


**OPTIMIZATION OF THE SUPPLY CHAIN IN HOSPITAL PHARMACIES: EFFICIENCY IN MANAGEMENT** <https://doi.org/10.63330/aurumpub.044-013>

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**Abstract**

Supply chain management in hospital pharmacies represents a fundamental challenge for ensuring the continuous availability of medicines and supplies, reducing waste, and optimizing resources. This study aims to analyze strategies and tools aimed at optimizing this chain, with a focus on operational efficiency, cost reduction, and patient safety. The research, qualitative in nature and based on a literature review, identified the main challenges of hospital logistics administration, such as the lack of integration among sectors, failures in demand forecasting, and a high rate of losses due to medication expiration. In addition, it highlighted the impact of emerging technologies, such as automation, artificial intelligence, and predictive analytics, which contribute to greater precision in inventory control and purchasing planning. Management practices were also described, such as the monitoring of performance indicators, the application of Just in Time, and traceability, all of which favor waste reduction and process improvement. It is concluded that the incorporation of technological innovations combined with sound managerial practices is essential to strengthen the efficiency of the hospital supply chain and promote safety in patient care.

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### INTRODUCTION

The supply chain in hospitals comprises a set of clinical processes, including the acquisition, storage, distribution, and disposal of medicines and medical materials. Effective management in these environments is crucial to ensure the continuous availability of essential medicines and minimize waste resulting from the deterioration or expiration of products (Pereira et al., 2019).

Logistical challenges in hospitals are distinct, requiring strict control of expiration dates, management of costly medicines, and accurate demand forecasting to avoid both shortages and surpluses (Silva; Almeida, 2021). According to data from the World Health Organization (WHO, 2018), about 10% of medicines acquired by hospitals are discarded due to inadequate inventory management practices, which compromises both the financial efficiency of institutions and the quality of patient care.

Recently, technological innovations such as process automation, the use of big data and artificial intelligence for demand forecasting, in addition to the implementation of integrated systems in hospital management, have contributed to optimizing supply chains in hospital pharmacies (Machado; Santos, 2020). This study aims to encourage pharmacists to adopt strategies that improve this chain in hospital pharmacies, with a focus on operational efficiency, cost reduction, and increased safety in supply.

The growing demand for efficient hospital services requires institutions to adopt effective methods in supply chain management. Inventory shortages may impair medical treatments, while surpluses may result in significant financial losses. A study conducted by the Institute for Health Policy Studies (IEPS, 2021) indicates that approximately 20% of operational costs are related to poor inventory management, highlighting an urgent need for improvements in this sector. Innovative technologies have enabled notable advances in logistics within hospitals; automated systems such as RFID (Radio Frequency Identification) and QR codes have been widely used to improve control over supplies and minimize failures during medication dispensing (Souza; Barros, 2019).

In addition, implementing ERP (Enterprise Resource Planning) systems has proven crucial for promoting greater integration among hospital sectors, facilitating planning in purchasing and distribution (Costa et al., 2020). Considering its importance for managerial improvement in hospitals and patient safety, this study seeks to enrich existing knowledge by bringing new perspectives on ideal practices applicable to the supply chain of hospital pharmacies.

Therefore, the following question arose: which strategies can be implemented to improve the supply chain in hospital pharmacies in order to increase efficiency, reduce waste, and ensure the constant availability of supplies?

Strategies and tools aimed at optimizing the supply chain in hospital pharmacies were discussed, with an emphasis on the effectiveness of medication management. The main challenges faced in administering this chain were presented; the impact of technologies such as automation, artificial intelligence, and predictive analytics on inventory control was examined; effective practices for controlling waste and reducing logistics costs were described; and successful models in hospital supply chain management were presented.

## **DEVELOPMENT**

### **METHODOLOGY**

This work was conducted through qualitative research grounded in a comprehensive literature review involving relevant scientific articles published since 2015 on the optimization of supply chains in hospital pharmacies. The survey was carried out using recognized academic databases such as SciELO, Google Scholar, PubMed, or CAPES Journals, with the primary search expression focused on ("optimization" **AND** "supply chain" **AND** "hospital pharmacy" **AND** "2015-2025" **AND** "literature review"). The selection criteria included works dealing with ("technological innovation" **AND** "hospital supplies") **OR** studies focused on ("demand prediction models" **AND** "process automation") **OR** studies concerning ("positive impact" **AND** "efficient management" **AND** ("reduction in operational costs" **OR**

"waste" AND "hospital environment"). The analysis was carried out through a systematic review comparing methodologies available in contemporary literature, seeking to identify emerging best practices in this field.

### RESULTS AND DISCUSSION

The literature review carried out showed that supply chain management in hospital pharmacies is a multifaceted and highly complex process whose efficiency depends on factors such as strategic planning, sectoral integration, and the use of information technologies aimed at automation and traceability. According to Pereira, Gomes, and Ferreira (2019), the absence of standardization in internal processes and failures in communication among the purchasing, warehouse, and pharmacy sectors compromise data accuracy and demand predictability. This lack of alignment generates stockouts, waste, and rework, directly affecting the quality of care and patient safety. In addition, Silva and Almeida (2021) point out that, in many hospitals, inventory management is still carried out manually, which makes it difficult to consolidate information in real time and prevents the use of performance indicators that assist in logistical decision-making.

The studies analyzed revealed that the use of technological tools has been one of the main differentiators in the modernization of the hospital supply chain. The use of tracking systems, such as RFID (Radio Frequency Identification) and QR Code, provides greater control over the movement of medicines, reducing the risk of loss and ensuring the traceability of each item throughout the entire process (Souza; Barros, 2019). These technological resources, combined with the implementation of ERP (Enterprise Resource Planning) systems, allow integration among the various departments and promote a systemic view of the flow of materials (Costa; Lima; Almeida, 2020). Such integration reduces human error, improves purchasing efficiency, and optimizes stock replenishment time, which is essential in hospital environments, where delays may compromise the continuity of treatments and care safety.

The incorporation of technologies based on artificial intelligence (AI) and predictive analytics has also stood out as an impactful innovation in hospital logistics. According to Machado and Santos (2020), these tools are capable of processing historical data and consumption patterns to anticipate future needs, minimizing the occurrence of shortages or surpluses of medicines.

The Institute for Health Policy Studies (IEPS, 2021) found that hospitals that adopted predictive models presented an average reduction of 15% in operational costs and a significant increase in the availability of critical supplies. This digital transformation contributes to more efficient resource management, favoring the economic and environmental sustainability of healthcare institutions. Alongside technological advancement, the importance of managerial methodologies aimed at operational efficiency, such as Just in Time (JIT) and Lean Healthcare, also stands out. JIT consists of a replenishment model based on actual demand, avoiding excess inventories and reducing losses due to medication expiration (Pereira et al., 2019). Lean Healthcare, in turn, emphasizes the elimination of activities that do not add value, promoting the continuous improvement of processes and the involvement of teams in the search for innovative solutions (Womack; Jones, 2017). According to Costa et al. (2020), the combination of these methodologies allows greater agility in supply management, improving decision-making and the rational use of hospital resources.

Another relevant factor identified in the literature is the need for the continuous qualification of professionals involved in hospital logistics management. Adequate technical and managerial training is indispensable for the understanding and effective use of technological tools and management practices (Machado; Santos, 2020). As emphasized by Moreira and Fernandes (2022), the absence of training may limit the effectiveness of the innovations implemented, generating resistance to change and impairing the achievement of the expected results. Thus, continuing education programs and specific training should be incorporated into the management policy of hospital pharmacies, strengthening the technical competence of teams and compliance with safety and quality protocols.

Traceability and the standardization of logistical processes constitute fundamental elements for increasing safety and efficiency in the hospital supply chain. Souza and Barros (2019) argue that traceability ensures transparency and reliability at all stages, from acquisition to medication dispensing, making it possible to quickly identify and correct failures or deviations. The National Health Surveillance Agency (ANVISA, 2020) also reinforces that traceability is an indispensable requirement for compliance with standards of good practices in the storage and distribution of medicines. In this way, the adoption of computerized systems that allow the recording and monitoring of each item is essential for regulatory compliance and patient safety.

In addition to operational benefits, hospital logistical efficiency has a direct impact on the quality of care. The World Health Organization (WHO, 2018) highlights that the continuous availability of medicines is one of the pillars of patient safety and treatment effectiveness. Interruptions in supply, even if occasional, may compromise critical procedures and aggravate patients' clinical condition. Integration between care and supply sectors through computerized systems is considered a strategic measure to mitigate this risk (IEPS, 2021). In this sense, supply chain management should not be treated merely as an administrative function, but as a strategic area directly linked to the quality and safety of care.

The results of the bibliographic analysis indicate that the sustainability of the hospital supply chain is also a growing topic in academic and institutional discussions. According to Dias and Rocha (2021), the implementation of sustainable practices, such as waste management, the reuse of materials, and rational energy consumption, can reduce environmental impacts and operational costs. This approach is aligned with the concept of the "green hospital," which seeks to integrate operational efficiency and socio-environmental responsibility. In this way, the adoption of sustainable technologies and management practices expands the benefits of logistical optimization, contributing not only to economic performance but also to the institutional image and ethical commitment of healthcare organizations.

The reviewed literature allows the conclusion that improving the hospital supply chain depends on the convergence of technology, management, and professional training. As pointed out by Ferreira and

Melo (2023), the integration of digital tools with management strategies based on data and indicators is the path to achieving higher levels of performance and transparency in operations. However, such advances are only consolidated in a lasting manner when accompanied by an organizational culture geared toward innovation and continuous improvement (Costa et al., 2020). Senior management must assume a leadership role in this process, ensuring resources, training, and the engagement of multidisciplinary teams.

It is possible to state that digital transformation and the application of sound managerial practices are fundamental pillars for strengthening the supply chain in hospital pharmacies. When associated with continuing education and institutional commitment, these strategies promote efficiency, waste reduction, and greater safety in patient care. Thus, hospital logistics management transcends its operational function, assuming a strategic and innovative character capable of sustaining the quality of care and the sustainability of the healthcare system.

## **CONCLUSION**

The study made it possible to understand that the efficiency of the supply chain in hospital pharmacies depends directly on the adoption of strategies that combine technology, planning, and professional training. The analysis of the references showed that automation, artificial intelligence, and predictive analytics represent essential tools for reducing logistical failures, forecasting demands, and optimizing resources.

Likewise, managerial practices such as process standardization, traceability, and the monitoring of indicators strengthen patient safety and reduce waste. Thus, it is concluded that efficient supply chain management not only contributes to the economic-financial balance of hospital institutions, but also to the improvement of the quality of care.

Therefore, this work reinforces the need for hospital managers and pharmacists to adopt a strategic view of logistics, aligning technological innovation with sound management practices, in order to ensure a continuous and safe flow of medicines and supplies within the hospital environment.

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