

## Exploring the Impact of Integrated Supply Chain Management on Healthcare Performance: An Indian Perspective

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### Abstract

In the last decade, the healthcare sector in India has witnessed a lot of transformation owing to the rising demand for healthcare, fast technological advancement, Government healthcare reforms, and the experiences of the COVID-19 pandemic. Integrated Supply Chain Management (ISCM) is an important strategic management tool for optimizing healthcare performance by facilitating better coordination, information sharing, inventory management and service delivery in this changing context. The healthcare supply chain in India is complex, with various stakeholders such as pharmaceutical companies, distributors, hospitals, healthcare providers, government organizations, and patients. The healthcare supply chain is still plagued by inefficiencies despite significant investments in building up healthcare infrastructure. Even with the extensive investments in healthcare infrastructure, the supply chain is still an issue on the quality of services, operational efficiency, and patient outcomes. This is a narrative review of how the integrated supply chain management affects healthcare performance in India. The review covers theoretical considerations, policy evolution, management of healthcare supply chains, technological adoption, and empirical insights from Indian healthcare institutions. The results suggest that processes of an integrated supply chain positively affect inventory optimization, procurement efficiency, service quality, availability of healthcare and organizational resilience. Moreover, India is witnessing a paradigm shift in healthcare logistics and operational decisions with the emergence of technologies like Artificial Intelligence, Blockchains, Cloud Computing, and Digital Health Platforms. The review highlights significant research gaps in the areas of sustainability, digital transformation, resilience and performance measurement, and suggests future research directions for researchers and practitioners. This research adds to the growing body of research related to healthcare supply chain management in the Indian context and underscores the need for supply chain integration to create efficient, resilient, and patient-centric healthcare systems.

**Keywords:** Integrated Supply Chain Management, Healthcare Performance, Indian Healthcare System, Healthcare Logistics, Digital Health, Supply Chain Integration, Healthcare Resilience.

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## 1. Introduction

India has one of the world's most complex and large healthcare systems, catering for a population of more than 1.4 billion people. The healthcare industry is also an important player in both the economic development and the health impact of the population. In the last 20 years India has seen significant improvement in the healthcare infrastructure, the pharmaceutical manufacturing business, healthcare technology, and healthcare service delivery. Yet despite these developments, health care systems are still grappling with a number of day to day issues concerning access, cost, quality, and resource utilization.

Effective healthcare supply chain management is one of the biggest challenges that the Indian healthcare system is facing. Healthcare supply chains, which involve a large number of stakeholders, enable the flow of medicines, vaccines, medical devices, diagnostic equipment, consumables, information and financial resources. These supply chains directly affect the effectiveness of healthcare service delivery, patient outcomes, and healthcare organizations' performance. In the past, Indian healthcare institutions had not focused much on managing the supply chain, devoting more time and resources towards clinical services and building new infrastructure. Increased healthcare costs, raised patient demands and competition amongst healthcare providers have, however, turned managerial focus to focusing on operational efficiency and supply chain optimization. Therefore, an integrated supply chain management (ISCM) strategy has been developed that helps to enhance the performance of healthcare.

Integrated Supply Chain Management is a whole-of-healthcare network approach to the efficient movement of information, materials and services throughout the organization. In order to bring about better responsiveness, lower cost, better service quality and increased organizational resilience, ISCM aims to achieve better collaboration between suppliers, manufacturers, distributors, hospitals, pharmacies and healthcare providers.

The recent years have witnessed a series of government initiatives that have contributed to the rapid transformation of healthcare and the integration of digital elements. New avenues for modernization of Healthcare Supply Chain due to initiatives like Ayushman Bharat, National Digital Health Mission (NDHM), e-Sanjeevani telemedicine services and Ayushman Bharat Digital Mission (ABDM) have been opened up. At the same time, India's pharmaceutical industry, one of the biggest in the world, has increasingly been using sophisticated technologies and logistics practices to enhance their operations.

## 2. Objectives of the Study

1. To understand the concept and significance of integrated supply chain management in the Indian healthcare context.
2. To examine theoretical perspectives explaining healthcare supply chain integration.

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3. To review empirical literature concerning healthcare supply chain practices in India.
4. To analyze the role of digital technologies and healthcare reforms in strengthening supply chain integration.
5. To identify major research gaps and future research opportunities related to healthcare supply chain management in India.

### **3. Research Methodology**

In this study, a narrative literature review methodology has been employed to review the existing literature regarding integrated supply chain management and healthcare performance in India. A narrative literature review has been chosen for this study as it provides scope for a comprehensive exploration of theories, findings, policies, and trends in an area of developing research.

References have been gathered from various academic sources such as Scopus, Web of Science, ScienceDirect, Emerald, Springer Link, Taylor & Francis, Wiley Online Library, and Google Scholar.

The process utilized combinations of keywords such as "Healthcare Supply Chain Management," "Integrated Supply Chain Management," "Healthcare Logistics," "Hospital Supply Chain," "Healthcare Performance," "Healthcare Integration," "Digital Health," "Healthcare Resilience," and "India."

The collected literature was analyzed thematically to identify major research streams, emerging trends, theoretical foundations, and research gaps related to healthcare supply chain management within India.

### **4. Theoretical Framework**

#### **4.1 Resource-Based View (RBV)**

The Resource Based View suggests that an organization can gain sustainable competitive advantages by using its core strengths and resources, which are characterized as valuable, rare, difficult to imitate, and non-substitutable (Barney, 1991). In health care organizations, the integration of logistics and information systems, suppliers' relationships, and logistics expertise are strategic resources.

#### **4.2 Dynamic Capabilities Theory**

Dynamic Capability Theory focuses on organizational capabilities of adapting and restructuring resources in line with changes in the environment (Teece et al., 1997). The Indian healthcare industry functions in a fast-changing environment, where technologies, demands, and regulatory changes occur frequently. Integration of the supply chain increases the organization's agility and flexibility, helping it cope better with changing circumstances.

#### **4.3 Systems Theory**

In Systems Theory, healthcare organizations are considered to be systems that are made up of many

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stakeholders. The success of the healthcare organization is dependent on coordination between suppliers, hospitals, distribution channels, healthcare practitioners, and the customers.

#### **4.4 Supply Chain Resilience Theory**

Supply Chain Resilience Theory explains how organizations anticipate, absorb, and recover from disruptions. The COVID-19 pandemic demonstrated the importance of resilience within healthcare supply chains and reinforced the need for visibility, flexibility, and collaboration among healthcare stakeholders.

### **5. Literature Review**

#### **5.1 Evolution of Healthcare Supply Chain Management in India.**

Stakeholders in the Indian healthcare sector include a wide variety of organizations such as manufacturers, distributors, hospitals, clinics, diagnostics facilities, regulatory authorities, insurance companies, and patients. The complexity involved in the health care ecosystem makes managing the flow of medicines, medical devices, consumables, and information very challenging. For these reasons, research has focused on recommending integration initiatives that can help foster collaboration among supply chain participants.

Agarwal & Narain (2018) found that many times, inefficiency arises within the health care organizations due to fragmentation, lack of visibility, information exchange problems, and poor collaboration among supply chain participants. Such inefficient practices lead to shortages, increased costs, delays, and dissatisfied patients. It was suggested that integration of the supply chains could be an effective solution since it fosters collaboration and synchronization among all processes.

In recent times, the introduction of various healthcare policies and initiatives has sparked a lot of interest in integrating the supply chains. There are several government programs which aim at improving health care services by enhancing access and the quality of care. Due to these reasons, the importance of supply chain management has been widely recognized within the healthcare sector.

#### **5.2 Healthcare Supply Chain Integration and Organizational Performance**

Research indicates that integration of the healthcare supply chain has a positive impact on the performance of healthcare organizations in India. Studies show that integration within the healthcare supply chain has a positive impact on healthcare organizations in India. Supply chain integration is defined as the coordination of internal departments and external parties such as suppliers, distributors and healthcare partners.

Researches carried out in Indian hospitals have shown that the integrated procurement systems play a significant role in the efficiency of the operations. Centralized procurement helps increase purchasing power, lower transaction costs, and better inventory control. Kumar and Sharma (2020) found that hospitals with integrated procurement systems have fewer stock-out issues, lower costs

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of procurement and better availability of medical supplies.

Internal integration has also been a lot of focus in research for the healthcare supply chain. It is important for departments like procurement, pharmacy, finance, inventory management, clinical services, and others to work in coordination to ensure smooth healthcare operation. Hospitals with a higher capability of internal integration have been found to have better resource utilization and quicker decision-making processes (Singh & Gupta, 2021).

External integration enhances the relationship between health care organizations and suppliers. Good supplier partnerships help with exact demand forecasting, replenishment of the stock and better quality assurance of products. Research suggests that a strategic supplier partnership can lead to more reliable supply and better healthcare service provision (Kumar et al., 2022).

The literature has shown that an integrated supply chain in healthcare organizations provides better performance than an organization with a fragmented supply chain. Reduced operational cost, better inventory management, better service quality and higher patient satisfaction are among the benefits to enjoy.

### **5.3 Digital Health Initiatives and Supply Chain Integration in India**

Digital transformation has emerged as a key enabler for the healthcare supply chain modernization in India. Digital health programs and trends that have been introduced by governments, along with technological innovations like HDR, have created opportunities to improve information integration, visibility, and decision making across health system supply chains.

The most important progress so far has been the rollout of Ayushman Bharat Digital Mission (ABDM) by the government, which was previously called the National Digital Health Mission. The strategy aims to create a holistic digital health care ecosystem, where health care providers, patients, pharmacies, labs and insurers will be linked up by interconnected digital platforms. Researchers state that this helps in sharing of information and evokes the idea of integrated healthcare service delivery (NITI Aayog, 2021).

Hospitals in India have been making a transition to Electronic Health Records (EHRs), Hospital Information Systems (HIS), and Enterprise Resource Planning (ERP) systems. The technologies help health providers connect procurement, inventory, logistics, finance and clinical operations in a single digital system. Research has indicated that the use of digital integration can lead to improved operational efficiency by minimizing manual tasks and ensuring greater accuracy in information (Patel & Desai, 2022).

However, the healthcare supply chain integration has also been aided by the use of technology related to clouds. Cloud-based platforms enable geographically distributed stakeholders to communicate and provide instant access to healthcare information. It's an improved connection that better coordinates hospitals, suppliers, distributors, and government agencies.

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In the healthcare supply chain, AI and the use of predictive analytics are becoming more and more common. The models based on AI can predict demand trends, manage inventory levels, and enhance procurement processes in healthcare organizations. Predictive analytics has great potential to improve healthcare resource allocation and operational efficiency (Sharma et al., 2023).

#### **5.4 Pharmaceutical Supply Chains and Healthcare Performance**

India is one of the world's biggest producers of medicines and has a significant role in the world's supply chains of medicines. Pharmaceutical industry plays a vital role in the delivery of health services because of its capacity to provide affordable drugs in the domestic and international market. As a consequence, pharmaceutical supply chain management is a key focus of academic and applied research.

Studies have shown that integration of the supply chain has great impacts on pharmaceutical performance. An integrated information system supports demand forecasting, production planning, inventory management and coordination of distribution. This integration shortens the lead time and enhances the availability of medicines, consequently leading to better healthcare outcomes (Narayana et al., 2021).

In their article, Kumar and Chandra, 2022, further emphasized the strategic significance of the pharmaceutical supply chains. India has become a major producer of vaccines and essential medicines during the pandemic and at the same time faced a problem of transportation, procurement, and inventory management. Research has indicated that companies with better integration were more resilient and high on the operational continuity during this time.

In recent years, cold chain management has gained greater significance in the pharmaceutical logistics, especially for the transportation of vaccines and temperature-sensitive goods. The researchers highlight the importance of integrated monitoring systems, IoT sensor technologies and real-time tracking solutions for ensuring product quality and minimizing losses (Verma et al., 2023).

Effective integration of the pharmaceutical supply chain has been consistently associated with the performance of the healthcare system, which should, at a minimum, include making medicines available, cutting costs, improving regulatory compliance, and facilitating greater access for patients to essential healthcare products.

#### **5.5 COVID-19 Lessons and Healthcare Supply Chain Resilience**

One of the biggest challenges any healthcare system faced around the world during the pandemic was COVID-19. The COVID-19 outbreak in India revealed the fragility of health care supply chains and the critical need for integration, visibility, and resilience.

PPE, oxygen cylinders, ventilators, medicines, vaccines, and hospital beds were all in high demand in the healthcare sector, seeing unprecedented demand. There were significant operational issues due to shortages, transportation disruption, and uncertainty of demand. These experiences have been

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found to be essential in lessons for healthcare supply chain management.

According to Reddy & Sinha, 2022, it is claimed that healthcare institutions that established supply chain systems were more resilient than others during the pandemic. The improved sharing of information led to quicker decision making and resource allocation. Coordinated responses were enabled by inter-agency, inter-sector, inter-provider, and inter-logistics partnership.

The pandemic pushed digital transformation forward in health supply chains. The pandemic has accelerated digitalisation in health supply chains. The role of telemedicine platforms, digital procurement systems, predictive analytics and real-time inventory monitoring tools grew in significance for healthcare service delivery. Due to these technological innovations, the post-pandemic strategies of healthcare supply chains are still affected.

Bhatia & Jain, 2023, believes resilience should be seen as more than a crisis management tool, as it should be part of the healthcare supply chain strategy. To create resilient health care supply chains, investments must be made in supplier diversification, visibility, flexibility, digital technologies, and collaborative networks.

### **5.6 Healthcare Performance Outcomes of Integrated Supply Chain Management**

Improvement of operational performance is shown through reduced procurement cost, low inventory holding cost, better resource allocation, shortened lead time, and increased logistics efficiency. Hospitals that use integrated supply chains always demonstrate better operational efficiency (Gupta et al., 2022).

Financial performance is another area of gain resulting from efficient supply chains. The effective process of procurement and inventory helps achieve financial savings. Several studies have highlighted that the effective implementation of integrated supply chains assists in dealing with rising costs in healthcare.

Improved service quality is an additional outcome that can be associated with supply chains. Enhanced coordination and availability of resources lead to shorter waiting periods and reliable services. Studies have established a positive correlation between service quality and supply chain integration.

Finally, the impact on patient safety and accessibility can also be identified. Better access to medicines and medical equipment ensures the effective delivery of health services. Thus, efficient supply chains improve both organizational and public health outcomes.

### **6. Research Gap**

These studies have largely been concerned with operations-related factors like procurement efficiency, inventory management, logistics optimization, and costs savings. Although these elements are crucial, little effort has been devoted to studying the connection between integrated supply chain

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management and the impacts on clinical outcome, patient safety, access to healthcare services, and public health performance. Future researchers need to make an effort to create a stronger connection between supply chain integration and its influence on the performance of healthcare services. In view of the fact that most of the Indian supply chain literature related to healthcare has been based on large private hospitals and the pharmaceutical industry, it appears that not much effort has been made on the study of supply chain integration in public healthcare facilities, primary healthcare centres, and rural healthcare services.

Though the use of various digital technologies including Artificial Intelligence (AI), Blockchain, IoT, Big Data Analytics, and Cloud Computing is now increasingly talked about in the context of healthcare supply chains, empirical research on the effective implementation of these technologies and their sustained use over time is relatively underdeveloped. Much of the current body of literature on the subject matter appears more conceptual in nature. It is also recommended that future research should address technology adoption impacts using longitudinal methods. Sustainability is one area that has not been well addressed in the Indian healthcare supply chain research community. Issues related to biomedical waste, carbon emissions, green procurement, sustainable packaging, and even circular healthcare supply chains appear under researched. Considering how important sustainability has become in the healthcare sector around the world, future research can focus on incorporating environmental goals into healthcare supply chains. Furthermore, relatively little research has addressed the impact of new government healthcare policies and programs such as Ayushman Bharat Digital Mission (ABDM) and those of NHA on supply chain management and performance.

### **7. Future Scope**

There is a need for researchers to consider the application and implementation of new technologies including Artificial Intelligence, Blockchain, Digital Twins, Machine Learning, Robotic Process Automation, and Predictive Analytics in Indian healthcare supply chains. A comparative analysis of technology adoption among the public and private organizations could add immensely to our body of knowledge. Researchers could also consider studying the influence of healthcare policies on supply chain integration. It would be interesting to know how government policy has influenced the logistics and procurement processes as well as the digital revolution in healthcare.

Lastly, researchers could take a multidisciplinary approach by integrating healthcare management, operations management, information systems, public health, logistics, and sustainability perspectives into their research.

### **8. Conclusion**

HSCM has become a strategic priority in the Indian healthcare sector as a result of the growing demand for healthcare services, technological upheaval, rising standards of the patients and changing policy landscapes. India's healthcare system is complex, and more coordination among

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stakeholders like suppliers, pharmaceutical companies, distributors, healthcare providers, government bodies, and patients is needed. As such, Integrated Supply Chain Management (ISCM) has emerged as a critical enabler to an efficient, resilient and patient-centric healthcare delivery. This review aimed to compile the findings of literature published till 2024 regarding the effect of the integrated supply chain management (ISCM) on healthcare performance in India. The results suggest that integrating the supply chain has positive effects on operational efficiency, inventory management, procurement effectiveness, financial performance, health care accessibility, service quality and patient outcomes. Integrated healthcare supply chains are linked with better coordination, better resource utilization and better responsiveness to the ever changing healthcare needs.

The review also points to the transformative power of digital technologies to enhance the integration of the healthcare supply chain. The healthcare industry is rapidly changing and evolving, fueled by government programs like Ayushman Bharat Digital Mission, as well as the growing popularity of ERP systems, cloud computing, AI, Blockchain technology, and predictive analytics, which are driving the modernization of healthcare supply chains in India. The COVID-19 pandemic was a pivotal moment for healthcare supply chain management, highlighting the need for resilience and integration across the supply chain as well as revealing vulnerabilities in the system that can be addressed through the use of these technologies. Healthcare firms with higher integration capabilities were more resilient and sustainable in times of disruption.

Solving these challenges will require a coordinated response from healthcare organizations, policy makers, technology vendors and researchers and it is evident from the literature that the capability of integrated supply chain management can help to improve healthcare performance and to build a more efficient, resilient and sustainable healthcare system in India. The integration of healthcare products and services into the global supply chain will continue to play a pivotal role in the success of organizations and the quality of healthcare services provided.

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