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People, Process, Technology, and Partner in Hospital Supply Chain Management: A Systematic Literature Review

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ABSTRACT

This systematic review aims to identify gaps in the areas of people, processes, technology, and partners within hospital supply chain management. The analysis followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a rigorous and comprehensive approach. The review identified significant gaps in each area. In terms of people, two key gaps were observed. First, there is a lack of research exploring the impact of hospital supply chain management on patients, particularly in relation to patient satisfaction and healthcare outcomes. Second, there is limited attention given to the role of government policies and regulations in shaping and influencing hospital supply chain management practices. Regarding the process, the review identified a gap in the understanding of service delivery within hospital supply chain management. In the area of technology, gaps were found in research related to specific technological applications. Specifically, there is a limited focus on the utilization of radio frequency identification (RFID), information technology (IT), and blockchain in hospital supply chain management. Exploring the potential benefits and challenges associated with these technologies would contribute to more efficient inventory management, enhanced traceability, and improved data security. Lastly, the review identified a gap in understanding the dynamics and effectiveness of partnerships within hospital supply chain management. Limited research has explored the strategies and best practices for establishing and managing partnerships with suppliers, distributors, and manufacturers. Investigating successful partnership models and factors influencing their effectiveness would enable hospitals to optimize collaboration efforts and achieve improved supply chain performance.

KEYWORDS

Hospital Supply Chain Management
People
Process
Partner
Technology

INTRODUCTION

According to the World Health Organization (WHO), a hospital is an integral part of a social and health organization that provides comprehensive services, cures (curative), and disease prevention (preventive) to the community. In its operations, a hospital must implement strategies to remain efficient in facing the intense competition in the health industry and, at the same time, adhere to various rules from government regulations. Frequently, the inefficiency of hospital operations is caused by high care costs (Kwon et al., 2016; Bvuchette et al., 2020), including the costs of inventory

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system (Budhiarta et al., 2019) and logistics (Kwon et al., 2016). Research on healthcare supply chain. management puts hospitals as the focal point (Yanamandra, 2018). Supply chain management is one of the solutions for increasing efficiency (lowering costs) and, in the case of hospitals, improving patient care (Setiawati et al., 2021; Yanamandra, 2018). Previous literature reviews (Kwon et al., 2016; Moons, 2019) underscored the importance of hospital supply chain management in increasing effectiveness and efficiency. Cost reduction, patient safety, inventory management, collaboration and partnerships, technology integration, and continuous improvement are key factors highlighted in the literature. Understanding and implementing best practices in these areas can significantly improve the overall performance of hospital supply chains, ultimately leading to better patient care, reduced costs, and enhanced operational efficiency.

The term "hospital supply chain" refers to "information, supplies, and finances related to the acquisition and movement of goods and services from the supplier to the end-user to improve clinical outcomes while controlling costs". The flow of medicines and medical devices, money, and information from suppliers to hospital warehouses, pharmacies, and patients is referred to as Hospital Supply Chain Management (HSCM), within the boundaries of hospitals. The scope of HSCM involves suppliers, hospitals, and patients. The process covers three flows, namely supply/material flow, financial flow, and information flow. Hospitals that continuously evaluate these three flows will provide optimal efficiency and effectiveness for the entire chain involved.

People, processes, and technology are parts of the supply chain that are also part of information, goods, and money flow. These three components become elements of supply chain management that lead to the maturity or improvement of the organization (Coimbra, 2017). Maturity is associated with the sequence of persistent improvement. It assesses organizational methods and processes according to management best practices. Organizational transformation and management needs people, processes, and technology. The three must be balanced and maintained in good working order to achieve organizational efficiency. In the context of hospitals, this framework can help hospitals achieve organizational harmony. Technology, visibility, and improved information quality and timeliness can lead to better decision-making and improvements in hospitals. Previous research affirmed that there is a strong and statistically significant relationship between supply chain maturity in hospital supply chain management and hospital performance (Facchini et al., 2020). It implies that the hospital's performance can be determined by the performance of its supply chain management.

The maturity model is one of the reference models that focuses on evaluation systems in people, processes, and technology (Carvalho et al., 2017; Mettler, 2011). In addition, Yanamandra (2018) stated that besides the three main components, collaboration amongst all stakeholders (partnership) is part of the synchronization of all processes. Therefore, instead of focusing only on people, processes, and technology (del Carmen León-Araujo et al., 2019), this study implicitly considers partners, such as stakeholders, in its discussion because improving collaboration and enhancing performance is the focus of hospital supply chain management. Partners are able to enhance the maturity of the organization which later leads to better performance. They make long-term goals clearer and help enhance the organization's performance.

Despite its importance, the integration between people, processes, technology, and partners in the context of hospital supply chain management is scarce in the existing literature. This study, therefore, aims to identify gaps in the area of people, processes, technology, and partners in the context of HSCM to provide direction for further research. The application of HSCM has not been widely studied empirically; thus, the results may indicate the need for more research work. The novelty of this study relies on the importance of the research category in people, processes, technology, and partners in the context of HSCM. The results should contribute to the academic or practical view, especially in developing countries.

This study employed current updated selected papers and identified gaps through the four categories (people, processes, technology, and partners), and this became its strengths and originality. The researchers sorted papers according to the highest citation criteria. Insights from this paper can improve our understanding of HSCM research and help future researchers fill the gaps in the newest area in the four categories.

The rest of the paper is structured as follows. Section 2 discusses the method of analysis. Section 3 provides the result and discussion. Section 4 presents the conclusion, and Section 5 presents the limitations of the research.

RESEARCH METHOD

Figure 1 presents the strategy to find the gaps while Figure 2 shows the number of selected papers collected. This study started with finding relevant keywords to research gap analysis using NVivo. NVivo is a qualitative and mixed-methods research software program that is specifically used to analyze unstructured texts, audio, videos, and image data, such as (but not limited to) interviews, focus groups, surveys, social media, and journal articles. The search process was done to the main research database, SCOPUS. It was chosen as its research articles have undergone rigorous review according to the most stringent standards. Apart from Scopus, papers were also added manually according to their suitability to the research theme. The keywords used for this research are shown in Table 1.

Table 1. List of keywords used for literature review

Keywords
Process, Technology, and Partner in Hospital Supply Chain Management
Process, Technology, and Partner in Healthcare Supply Chain Management
People or actors in Hospital Supply Chain Management
People or actors in Healthcare Supply Chain Management

This study differentiated hospital supply chain management and healthcare supply chain management due to the frequent confusion between the two phrases. Through these distinct keywords, the process in HSCM can be clearly distinguished. Process-related keywords directed the research to the main activity of HSCM, technology led to the newest technology in HSCM, and partners led to collaboration within and outside the hospital to identify the actors involved in the hospital supply chain. Actors could also refer to people who are engaged in adding value to the hospital.

We conducted a systematic literature review or PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) as depicted in Figure 2. The process consisted of identification, screening, and eligibility to obtain the results of a comprehensive review. The identification stage resulted in 1,981 papers from databases (SCOPUS and manually added data) from 2005-2021. In the screening stage, we sorted duplicated papers, publication titles, and abstracts that did not align with the purpose of this study. We then removed and manually added more papers from other sources in the eligibility stage. At last, 73 articles were obtained and comprehensively examined to identify the information related to people, processes, technology, and partners in HSCM.

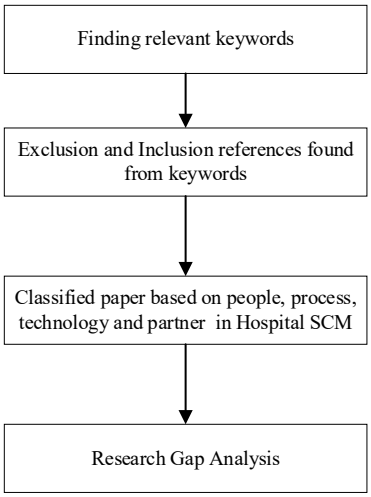

Figure 1. Strategy to conduct the state-of-the-art

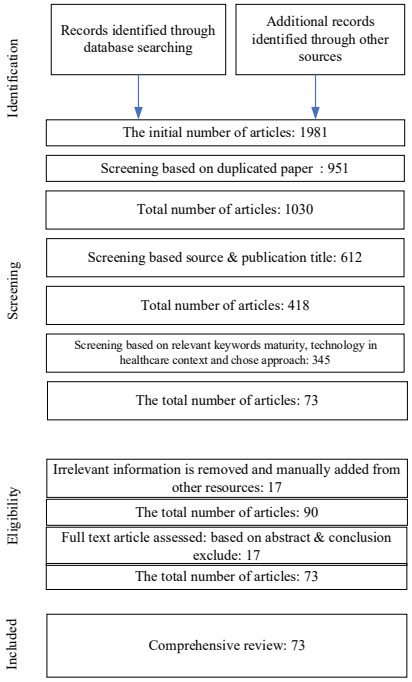

Figure 2. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

RESULTS AND DISCUSSION

Based on a comprehensive review of the papers selected, there is a link between supply chain management and business process management with people, processes, and technology (Pradabwong et al., 2017). This study also affirms that instead of focusing only on those three, the research must also consider partners' engagement, such as stakeholders, as part of maturity in the organization. Thus, this research believes that people, processes, technology, and partners not only improve organizational performance but also aid in collaborative activities, which in turn help to improve internal capabilities.

NVivo identified those four main areas of research within hospital supply chain management (people, process, technology, and partners). First, in terms of people, the research area focused on the human element involved in hospital supply chain management. NVivo software analyzed data related to healthcare professionals and staff members and their roles within the supply chain. The investigation identified the challenges faced by individuals and their impacts on the overall efficiency and effectiveness of the supply chain. Second, the process area discussed various steps and activities involved in hospital supply chain management. Nvivo examined the workflows, procedures, and protocols in place within the supply chain. It helped identify bottlenecks, inefficiencies, and areas where improvements can be made to streamline the processes. Third, in terms of technology, the research focused on the technological aspects of hospital supply chain management. NVivo software aided in analyzing data related to various technologies used in the supply chain, such as inventory management systems, tracking systems, and automated processes. NVivo enabled us to assess the effectiveness and impacts of different technologies on the overall supply chain performance. Last, the partner aspect in this research referred to the collaboration and relationships among different stakeholders involved in the hospital supply chain. NVivo software assisted in examining data related to partnerships, alliances, and interactions between hospitals, suppliers, distributors, and other entities. It helped identify the key factors that contribute to successful partnerships and collaboration within the supply chain. The following paragraphs explain the division of the analysis and the results of the review.

People

The people involved in hospital supply chain management consist of patients, hospitals, suppliers, and the government. Patients are the main consumers, hospitals provide health services, suppliers supply medicines and medical devices, and the government provides policies so that all processes run effectively and efficiently.

In the HSCM research, patient safety characteristics include error-free treatment, no treatment delays, and treatment completion. Cost, time, reliability, efficiency, and productivity are all aspects of the clinical care process. Göleç & Karadeniz (2020) stated that there are different perspectives when it comes to involving patients in research. Some previous studies focus on the patient treatment process (patient activities in hospitals), and some others discuss the patient relation process (patient experience on access to service). From all the synthesized papers, however, the research emphasizing hospital supply chain management on patients is still limited with only two papers. This becomes an opportunity to be further explored.

Next, studies regarding hospitals in the HSCM context focus more on hospital performance, including low inventory and high-quality services. Reda et al. (2020) measured the hospital performance-based operations evaluation. Gonul Kochan et al. (2018) focused on the main practices of HSCM and the challenges faced by the actors, specifically hospitals. Monika Arora and Yogita Gigras (2018) stated that HSCM in developing countries is important, especially in the pharmaceutical area. Beldek et al. (2020a) concluded the similarity among previous studies, that they do not go in-depth into the hospital but only focus on the attributes such as barriers or enablers so that the business process after the goods arrive at the consumer cannot be clearly described. The development of supply chain management research in the hospital context focuses on two main things: macro and micro. Macro research deals with information systems and material management while micro focuses on standardizing data that leads to traceability systems (Kritchanchai et al.,

2019). Further, Gendy & Lahmar (2019) maintained that the division of hospital supply chain management focuses on strategic issues and operational issues. However, no past research has focused on the surplus by adapting the strategies along with the critical success factors of HSCM performance. Hospitals, as the largest primary health facilities, need to be observed; otherwise, their actual supply chain conditions cannot be thoroughly assessed.

In the context of suppliers, Guggenberger et al. (2020) highlighted the importance of information sharing. Other studies (Kritchanchai et al., 2019; Mettler, 2011; Turhan & Vayvay, 2012) examined the key factors of collaborating suppliers with hospitals. There are barriers and supporting factors that include trust knowledge exchange and integration between hospitals and suppliers. Research on suppliers and hospitals also analyzes how to examine suppliers' performance in fulfilling hospital needs. By focusing only on suppliers' barriers and obstacles, especially in Vendor-Managed Inventory (VMI), the processes are thoroughly explored. However, the hospital's main business processes after the goods arrive are not yet discussed. Fostering the relationship between hospitals and suppliers is essential to maintain critical areas from medicine shortages (Emmett, 2019). The research also justified the importance of multiple suppliers and safety stock. Hospitals that do not collaborate with suppliers may encounter several problems, including false scarcity, low service levels, and lost sales.

Finally, this systematic review discovered that research examining the role of government as one of the main actors in HSCM seems to be scarce or even has not been conducted previously. Also, there is no research (explorative study), specifically in developing countries, that describes the collaboration between internal actors. Whereas, the involvement of actors is crucial, especially suppliers who support the sustainability of the hospital (Duque-Uribe et al., 2019).

Several important points can be drawn from the synthesis of research related to people involved in hospital supply chain management. First, each actor in HSCM tends to lead to individual efficiency rather than integrated efficiency. Second, research examining the role of government in hospital supply chain management has never been investigated, and there are only two papers discussing patients. Third, previous studies have placed actors in different positions, operational and strategic, in which supply chain research leads to traceability systems. Patients and suppliers are in the operational area, which relates to patients' data and medicine availability. Meanwhile, hospitals are at a strategic level that focuses on the best service for patients, which later leads to efficiency and effectiveness. However, this separation causes drawbacks. When the research only focuses on the operational area, the big picture of hospital strategy is not depicted, causing technical problems that may impact patients and suppliers. Meanwhile, when the research focuses only on the strategic area, the relationship between the actors is not described because the research leads to the general strategy of the hospital.

Process

The process in HSCM refers to the efficiency and effectiveness of the hospital procedure, from the beginning of the arrival of medicine until the patient receives it. The process consists of four categories: procurement, logistics, inventory, and service (Chopra and Meindl, 2007), which involve planning, sourcing, making, delivering, and returning. Procurement includes planning (preparing health services according to the hospital standards and strategies) and sourcing (procuring medicines and medical devices according to the plans). Logistics and inventory activities are carried out from the center to each division in the hospital. Meanwhile, service deals with the purpose of the hospital to provide health services for both outpatient and inpatient.

First, in the context of procurement, HSCM focuses on overcoming one or more fundamental challenges such as transparency of outcomes and local care delivery. The supply chain management system that allows hospitals to improve pharmaceutical procurement processes and inventory

control results in a 30% reduction in total inventory costs. This HSCM can improve overall hospital organizational performance with a starting point of procurement (Mathur et al., 2018). Previous studies discussing procurement more focus on the VMI areas and issues arising from hospital coordination with suppliers. However, they do not elaborate detailed steps that need to be taken to continuously improve the entire hospital's performance (no end-to-end integration).

Next, in terms of logistics, inventory management helps improve HSCM since the logistic cost is the second-highest in hospital management (Volland et al., 2017). HSCM can be improved by utilizing Supply, Processing, and Distribution (SPD) management. Thus, this study recommends future research concentrate on 1) supply and procurement, 2) inventory management, and 3) distribution and scheduling, using optimization techniques, and (4) holistic supply chain management as the final identified research field. Moreover, Feibert et al. (2019) maintained that employing a centralized warehouse can improve supply cost efficiency. It is also beneficial to have both a cross-dock and a hub. Since logistics contributes as the second-highest cost after labor, hospital expenses will decrease significantly if we discover the cause of logistics cost overruns.

In terms of inventory management, HSCM has the potential to enhance efficiency and reduce healthcare supply chain costs through the optimization of inventory and operational factors, as highlighted in operations research (Beldek et al., 2020b). It is crucial for hospitals to implement supply chain management, along with vendor-managed inventory (VMI) and a strong IT infrastructure, to achieve optimal outcomes. However, this could result in significant cost increases for both hospitals and suppliers. To avoid such high expenses, hospitals and suppliers should adopt service-oriented architecture (SOA) principles to improve interoperability and mitigate data integration issues. Ahmadi et al. (2019) identified four key criteria for a collaborative system to improve the hospital supply chain: low cost, ease of connection and integration, ability to integrate external systems and information, and information privacy. Implementing VMI in inventory systems, particularly in pharmacy areas, contributes to enhancing supply chain management in hospitals. Previous studies (Aldrighetti et al., 2019; Kritchanchai et al., 2019) investigated inventory-related challenges, such as drug shortages in hospitals. Findings indicate that HSCM reduces the likelihood of drug shortages in hospitals (Emmett, 2019). In the simulation of inventory management, key performance indicators (KPIs) encompass financial metrics (total cost, including inventory holding, product purchase, transportation, and outbound and inbound processing costs), customer-related metrics (service level and fulfillment of delayed orders), and operational metrics (inventory dynamics, on-stocks, backorders, and shipped vehicles). Three proposed solutions to address disruptions in hospital inventory include improved supply chain management, enhanced collaboration, and internal hospital measures. In addition, research by Moon (2019) focused on the operating room environment within hospital supply chain management. KPIs for inventory management include quality metrics (availability, inventory visibility, critical inventory items), patient safety metrics (delays, errors), time-related metrics (replenishment time, clinical staff involvement), and financial metrics (inventory cost, stock value, stock wastage) (Moons, 2019). The hospital supply chain management emphasizes inventory management under both disrupted and normal conditions, employing diverse methods to minimize costs and improve patient safety.

Finally, in the context of service, a model proposed by Göleç and Karadeniz (2020) utilized competency-based operational evaluation (fuzzy) along with performance analysis in service delivery. The model aims to assist organizations in achieving their SCM performance goals, such as high service level. Furthermore, as suggested by Bvuchete et al. (2020), it can contribute to improving operational efficiency and indirectly reducing costs. Enhancing service delivery involves three primary processes. First, there is the patient relation process, encompassing aspects such as patient experience, access to services, and end-of-life experiences. Second, the patient treatment process involves various elements, including patient care, drug administration, infection prevention,

sterilization management, transfusion management, radiation safety, operating room procedures, ICU care, dialysis unit operations, and laboratory services in biochemistry, microbiology, pathology, and tissue typing. The third process focuses on supplier relations, covering areas such as facility management, hospitality services, information management, medical record and archive service (Govindan et al., 2014), waste management, and material and device management.

Key insights emerge from synthesizing the research on procurement, logistics, inventory, and service processes. First, procurement focuses on the importance of transparency, fostering clear communication both within hospital departments and with vendors. Second, logistics emerges as a significant factor affecting research centers, ranking second in causing cost overruns after labor costs. Third, enhancing efficiency in the inventory process is achievable if the pharmacy division at the hospital learns from the insights gained by the material management division. Fourth, within the HSCM process, the service aspect focuses on KPIs for patients, specifically in emergency areas such as operating rooms, highlighting the trade-off between inventory and service, especially in critical areas like the blood bank. Collaborative efforts across the entire supply chain process prove more cost-effective than isolated actions by individual stakeholders.

Technology

Technology has become part of HSCM to enhance hospital efficiency and performance. It is an important part of hospital supply chain management since it improves hospital internal and external communication, facilitating end-to-end integration. The technology category consists of radio-frequency identification (RFID), blockchain (Jayaraman et al., 2019), and IT/IS as outlined by Gendy and Lahmar (2019), who delved into the latest advancements in hospital supply chain technology.

First, the healthcare industry has the potential to enhance operational efficiency through the adoption of innovative technologies such as radio-frequency identification or RFID (Abugabah et al., 2020). RFID is able to capture data without human intervention. It consists of a transponder (tag), a transponder-reader, and a database software application. The five primary standardized infrastructures within RFID include standardized product and location identification, electronic product catalogs, e-procurement enabled by electronic data interchange (EDI), automatic identification and data capture (AIDC) systems—such as barcodes and RFID, and traceability systems. Significantly, RFID has demonstrated its ability to yield substantial cost reductions in inventory management across various healthcare settings. Its implementation holds the promise of improving HSCM performance, offering benefits and associated risks for all stakeholders. RFID technology benefits include reduced inventory and costs, increased service levels, increased inventory turns, real-time information accessibility, and enhanced warehouse efficiency.

The utilization of RFID introduces risks to vendor-managed inventory (VMI), including the potential for opportunistic behavior, reliance on vendor switching costs, initial technology expenses, and challenges in integrating technology. There are still contingent factors to improve collaboration with suppliers, such as product characteristics, spatial complexity, goal unity, and the degree of trust/commitment between actors. RFID-enabled cabinets are used in replenishing consignment and high-value supplies in certain operating rooms, cardiac catheterization laboratories, and interventional radiology departments as a complementary solution facilitating the tracking of medical devices removed from RFID-enabled cabinets. In short, the hospital supply chain's end-to-end traceability of medical products can be significantly improved (del Carmen León-Araujo et al., 2019). Thus, the healthcare industry is rapidly adopting RFID to track medical supply stock, identify patients, and manage the workforce.

Abugabah et al. (2020) focused on the aim of tracking medical assets and facilitating interaction with various elements, including medical devices, pharmaceutical materials, information technology

equipment, and individual patients, deployed in hospitals worldwide. The objectives outlined in their research addressed the broader challenges associated with RFID, without specifically concentrating on RFID for hospitals as a holistic entity. Despite the varied scopes of these studies, a common thread emerges—the utilization of RFID for enhancing efficiency in hospitals leads to productivity gains in logistics processes, reductions in inventory shrinkage, and non-recurring inventory-related savings.

Second, in terms of blockchain, Guggenberger et al. (2020) investigated VMI in hospitals employing blockchain technology. Their study explored the information flow between suppliers and hospitals, encompassing demand planning, production planning, logistics, and finance/accounting. A comparison was made between non-blockchain and blockchain solutions, evaluating data sharing, security, and use case specificity, including editable supply and demand data, shipping information, invoicing, event notification, and GUI. The conclusion drawn was that, at present, HSCM appears to be the most suitable domain for the application of blockchain technology. Reda et al. (2020) studied the opportunities presented by blockchain in HSCM. Meanwhile, Kochan (2018) compared performance metrics in various models, specifically focusing on average inventory levels, lead time, and unfilled orders. The study asserted that cloud-based information sharing improves visibility among actors in the supply chain. The results show that the absence of technology hampers the role of suppliers in HSCM, suggesting that integrating blockchain with suppliers could address this challenge. The commonality observed in research using blockchain is that blockchain serves as a facilitator for information sharing between external and internal parties.

Finally, in the context of HSCM, the significance of IT/IS has grown exponentially, particularly in the domains of information transparency and information sharing (Guggenberger et al., 2020). They defined IT/IS as the utilization of enterprise resource planning or an integrated hospital system. Empirical findings showed that a hospital with a high level of logistical integration with its suppliers tends to exhibit superior supply chain performance. Additionally, the study revealed that IT integration and knowledge exchange between the hospital and suppliers results in enhanced logistical integration. Furthermore, the exploration of cloud computing as an enabler of electronic supply chain management systems (e-SCMs) in multi-echelon hospital supply chains shows potential improvements in collaborative information sharing and subsequent enhancements in visibility and hospital responsiveness (Gendy & Lahmar, 2019). IT in e-SCMs can improve several measurements of effectiveness and efficiency in hospitals, such as average inventory levels, lead time, and unfilled orders (Kochan, 2018).

The synthesis of research on technology, consisting of RFID, blockchain, and IT/IS, highlights several crucial points. First, the focus of RFID research revolves around addressing the challenges associated with asset tracking and patient data management. Second, the use of blockchains increases information sharing among internal hospital departments and external entities. Notably, the primary hurdle faced by RFID technology pertains to the integration of applications and associated costs. Third, hospitals that use an integrated information system have higher documentation and performance, as seen in the average inventory level, lead time, and unfilled orders.

Partners

The fourth category of HSCM is partners. Partners can enhance collaboration within and beyond organizational boundaries. With partners, organizations can establish and manage strategic relationships, integrate suppliers into value creation and operational processes, improve supplier performance and safeguarding/developing quality, and strategically manage costs across the supply chain. Supply chain management can achieve the highest level of maturity by establishing procedures for collaboration with suppliers and customers (level 5 out of 5). The biggest challenge

in partnering in HSCM arises in the transition from material management divisions to nursing units. The manual method, which relies on clinical staff involvement, causes inefficiency in the hospital system. Currently, there is a lack of explicit research addressing the involvement of internal and external partners in hospital supply chain management or in other industries (Ageron et al., 2018). The utilization of a sample reflecting the characteristics of developing countries is advantageous due to the inclusion of experts with diverse perspectives. Notably, there is a gap in research discussing the significance of partner involvement in specific hospital cases, although this gap remains within the broader scope of divisions and industries.

Additionally, the partner category is introduced to enhance collaboration in hospital supply chain management, drawing on the insights of Del Carmen León-Araujo et al. (2019) and Roy and Shijin (2018). Strategic and operational variables play crucial roles in influencing buyer-supplier partnerships, consequently impacting overall supply chain performance. The absence of a partnership hinders the achievement of optimal supply chain performance.

This research indirectly highlights key variables within the realms of people, processes, technology, and partners in HSCM. Figure 3 shows the research gaps identified across these dimensions in hospital supply chain management research. In the people category, the research gap pertains to patient- and government-related variables. Specifically, there is a lack of research exploring the role of government as an actor in hospital supply chain management. Regarding the process dimension, logistic and inventory areas have been extensively studied, particularly in the context of high-value supplies such as those used in the ICU, blood bank, and operation room. However, a notable weakness in these studies is the absence of consideration for the ongoing process improvement within each scope. Currently, there is a deficiency in guiding the enhancement of positions concerning process, people, and technology. This constitutes a research gap in the process area, particularly concerning service delivery. Regarding technology, blockchains are still rare in the hospital supply chain. Reda et al. (2020) explored the opportunities and challenges in the hospital supply chain. They discovered that blockchain technology can significantly improve demand forecasting, data provenance, fraud prevention, and transaction processing. However, there is a cost associated with implementing and running this technology, which for the most part remains unregulated to this day. Guggenberger et al. (2020) stated that blockchains can enable supply chain management in the healthcare industry. This research explained how and to what extent blockchains can facilitate information sharing for VMI. Future research that can answer this gap can propose additional designs that use various technologies to challenge and extend the previously introduced design principles.

CONCLUSION

This study aims to identify gaps in the studies on hospital supply chain management. Despite the growing interest in HSCM, several issues remain unaddressed. The review of 73 articles has facilitated classification into four categories. The first category revolves around people in HSCM, the second focuses on the process in HSCM, the third centers on technology in HSCM, and the last category pertains to partners in HSCM.

Regarding people, research gaps are found in the realms of the government and patients as the leading actors in HSCM. Gaps also emerge in the service delivery process and the procurement department within hospitals. While previous studies have accentuated the logistics and inventory area, particularly in units with high emergency rooms or operating rooms, there is a lack of clarity regarding its implementation throughout hospitals, spanning from purchasing planning to the hands of consumers. The gap underscores the need for a comprehensive

understanding and exploration of the entire procurement process within hospital settings. Next, the predominant focus of research within the technology category often revolves around the latest technological advancements. However, it is noteworthy that hospitals predominantly rely on internal information systems. Blockchain-related policies are still a challenge, while modern hospitals in most developed countries have successfully integrated RFID technology into their operations. Finally, based on the synthesized research findings, it is recommended that HSCM research should emphasize partner involvement, integrating both RFID and blockchain technologies, with active participation from patients and government entities within hospital settings.

The concept of maturity is highlighted as a valuable tool for organizations to evaluate their methods and processes in alignment with management best practices. In extending this research, three key areas are suggested. First, there is a need for exploration into how hospital maturity can be effectively assessed through the dimensions of people, processes, technology, and partners. Second, there is an opportunity to identify specific components within each category—people, processes, technology, and partners—that require improvement within the hospital context. Third, empirical studies in the realm of hospital supply chain management, particularly focusing on developing countries, remain a notable gap that warrants further investigation.

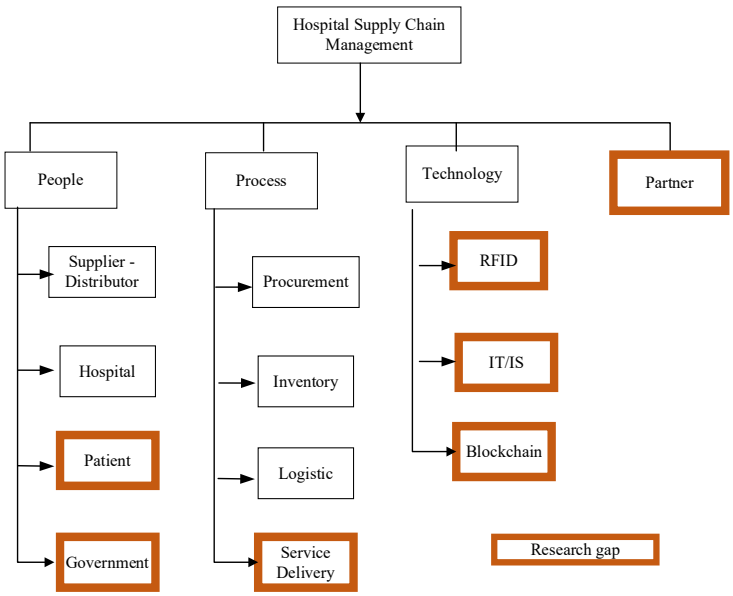

Figure 3. Reviewed categories and research gaps

MANAGERIAL IMPLICATIONS

This study intends to identify gaps in the areas of people, processes, technology, and partners within hospital supply chain management. The results can be utilized by practitioners for efficiency and effectiveness in hospitals. There are several implications that we suggest. First, from the people side, managerial implications are in the form of increasing workforce capability, which leads to patient satisfaction. Second, from a process and technology perspective, the inventory section, which has always been the center of research attention, needs to be balanced with the use of technology to

increase efficiency. New technology or systems can help address gaps in supply chain management. Third, from the partner side, not only short-term but also long-term collaboration with suppliers can increase hospital efficiency.

LIMITATIONS AND FUTURE RESEARCH

This research is subject to several inherent limitations. First, potential limitations to understanding may arise from the chosen keywords and the reliance on sources solely from Scopus. Second, the quality of the findings may be contingent upon the studies included. If the selected studies have limitations or are not representative of the broader population or research context, the generalizability of the review's conclusions may be limited. Research that contains a literature review usually relies on secondary data, namely, data that already exists in the literature. This can result in a limited understanding of the phenomenon being researched because the research does not produce new or primary data. Third, there is the potential for publication bias in the methodology following the PRISMA guideline. Studies with negative results or smaller sample sizes may be less likely to be published, leading to an overrepresentation of positive findings in the review.

For future studies, it is recommended to undertake comparative analyses of people, processes, technology, and partners through the lens of case studies. This approach presents an opportunity for subsequent researchers to delve deeper into the framework and gain a more nuanced understanding of the subject matter.

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