

Integrated Healthcare Supply Chain Practices and Hospital Performance in Pune

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Abstract

The healthcare industry is characterized by a rapidly changing environment where proper resource, information, and service management are vital to provide high-quality health services to patients. Integrated Supply Chain Management (ISCM) is a strategy aimed at coordinating activities of various supply chain partners such as suppliers, manufacturers, distributors, health facilities, and patients. The rise in the complexity of health service delivery systems, higher cost of healthcare delivery, and increasing consumer demands make it necessary for organizations to adopt ISCM principles. This paper is going to discuss a narrative literature review about health supply chain management focusing on the case of Pune. Pune has gained recognition as an important healthcare hub in India owing to the presence of public and private hospitals, pharmaceutical firms, diagnostic centres and healthcare IT organizations in the region. The review will cover aspects such as the evolution of health supply chains, dimensions of integration, and their effect on process optimization, operational waste, inventory management, operational performance, and cost management. Current literature shows that organizations adopting ISCM principles have better information flow and coordination, less operational waste, and increased resilience to disturbances. The review also brings into focus the contribution that technology, such as ERP, RFID, IoT, blockchain, and AI, makes towards supply chain integration. Although there is an abundance of literature available, many challenges still exist related to interoperability, adoption of technology, data security, and resistance to change among others. Conclusions drawn from the analysis reveal important research gaps that need to be addressed in the future through healthcare supply chain resilience, sustainability, and digital transformation. This review offers valuable insights into the significance of integrated supply chain management strategy in improving the performance of healthcare organizations.

Keywords: Integrated Supply Chain Management, Healthcare Performance, Supply Chain Integration, Healthcare Logistics, Digital Healthcare, Patient Outcomes, Operational Efficiency.

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1. Introduction

There have been notable changes within the health care sector within the last few decades because of various factors such as the emergence of technology, changes in customer expectations, globalization, among others. The distribution of health care services is dependent on the movement of drugs, machinery, information, and manpower across the network. Therefore, it can be concluded that there has been a need to incorporate health care supply chain management within the system.

Historically, healthcare providers concentrated on clinical performance without giving much thought to supply chain efficiency. Yet, rising costs in the industry, competitive pressure, and disturbances in international supply chain networks have drawn more interest towards strategic supply chain management initiatives (Christopher, 2016). Among many, healthcare supply chains are considered to be one of the most complicated supply chains owing to the presence of a number of parties, regulatory constraints, the diversity of products, and crucial services provided in healthcare (Bhakoo et al., 2012). Problems within the healthcare supply chain may result in high costs, scarcity of supplies, delays in treatment delivery, and diminished service quality, among others. To overcome these issues, Integrated Supply Chain Management (ISCM) has emerged as a powerful strategic tool. ISCM can be defined as an approach to the systematic coordination of activities, resources, and stakeholders of the supply chain with the aim to ensure efficient information exchange and resource allocation throughout the entire process. ISCM differs from other conventional supply chain management strategies in terms of emphasis on coordination, synchronization, and integration of activities within supply chains.

There have been various reasons why the city of Pune is considered an important healthcare center with well-known pharmaceutical companies located here. Such companies play a crucial role in the efficient healthcare delivery process within Western India and the world in general, thus proving the significance of healthcare supply chain management (Government of Maharashtra, 2023; National Health Authority, 2024). Supply chain integration gained particular prominence with the rise of major global events like pandemics, disasters, and health-related emergencies. Healthcare institutions with high integration levels were found more resilient while facing unexpected changes in their demand (Ivanov & Dolgui, 2020). This has improved the appreciation of the ISCM concept as a strategic capability rather than just an operational function. Organization integration improves the level of coordination between various departments within the healthcare organization, whereas organization integration helps establish effective connections with suppliers, distributors, and health care partners (Prajogo & Olhager, 2012). In addition, the rise of technological solutions has contributed to the increase in integration of healthcare supply chains. Technologies such as ERP systems, RFID technology, cloud computing, blockchain, IoT, and artificial intelligence have changed the nature of the healthcare supply chain, making it a more interconnected network system (Queiroz et al., 2021). As a result, visibility and traceability capabilities have been improved, enabling decision-making and service delivery improvement.

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Even though there are a number of advantages that can be achieved from ISCM within the health care industry, there are a myriad of challenges that have been experienced by many organizations in the implementation of integrated supply chains (Mustaffa & Potter, 2009). Some of the challenges include fragmentation of health care systems, lack of technical capability, organization resistance, information exchange limitations, among others.

2. Objectives of the Study

1. To conceptualize integrated supply chain management (ISCM) in healthcare.
2. To evaluate healthcare supply chain integration dimensions and their impact on performance.
3. To synthesize literature on ISCM's effect on efficiency, quality, cost, and patient outcomes.
4. To analyze the role of digital technologies in facilitating supply chain integration.
5. To identify research gaps and propose future directions in healthcare supply chain management.

3. Integrated Supply Chain Management in Healthcare

Supply chain management (SCM) is the process through which the activities associated with the procurement, acquisition, production, distribution, and delivery of goods and services from the suppliers to the consumers are planned, coordinated, and controlled (Mentzer et al., 2001). In the healthcare industry, supply chain management involves the flow of medicines, devices, diagnostic equipment, supplies, information, and funds among other things, between various parties. The supply chains that operate in the health care industry are quite distinct from traditional industrial supply chains because the significance of health care delivery and the importance of the supply chain in delivering health care services are very crucial to patient care.

The concept of Integrated Supply Chain Management goes beyond the scope of conventional SCM by stressing the need for cooperation and coordination between the various members of the supply chain. According to Flynn et al., (2010), supply chain integration refers to the extent of strategic collaboration among organizations within the supply chain and the management of organizational processes within and between firms. The purpose of integration is to create a seamless network.

Healthcare supply chain integration generally consists of three major dimensions:

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Dimension	Description	Key Benefits
Internal Integration	Refers to coordination among various departments within a healthcare organization, including procurement, pharmacy, inventory management, logistics, finance, and clinical services.	Effective internal integration facilitates seamless information flow and operational alignment across functional units (Flynn et al., 2010).
Supplier Integration	Involves establishing collaborative relationships with suppliers to improve procurement efficiency, inventory availability, quality assurance, and responsiveness.	Supplier integration enables organizations to synchronize procurement activities and strengthen supply chain partnerships (Prajogo & Olhager, 2012).
Customer and Stakeholder Integration	Focuses on aligning healthcare services with patient needs and expectations through collaboration among hospitals, healthcare providers, distributors, insurers, and patients.	This dimension promotes coordinated healthcare delivery and enhances stakeholder engagement (Bhakoo et al., 2012).

By integrating processes, information, and stakeholders, healthcare organizations can improve operational performance, reduce costs, increase service quality, and enhance patient satisfaction. Consequently, ISCM has become a strategic priority for healthcare systems worldwide seeking to achieve sustainable performance improvements.

4. Theoretical Foundations of Integrated Supply Chain Management in Healthcare

The increasing significance of integrated supply chain management in healthcare has led to scholars applying different theories that explain the phenomenon from various angles. Theories describe why healthcare organizations opt for integration, how the integration affects their performance, and the processes through which value creation takes place in healthcare supply chains. The most popular theories in healthcare supply chain studies include the Resource-Based View (RBV) theory, Dynamic Capabilities theory, Systems theory, and Supply Chain Resilience theory.

4.1 Resource-Based View (RBV)

The Resource Based View (RBV), introduced by Barney (1991), is the view that organizations gain competitive advantage via valuable, rare, inimitable, and non-substitutable resources. In the healthcare industry, an integrated supply chain is becoming a strategic resource in improving organizational performance. A good relationship with the suppliers, information system, network, and logistics improve organizational performance in the healthcare field, where competitors might

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be hard pressed to mimic the same.

Efficient integration of procurement, inventory management, logistics, and information systems makes organizations more efficient and provide better services in the healthcare industry. This means that organizations make good use of their resources to be more responsive and cost-effective (Prajogo & Olhager, 2012). RBV can therefore help to explain why integrated supply chains improve healthcare organizations' performance.

4.2 Dynamic Capabilities Theory

Unlike RBV that centers on resource ownership, dynamic capability approach highlights the organizational ability to modify its resources based on changes in the environment (Teece et al., 1997). For instance, healthcare organizations operate under conditions that feature technological innovations, changes in patients' needs, regulatory amendments, and unforeseen shocks to the organization.

The integration of healthcare supply chains allows for the continuous tracking of changes in the environment, sharing of information, and operational adaptation to such changes. In particular, through dynamic capabilities like supply chain flexibility, responsiveness, and agility, healthcare organizations are able to sustain their operations despite uncertainty (Dubey et al., 2021).

4.3 Systems Theory

In this case, System Theory perceives an organization as a set of systems comprising several interrelated parts that work together towards a common goal (Von Bertalanffy, 1968). Health care chain systems include such institutions as hospitals, suppliers, manufacturers, distributors, pharmacies, health insurance agencies, and patients that have the potential to impact the whole system.

Based on the theory, it becomes apparent that problems in any single part of the health care supply chain can adversely impact the performance of the whole chain. The main advantage of integrated supply chain management is the coordination among different agents, which leads to an efficient flow of information, materials, and services through the entire system.

4.4 Supply Chain Resilience Theory

Organizations in the healthcare sector have been witnessing increased risks associated with disruptions in their supply chains, which may occur due to pandemics, natural catastrophes, geopolitics, and market conditions.

According to Supply Chain Resilience Theory, the capacity of organizations to foresee, endure, respond, and restore themselves following a disruption, while keeping their operations running, is vital (Ponomarov & Holcomb, 2009). Integrated supply chains play a crucial role in developing

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resilience in terms of improving visibility, collaboration, and sharing of risks among all parties involved (Ivanov & Dolgui, 2020).

5. Literature Review

5.1 Supply Chain Practices and Hospital Performance in Pune

Supply chain integration has been considered an important topic within health care management studies because of its ability to enhance operations efficiency, service delivery, and patient results. Academic literature has maintained that there is substantial potential for health care institutions to derive numerous advantages through the establishment of stronger links between different departments of the same institution, and even between different supply chain entities from the outside.

The existence of the Serum Institute of India, one of the biggest manufacturers of vaccines globally, helps strengthen the health care system of Pune due to the company's huge distribution network (Serum Institute of India, 2023).

Mustaffa and Potter (2009) found that a fragmented structure of a supply chain often leads to stock shortages, inefficient purchasing processes, and high operating costs. The authors believe that more integrated healthcare systems have better inventory visibility and do not experience duplications in their operations.

The study carried out by Bhakoo et al. (2012) evaluated healthcare supply chain management processes and concluded that cooperation in the relationship between hospitals and suppliers greatly enhances the effectiveness of the supply chain management process. Cooperation between the two parties helped to bring about reduction in procurement costs, enhanced reliability of services, and ensured product availability.

In addition, Prajogo and Olhager (2012) studied the connection between supply chain integration and organizational performance. Their results indicated that internal and external supply chain integrations had positive impacts on operational performance. In addition, internal integrations led to better departmental coordination while external integrations enhanced the organization's relationship with its suppliers and customers.

As pointed out by McKone-Sweet et al. (2005), many healthcare facilities allocate a sizeable chunk of their budget towards supply chain operations. Integration would ensure that purchasing activities are effectively managed to yield great efficiencies in terms of minimizing wastage and better inventory management, thus saving lots of money. There is also research evidence indicating that supply chain integration plays an essential role in determining patient care. Coordinated efforts among healthcare facilities, suppliers, and logistics firms would ensure timely delivery of medications, medical equipment, and other health care items, hence improving patient safety and

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quality of care (Bhakoo et al., 2012).

In conclusion, there is substantial evidence indicating that there is a direct positive relationship between supply chain integration and health care success.

5.2 Digital Healthcare Infrastructure and Supply Chain Integration in Pune

The evolution of digital technologies has revolutionized the healthcare supply chain in terms of timely information exchange, visibility, and decision-making capabilities. Integration of information can be regarded as one of the key aspects of integrated supply chain management in that it promotes coordination among various parties involved in the healthcare supply chain while minimizing uncertainty and inefficiencies.

Various digital healthcare programs developed in the context of Pune's Smart City concept have increased access to information and promoted coordination in the provision of healthcare services in urban healthcare establishments (PSCDCL, 2023).

One of the most commonly applied technologies in healthcare supply chain integration is enterprise resource planning (ERP) systems. ERP systems promote integration and centralization of the information through integrating procurement, inventory, accounting, logistics, and clinical activities. There are studies suggesting that ERP system implementation increases visibility and improves decision-making capabilities (Kelle & Akbulut, 2005).

Radio Frequency Identification (RFID) is yet another area of focus in the healthcare field of supply chain management. The main advantage of RFID is the ability to track goods, equipment, and other items automatically and at any point of their circulation in the chain. According to Wang et al., RFID adoption positively impacts inventory accuracy, loss reduction, and patient safety (2006).

Another technological development associated with improved healthcare supply chain management is that of the Internet of Things (IoT). The IoT allows the constant monitoring of inventory status, condition of equipment, environmental factors, as well as the needs of patients. Ben-Daya et al. emphasize the importance of IoT to enhance supply chain efficiency and facilitate predictive decision-making processes (2019).

Finally, another revolutionary invention for healthcare supply chains is the introduction of Blockchain. Blockchain is known to be an efficient mechanism for conducting transactions and tracking products in any network of supply chains. According to Queiroz et al., blockchain technology offers higher traceability, security, and trust (2021). This technology could be especially beneficial in combating the issue of counterfeit pharmaceuticals in health care settings.

Artificial intelligence (AI) and analytics have become common in the optimization of the supply chain management activities of health facilities. AI forecasting techniques are capable of assisting healthcare institutions to be more efficient in forecasting future demands and thus optimizing their

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inventories and making good procurement plans. Machine learning can detect patterns within past data which can assist managers in predicting any disturbances (Ivanov et al., 2019).

In summary, it is clear from the literature review that the use of technologies plays a major role in improving the integration of healthcare logistics networks. Information integration with the help of technology such as ERP, RFID, IoT, blockchain, artificial intelligence, and cloud computing improves supply chain visibility and responsiveness among others. Technological integration is thus expected to become a key performance determinant for healthcare organizations.

5.3 Supply Chain Resilience in Pune Hospitals after COVID-19

Due to the rise of disruptions occurring in the world, resilience of the supply chain has become an important area of study within healthcare. Healthcare organizations function in environments characterized by a high level of uncertainty that is capable of disrupting the access to medicines, medical devices, protective gear, and health care services. Therefore, there has been an increasing interest in the ways of improving supply chain resilience.

According to Ponomarov and Holcomb, resilience is the capacity of a supply chain to anticipate, prepare for, react to, and recover from disruptions while keeping its operations uninterrupted (as cited in Ponomarov & Holcomb, 2009). Supply chain resilience becomes extremely important in the context of healthcare as a disruption could lead to adverse consequences on patients' health. Healthcare providers do not afford to experience any delays in deliveries since they perform crucial work.

In their studies, Christopher and Peck found out that information exchange and partnership are vital in improving organizational resilience (as cited in Ponomarov & Holcomb, 2009). Integrated supply chain helps stakeholders in identifying possible risks and responding to them in a coordinated manner. This quality proves extremely useful in healthcare supply chain as decisions should be made quickly.

Resilience gained more importance amid various health pandemics. Ivanov and Dolgui (2020) noted that healthcare providers whose supply chains were integrated showed better adaptability. Better visibility in supply chains helped managers notice shortages in supplies, reroute available supplies, and control procurement activities. The authors concluded that integration in the supply chain is not only beneficial for effectiveness; it is equally important for crisis management.

The importance of supply chain visibility in managing risks in health facilities was also stressed by research. Visibility means obtaining relevant and up-to-date information about inventory stocks, supplier performance, transportation services, and the demands for goods across the supply chain. It allows health care facilities to take precautionary actions before shortages happen (Brandon-Jones et al., 2014).

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Technology integration is important to increase the resilience capacity of the supply chain. Digital tools, prediction systems, IoT devices, and artificial intelligence systems can help obtain real-time data on potential risks and their mitigation. The work by Ivanov et al. (2019) states that digitally integrated supply chains show better responsiveness in times of uncertainty due to access to relevant information.

A study carried out after the COVID-19 period in Pune Municipal Corporation hospitals revealed that there was recognition by the healthcare organizations about the significance of proper management system, increased resource availability, support from skilled workforce and cooperation within departments for building resiliency and ensuring healthcare continuity services (Patil et al., 2024). Additionally, experiences during the pandemic period have shown that hospitals that had stronger integration abilities were well prepared in handling disruptions and maintaining their operations even in highly uncertain circumstances (Patil et al., 2024).

According to several literature reviews, healthcare supply chain integration is associated with high resilience and helps achieve continuity of operations. Healthcare organizations are able to handle any potential disruption and associated risks by enhancing their collaboration abilities, exchanging information, increasing visibility and technology support. Therefore, resiliency has become one of the most important results of integrated supply chain management in healthcare.

5.4 Inventory and Procurement Practices in Pune Healthcare Institutions

Inventory management is one of the biggest issues that healthcare organizations face today. It is critical for healthcare organizations such as hospitals and clinics to manage their inventory in a way that would allow them to ensure their sufficient stocks of medicines, surgical equipment, diagnostic devices, and other materials while at the same time reducing cost inefficiencies. Recent reforms in the healthcare sector along with advances in technologies have prompted healthcare organizations operating out of Pune to enhance inventory control and procurement by integrating their supply chains and working together strategically with suppliers (Patel & Desai, 2022; Government of Maharashtra, 2023).

According to Kelle and Akbulut (2005), information exchange within the framework of the supply chain partnership helps to decrease uncertainties and increases inventory control capacity. Improved visibility of inventory is one of the key advantages of integrated supply chain processes. The use of information technologies allows companies to observe their inventories in real time and make appropriate forecasting and replenishing decisions.

Research has also proven that collaborative relationships help healthcare providers to manage their inventories more effectively. For instance, the use of vendor-managed inventory system allows suppliers to track down the inventories and perform necessary operations. Such collaboration decreases the administrative burden of the process, increases the availability of goods and minimizes

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the costs associated with the procurement process (Bhakoo et al., 2012).

The implementation of procurement system also helped healthcare providers to increase their cost efficiency. Centralized procurement systems, product standardization and negotiation of more beneficial agreements with suppliers allow companies to benefit from economies of scale and decrease overall expenses on procurement process (Burns, 2002).

Principles of lean supply chain have also become common in healthcare inventory management. The main objective of lean systems is to reduce waste and inefficiencies. According to research, organizations adopting lean inventory management practices have experienced lower costs associated with holding inventory, faster deliveries, and effective use of resources (De Vries & Huijsman, 2011).

The issue of cost efficiency continues to be a priority for healthcare executives in many countries. Costs continue to grow in the healthcare industry because of population increases, aging population, technological advances, and patient expectations. Supply chain management costs account for a significant percentage of total operating costs in hospitals and therefore must be effectively managed (McKone-Sweet et al., 2005).

Research has proven that the integration of supply chain management processes enables healthcare organizations to save more on procurement, costs associated with holding inventory, more accurate forecasting of supplies, and efficient logistics operations. Successful integration of the supply chain processes makes it easier for an organization to achieve cost efficiency.

5.5 Service Quality and Patient-Centered Healthcare Delivery in Pune

Quality patient care remains the ultimate goal of healthcare organizations. It implies that healthcare delivery performance cannot be assessed in relation to efficiency or profitability alone. Patient satisfaction, quality service delivery, treatment effectiveness, and safety remain important measures of the success of an organization. Recent research emphasizes that the integration of supply chain management has a direct impact on patient-centered health delivery.

Effective service delivery and patient-centered healthcare delivery have emerged as important considerations for healthcare organizations in Pune, particularly regarding the need for timely provision of health resources and improvement of patient satisfaction through effective integration of supply chains and efficient healthcare delivery (National Health Authority, 2024; Government of Maharashtra, 2023).

Within the healthcare delivery industry in Pune, effective supply chain integration plays a critical role in service quality and patient-centered health delivery by ensuring the consistent provision of medicines, healthcare equipment, and other necessary healthcare resources (Patel & Desai, 2022; National Health Authority, 2024).

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According to Bhakoo et al. (2012), an integrated healthcare supply chain creates an opportunity for increased coordination between healthcare suppliers, healthcare providers, and logistics partners, hence creating a situation where there is increased efficiency in services provision. Coordination increases the chances of having healthcare resources where and when they are needed.

According to Mustaffa and Potter (2009), studies have revealed that healthcare organizations with integrated supply chains suffer less from shortages of supplies and more efficient supply chains. The quality of services in healthcare has been linked to supply chain performance. The timely acquisition of resources, efficiency in their storage, and effective demand forecasting contribute to the effectiveness of resource availability within the healthcare sector, hence improved delivery.

The emergence of the value-based health care framework has added yet another dimension to the relationship between supply chain management and patient-related outcomes. The value-based healthcare system focuses on optimizing patient outcomes based on their associated cost factors. An integrated supply chain helps to achieve this goal since its effectiveness lies in better use of resources, minimization of waste, and provision of healthcare products and services (Porter & Lee, 2013).

On the whole, one can note several ways in which the integration of a supply chain impacts patient-centred outcomes. Effective coordination, increased resource availability, reliable services, and more robust patient safety measures all work together to provide improved healthcare services and higher patient satisfaction rates.

6. Research Gap

There has been considerable advancement in the understanding of the linkages between integrated supply chain management and healthcare performance; however, there still exist some important research gaps in this domain that require further investigation. First of all, although many studies in healthcare supply chain management are conducted, they are predominantly based on cases from highly developed countries such as the US, UK, Germany, and Australia. In addition, there is very little research that investigates supply chain integration in the context of healthcare sector of developing and emerging economies. The healthcare industry in these countries may confront peculiar issues such as limited infrastructure, constrained resources, fragmented supply chain, and complex regulations. Moreover, most of the studies related to healthcare supply chain performance concentrate on operational factors like inventory optimization, procurement effectiveness, and cost savings. However, limited empirical evidence exists regarding healthcare supply chain integration in Pune hospitals.

7. Future Scope

Future studies need to conduct comparative analyses among different countries and their healthcare systems so that researchers can learn about how contextual elements affect the effectiveness of

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supply chain integration. Comparative studies between developed and developing healthcare systems will certainly bring about valuable information for future consideration and implementation. It is necessary for researchers to study how recent technological innovations like artificial intelligence, machine learning, digital twins, blockchain technology, and advanced analytics can help reform the healthcare supply chain. Issues like technology adoption challenges, investment returns, and organizational readiness need to be studied carefully. Additional empirical studies on the link between supply chain integration and patient-focused performance measures must be conducted. These studies will further bolster the case for investment in healthcare supply chains and initiatives regarding them. The growing trend toward value-based healthcare opens up new areas of inquiry. Researchers need to find out about the contribution of supply chain integration in creating value in healthcare.

8. Conclusion

Healthcare organizations operate in increasingly complex and dynamic environments where efficient resource management is essential for delivering high-quality patient care. Integrated Supply Chain Management (ISCM) has emerged as a strategic approach that enables healthcare organizations to improve coordination, enhance information sharing, optimize resource utilization, and strengthen relationships with supply chain stakeholders. This narrative review examined hospitals and healthcare institutions operating in Pune literature on the impact of integrated supply chain management on healthcare performance up to the year 2023. The review revealed that healthcare supply chain integration positively influences multiple dimensions of organizational performance, including operational efficiency, inventory management, procurement effectiveness, cost reduction, service quality, and patient outcomes. The findings demonstrate that integrated healthcare supply chains facilitate greater collaboration among stakeholders, leading to improved responsiveness and more efficient healthcare delivery highlighting the transformative role of digital technologies such as Enterprise Resource Planning systems, Radio Frequency Identification, Internet of Things, blockchain, artificial intelligence, and cloud computing in strengthening healthcare supply chain integration. These technologies enhance visibility, traceability, forecasting accuracy, and decision-making capabilities across healthcare networks.

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