Management continues to grow and to be introduced in the literature [4]. Supply chain, especially in multi-vendor supply chains, which can be globally or locally, may be difficult in terms of evaluation of performance as it is hard to define performance measurement criteria in a supply chain [5]. Furthermore, supply chain management provides an energy between local and global companies to integrate the process excellence of management and to manage the interaction between all members of a supply chain [6].

The integration of healthcare supply chain management principles with current technology appears as a disruptive way to modernize hospital services and improve patient care in this environment. In emergency situations, patients are transported from one hospital to another for better care and amenities. However, sometimes the transfer hospital would refuse to receive the patient due to other reasons. Through a seamless integration of supply chain principles with healthcare services, our innovative approach seeks to enhance collaboration between hospitals. It promotes a patient-centric care delivery model. The web application will enable healthcare providers to make more informed decisions, resulting in better coordination and eventually better patient outcomes. As critical care hubs, hospitals are continually challenged with properly managing patient transfers to ensure that every individual receives the most appropriate and timely medical attention. However, the procedure of transferring patients between hospitals is frequently complicated, resulting in delays and significant gaps in care [1] [7].

LITERATURE REVIEW

Author IBN EL FAROUK and JAWAB Fouad [7] in the 13th International Conference of Logistics and Supply Chain Management published a paper on improving sustainability in public hospitals through medicine supply chain management. They highlighted the significance of this approach in enhancing the healthcare system's effectiveness. Their research focused on two crucial aspects: managing expenses for medicines and ensuring high-quality patient care. Their three-step plan involved conducting a thorough audit of the medicine supply chain, identifying and understanding any issues, and providing practical recommendations for improvement. Their study centered on a major public hospital in Casablanca, Morocco, which served as a valuable case study for understanding the complexities within the healthcare system.[7]

Walker et al. (2008)[12] studied the important factors of green supply chain management and initiatives in the private and public sector such as external and internal barriers to implement the environmental concepts. In order to understand how laws affect hospitals' suppliers, researchers also looked at a private healthcare provider as a case study. They concluded that hospitals typically chose local suppliers to support the local economy.[12]

Baltacioglu et al. (2007)[3] provided a standard supply chain model for the service industry. The essential parts of the chain are incorporated in the proposed model and include capacity, demand, customer and supplier relationships, service management, and order operations management. This concept can be used in the healthcare industry [13].

McKone-Sweet et al. (2005)[14] studied supply chain management implementation to healthcare sector. They discovered some limitations, including lack of leadership, ambiguous incentives, data collection and evaluation, team operations for procurement, and all parties in the chain. The key issue is the practical application of leaders' and managers' understanding of the supply chain, which has a direct impact on supply chain performance [14].

Kwon et al. (2016) [15] discussed the importance of supply chain management in healthcare sector in terms of costs of patients compared to the rate of readmission. They also investigated the three main strategic areas in order to increase the profit of suppliers and to improve supply chain process and concluded that the quality of healthcare service quality depends on the supply chain surplus [15].

The COVID-19 pandemic has presented unprecedented challenges to healthcare systems, and a major issue facing patients during this period is network instability between hospitals and healthcare facilities. Healthcare supply chain management is a complex and challenging area that plays a key role in ensuring efficient patient care. However, the increasing complexity of healthcare systems and increasing patient demand have increased the need for high-speed connectivity in patient transport between hospitals. There are lots of challenges posed by unstable networks during the pandemic like "COVID-19" by implementing a robust and reliable communication system between hospitals[9].

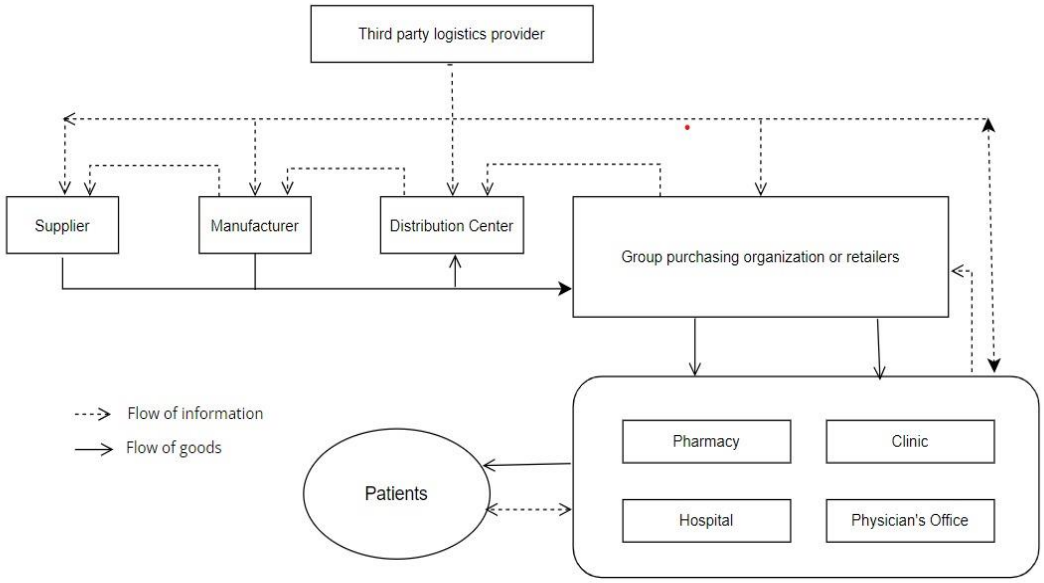

Fig.1 The effect of the product flow and service quality on HSCM [8]

Getele, G. K., Li, T., & Arrive, T. J., in their paper,[7] The Role of Supply Chain Management in Healthcare Service Quality, explained the diagram shown in Fig, which shows the effect of products and service quality management on HSCM. First, information flows into the healthcare organisation as to what kind of product is needed, then a producer can produce and distribute to the group purchasing organisation (practitioners working in the purchasing department), and after that, it can be delivered to the hospital or other sectors of health service (HS). [2]

As mentioned in the article[10], authors used several parameters to analyse the supply chain management, some od parameters along with their number, mean ET Demand N (%), RR (CI), P value are shown in Table 1.

Table: Parameter used in Supply chain management [10]

Variables	Total number	% or Mean (ET) or Med(Q1 – Q3)	Deceased N (%)	RR (95% CI)	p-value
Referral time		1.4 (0.8-5.4)			0.014
One hour or less	127	37.8	6 (4.7)	1	
More than one hour	209	62.2	27 (12.9)	3.0 (1.2–7.5)	
Mode of transport to hospital					0.036
Ambulance	68	20.5	12 (17.7)	3.2 (1.2–8.6)	
Fire department or police	151	45.6	13 (8.6)	1.4 (0.5–3.7)	
Others (relatives or witnesses)	112	33.8	7 (6.3)	1	
Care during transfer					0.241
Yes	42	12.7	6 (14.3)	1.8 (0.7–4.6)	
No	289	87.3	25 (8.6)	1	

A sensitivity analysis of referral time noted that this variable was consistently associated with the incidence of death. The categorization of 'less than 1 hour' and 'more than 1 hour' is maintained because it is believed that patients with severe trauma

should be referred as soon as possible. 37.8% of the subjects referred within first hour after the accident. A similar observation was made in Nigeria, where 48.2% of the victims reached the emergency department within his first hour after the accident. Longer treatment times indicate an inadequate referral system, which is a contributing factor in the incidence of fatalities. In the chain model, hospitals optimize the time required for referrals [10].

Based on extensive research to date, it has become clear that the main focus in hospital supply chain management is to build connections between hospitals, hospital service providers and pharmacies. However, one important aspect that has been overlooked is the lack of direct connecting links between hospitals. To bridge this gap, our innovative web application acts as the critical link between hospitals, enabling seamless communication and collaboration. By building this critical bridge, our platform will improve the overall efficiency and coordination of hospital operations, facilitating a more connected and streamlined healthcare supply chain system.

OPTIMIZING HOSPITAL SUPPLY CHAIN MANAGEMENT

HSCM facilitates smooth communication and data exchange between hospitals, ensuring rapid access to medical records, patient information and critical resources. Hospitals will be able to efficiently coordinate patient transfers, consult with experts from other facilities, and share best practices, all in real time. This interconnected hospital network will improve the overall coordination of medical services, especially in emergencies, ultimately saving lives and improving patient care.

It offers seamless hospital-to-hospital communication, online consultations with doctors, 24-hour pharmacy services, organ transplant search capabilities, real-time tracking of available facilities, and much more. This web application aims to streamline healthcare operations to improve patient outcomes, reduce response times, and improve overall healthcare accessibility and efficiency. Through HSCM patients can enjoy a virtual consultation with experienced medical professionals. Patients can access medical advice from the comfort of their own homes, whether they live remotely or are practicing social distancing during the pandemic. This capability not only improves access to care, but also reduces strain on physical infrastructure, minimizes wait times and improves overall care efficiency.

The web application includes a search function that allows patients and hospitals to find organs available for transplantation at various medical facilities. Patients needing organ transplants can find suitable donors and available hospitals, greatly reducing waiting times for life-saving surgery. This capability will facilitate hospital-to-hospital collaboration, empower patients to make informed decisions about their care, and ultimately improve transplant success rates. Patients and hospitals can use a web application to find nearby hospitals that offer a particular facility or service. This feature ensures that patients are directed to the most appropriate medical facility, especially in emergencies and special medical cases. This capability improves patient outcomes and reduces strain on overburdened hospitals by optimizing the use of medical resources.

CONCLUSION

The complexity of healthcare supply chain management poses significant challenges in the rapidly evolving healthcare environment. As patient demands increase, the need for efficient and fast connectivity in patient mobility becomes more and more important. The proposed web based application, represents an innovative solution to address these challenges and revolutionize hospital services.

The real-time data processing and predictive capabilities of the MERN stack enable hospitals to make informed decisions and optimize resource allocation during patient transport. Web applications streamline the transfer process by facilitating seamless communication and coordination, reducing delays and improving overall patient care. Proactive resource management prepares hospitals for timely admission of incoming patients and improves the efficiency of medical service delivery.

The MERN stack-based web application can become a promising avenue for improving medical supply chain management and patient transport in hospitals. By leveraging technological advances, healthcare facilities can optimize patient care, improve operational efficiency, and improve the standard of care delivery. As the healthcare industry continues to evolve, integrating MERN stack technology into supply chain management will overcome complexity, streamline operations and ultimately improve the quality of patient care in the modern healthcare ecosystem. It will be a great opportunity.

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