

The Impact of Supply Chain and Procurement Management on Healthcare Service Delivery in Nigeria: An Assessment of Procurement Efficiency, Medicine Availability, and Supply Chain Challenges

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ABSTRACT

The delivery of healthcare services in Nigeria is significantly driven by the procurement and supply chain management system as medicines, vaccines, laboratory commodities and other health supplies need to be delivered efficiently, at the right time, in the right quantity, and in the right quality and at minimum cost. This article reviews the influence of supply chain management and procurement on healthcare services delivery Nigeria with respect to procurement efficiency, stock availability, cost efficiency, logistics and supply chain bottlenecks. It does so by conducting a structured narrative literature review of 15 selected journal articles including procurement for health, pharmaceutical supply chains, medicines availability, logistics management, resource allocation, digital medicine tracking and healthcare performance. The review reveals that inefficient procurement system, low inventory management, stock-outs, overstocking, logistical bottlenecks, inefficient logistics management and poor supply chain visibility may hamper healthcare service delivery. It shows as well that effective procurement planning, inventory management, logistics management, resource allocation, digital health tracking and institutional coordination could enhance supply chain performance. Finally, the review suggests that good supply chains in Nigeria need to be linked to a comprehensive health system taking into consideration system end-to-end rather than on procurement alone and calls for enhancing procurement systems alongside inventory, logistics, technology, monitoring and institutional accountability.

Keywords: Healthcare supply chain management; Procurement management; Medicine availability; Healthcare service delivery; Logistics; Supply chain efficiency; Nigeria.

DOI:10.21590/ijtmh.7.02.05

1. INTRODUCTION

A well-functioning health system requires not only that there will be enough trained health providers and facilities for delivering healthcare but also the persistent availability of medicines, vaccines and laboratory commodities or other health products to support health services (Kress et

al., 2016; Chukwu et al., 2017). Healthcare supply chain management is a critical part of healthcare service delivery as it links procurement, storage, transportation, and distribution along with inventory management and final access to health commodities by the patients (Chukwu et al., 2017; Umoren et al., 2021).

Procurement management is of critical significance as research in developing countries has provided evidence of how the efficiency of the procurement process impacts on the cost, quality, quantity and timely availability of health commodities (Seidman & Atun, 2017). Procurement and supply-chain improvements have been found to generate savings and increase the availability of medicines and other commodities (Seidman & Atun, 2017). In the context of Nigeria, the management of medicine supply has previously been undermined by: inventory control, distribution, and coordination among supply-chain actors (Mohammed et al., 2008; Aigbavboa & Mbohwa, 2020).

Medicine stock-outs and overstocking are important manifestations of supply-chain inefficiency because shortages can interrupt treatment while excessive inventories can increase wastage and tie up scarce financial resources (Jatau et al., 2015). The management of health commodities is therefore not simply a purchasing function but involves forecasting, procurement, storage, distribution, monitoring, and timely decision-making throughout the supply chain (Chukwu et al., 2017; Nwobodo, 2019).

The Nigerian pharmaceutical supply chain also faces challenges associated with distribution, inadequate coordination, weak control mechanisms, and vulnerabilities that can facilitate the circulation of counterfeit or substandard medicines (Aigbavboa & Mbohwa, 2020; Yakubu, 2020). These challenges can affect the reliability of medicine availability and consequently undermine the effectiveness and continuity of healthcare services (Mohammed et al., 2008; Gbadeyan et al., 2017).

Logistics is another critical dimension of healthcare supply-chain performance, particularly in geographically dispersed areas where transportation and distribution difficulties can affect access to health commodities (Umoren et al., 2021). The Niger Delta context, for example, demonstrates the importance of logistics optimization in improving the efficiency of healthcare supply-chain operations (Umoren et al., 2021). Similarly, vaccine procurement and distribution have demonstrated the importance of overcoming logistical and organizational barriers to ensure timely access to essential healthcare products (Chukwu & Nnogo, 2021).

The growing application of information and communication technologies provides opportunities to strengthen supply-chain visibility and improve medicine tracking in Nigeria and other African countries (Egharevba et al., 2019). Smartphone-based systems, for example, have been explored as tools for tracking medicines and improving supply-chain management (Egharevba et al., 2019). Sustainable supply-chain systems also require effective ownership, coordination, accountability, and institutional capacity to maintain improvements over time (Itiola & Agu, 2018).

Supply-chain management can ultimately influence healthcare organizational performance because efficient allocation of resources, planning, procurement, and distribution contribute to the ability of healthcare institutions to provide services effectively (Gbadeyan et al., 2017; Agumalu, 2021). Strategic resource allocation and appropriate management of financial and operational resources are similarly important for maintaining efficiency and reducing avoidable risks within organizational systems (Adenike, 2017). Consequently, examining procurement and supply-chain management provides an important basis for understanding some of the factors influencing healthcare service delivery in Nigeria.

Against this background, this article examines the impact of supply chain and procurement management on healthcare service delivery in Nigeria, with particular attention to procurement efficiency, medicine availability, cost efficiency, and the major challenges affecting healthcare supply-chain performance.

1.1. Statement of the Problem

Nigeria's healthcare system continues to face challenges associated with the procurement, availability, and distribution of essential medicines and healthcare commodities (Mohammed et al., 2008; Aigbavboa & Mbohwa, 2020). Inefficient procurement and supply-chain processes can contribute to medicine shortages, excessive inventory, wastage, increased operational costs, and disruptions in healthcare delivery (Jatau et al., 2015; Seidman & Atun, 2017).

The problem extends beyond procurement itself because weaknesses in transportation, inventory management, information systems, distribution, and supply-chain coordination can reduce the effectiveness of health commodity management (Umoren et al., 2021; Chukwu et al., 2017). In addition, vulnerabilities within pharmaceutical supply chains can create opportunities for counterfeit medicines to enter the market, posing further challenges to healthcare quality and patient safety (Yakubu, 2020).

Although previous studies have examined specific aspects of medicine procurement, logistics, pharmaceutical distribution, and health-commodity management in Nigeria, there remains a need to bring these dimensions together to assess their collective implications for healthcare service delivery (Gbadeyan et al., 2017; Itiola & Agu, 2018). This article therefore focuses on how procurement efficiency and supply-chain management influence medicine availability, cost efficiency, and the broader performance of healthcare service delivery in Nigeria.

1.2. Aim of the Study

The aim of this article is to assess the impact of supply chain and procurement management on healthcare service delivery in Nigeria, with emphasis on procurement efficiency, medicine availability, cost efficiency, and supply-chain challenges.

1.3. Objectives of the Study

The specific objectives are to:

1. Examine the role of procurement management in the efficiency of healthcare service delivery in Nigeria.
2. Assess the influence of supply-chain management on the availability of medicines and healthcare commodities.
3. Examine the effects of supply-chain inefficiencies on healthcare costs and resource utilization.
4. Identify the major procurement, logistics, distribution, and inventory-management challenges affecting healthcare supply chains in Nigeria.
5. Examine the potential of digital technologies and improved supply-chain practices to enhance healthcare commodity management.
6. Propose measures for improving procurement efficiency, medicine availability, and healthcare supply-chain performance in Nigeria.

1.4. Research Questions

The article addresses the following questions:

1. How does procurement management affect healthcare service delivery in Nigeria?
2. How does supply-chain management influence the availability of medicines and healthcare commodities?
3. What are the major supply-chain challenges affecting healthcare delivery in Nigeria?
4. How do supply-chain inefficiencies influence healthcare costs and resource utilization?
5. How can technology and improved management practices strengthen healthcare supply chains in Nigeria?

1.5. Significance of the Study

The study is significant because effective procurement and supply-chain management are essential for maintaining the continuous availability of medicines, vaccines, laboratory commodities, and other healthcare products (Chukwu et al., 2017; Egharevba et al., 2019). The findings can provide useful insights for healthcare managers, procurement officers, policymakers, government agencies, development organizations, and other stakeholders seeking to improve healthcare commodity management in Nigeria (Itiola & Agu, 2018; Gbadayan et al., 2017).

The study also contributes to understanding how procurement efficiency, logistics, inventory management, distribution, and technological solutions can collectively influence healthcare service delivery (Seidman & Atun, 2017; Umoren et al., 2021). In addition, identifying supply-

chain weaknesses can support the development of strategies aimed at reducing stock-outs, minimizing wastage, improving resource utilization, and strengthening the reliability of healthcare services (Jatau et al., 2015; Chukwu & Nnogo, 2021).

1.6. Scope of the Study

The article focuses on healthcare supply chain and procurement management in Nigeria, particularly the processes involved in procurement, medicine availability, inventory management, logistics, distribution, cost efficiency, and supply-chain performance. It also considers challenges relating to pharmaceutical supply chains, healthcare commodities, vaccines, laboratory supplies, counterfeit medicines, and the application of digital technologies in supply-chain management (Aigbavboa & Mbohwa, 2020; Nwobodo, 2019; Yakubu, 2020; Egharevba et al., 2019).

2. LITERATURE REVIEW

2.1 Concept of Healthcare Supply Chain Management

Supply chain management in healthcare is the integrated design, planning, execution, control and monitoring of the efficient flow of medicines, vaccines, laboratory commodities and health products from point of origin to point of use, to meet patient requirements (Chukwu et al., 2017). The success or failure of the above activities determines whether health care providers have the right products, in the right quantities, in the right time for the right cost (Seidman & Atun, 2017). In Nigeria healthcare supply-chain management is very important because substandard management of commodities can lead to stock-outs, over stock-outs, wastages and discontinuity of care (Mohammed et al., 2008; Jatau et al., 2015).

An efficient health care supply chain is ensured by the proper coordination of procurement agencies, suppliers, warehouses, transportation modes, health care centers and end users (Itiola & Agu, 2018). Poor coordination and communication of these actors can inhibit the detection of supply-chain visibility and hinder response to the rising shortage or excess stock (Jatau, Mpunmang, Ajuya, & Abraham, 2015). Thus, the supply-chain management also involves information management, planning, monitoring, forecasting and responsibility monitoring as well as flow of products (Egharevba, Magi, & Fasina, 2019; Nwobodo, 2019).

2.2 Procurement Management and Efficiency

Procurement is a key element of healthcare supply chain management as it involves the purchasing of medicines and other relevant goods (Seidman & Atun, 2017). To be effective procurement benefits from proper product selection, accurate quantification, supplier management, timely purchasing, cost control, and effective coordination with inventory and distribution systems (Chukwu et al., 2017).

Evidence from low- and middle-income countries indicates that improvements in procurement and supply-chain processes can contribute to reductions in costs and improvements in the availability of health products (Seidman & Atun, 2017). However, procurement efficiency can be undermined when planning and resource allocation are inadequate (Agumalu, 2021). Strategic allocation of limited financial resources is therefore important for ensuring that available funds are directed toward priority healthcare requirements (Adenike, 2017).

In Nigeria, medicine supply management has historically experienced challenges involving procurement and distribution, which can affect the regular availability of medicines at healthcare facilities (Mohammed et al., 2008). These challenges demonstrate that procurement efficiency cannot be assessed solely by the purchasing price of commodities but should also consider timeliness, availability, quality, distribution, and the overall cost of managing the supply chain.

2.3 Medicine Availability and Stock-Outs

Medicine availability is one of the most visible outcomes of an effective healthcare supply chain because patients and healthcare professionals require continuous access to essential medicines for treatment (Chukwu et al., 2017). Stock-outs occur when required medicines are unavailable when needed, while overstocking occurs when inventory exceeds immediate or anticipated requirements (Jatau et al., 2015). Both conditions can indicate weaknesses in forecasting, procurement, inventory control, or distribution.

The study by Jatau et al. (2015) on multidrug-resistant tuberculosis in Nigeria demonstrates the importance of early-warning systems for monitoring stock-outs and overstocking. Effective monitoring can enable supply-chain managers to identify emerging shortages and take corrective action before they disrupt treatment (Jatau et al., 2015). Similarly, medicine supply management in Kaduna State highlights the importance of effective procurement, storage, and distribution in maintaining the availability of pharmaceutical products (Mohammed et al., 2008).

2.4 Logistics and Distribution Challenges

Logistics is a critical part of healthcare supply-chain performance because medicines and health commodities must be transported from procurement and storage points to healthcare facilities in a timely and appropriate manner (Umoren et al., 2021). Inefficient transportation and distribution can increase delivery times, raise operating costs, and contribute to shortages at healthcare facilities (Aigbavboa & Mbohwa, 2020).

The Nigerian context presents particular logistical challenges because healthcare commodities may need to move through geographically dispersed locations and complex distribution networks (Umoren et al., 2021). The Niger Delta, for example, requires logistics approaches capable of addressing regional transportation and distribution difficulties (Umoren et al., 2021). These challenges make logistics optimization important for improving the efficiency and reliability of healthcare supply chains.

2.5 Pharmaceutical Supply Chain and Counterfeit Medicines

The pharmaceutical supply chain is vulnerable to weaknesses in procurement, distribution, monitoring, and control, which can create opportunities for counterfeit medicines to enter legitimate distribution channels (Yakubu, 2020). Counterfeit medicines present a major concern because they can undermine confidence in healthcare systems and potentially compromise treatment outcomes (Yakubu, 2020).

Aigbavboa and Mbohwa (2020) identify challenges within Nigeria's pharmaceutical outbound value chain, demonstrating that medicine distribution involves multiple interconnected activities that must be effectively controlled. Strengthening supply-chain monitoring, improving accountability, and increasing visibility across distribution networks can therefore contribute to better control of pharmaceutical products (Yakubu, 2020; Egharevba et al., 2019).

2.6 Technology and Healthcare Supply Chain Management

Technology provides an opportunity to improve the visibility, monitoring, and coordination of healthcare supply chains (Egharevba et al., 2019). Digital systems can facilitate the tracking of medicines and provide information that supports supply-chain decision-making (Egharevba et al., 2019). This is particularly relevant where conventional record-keeping systems make it difficult to determine inventory levels and product movements accurately.

Egharevba et al. (2019) demonstrated the application of a smartphone-based system for tracking and managing medicines in Africa, indicating the potential of relatively accessible digital technologies to strengthen medicine supply-chain processes. Technology can therefore support better inventory monitoring, reduce information gaps, and improve the ability of managers to respond to supply-chain problems.

2.7 Supply Chain Management and Healthcare Performance

Supply-chain management can influence healthcare organizational performance because healthcare facilities depend on the availability of essential commodities to provide uninterrupted services (Gbadeyan et al., 2017). Inefficient supply chains can increase costs and reduce operational efficiency, whereas effective supply-chain practices can contribute to improved organizational performance (Gbadeyan et al., 2017).

The relationship between supply-chain performance and healthcare delivery is also connected to broader health-system performance because primary healthcare services require functioning systems for the provision of medicines and other essential resources (Kress et al., 2016). Consequently, improvements in procurement, inventory management, logistics, and distribution can support broader improvements in healthcare service delivery.

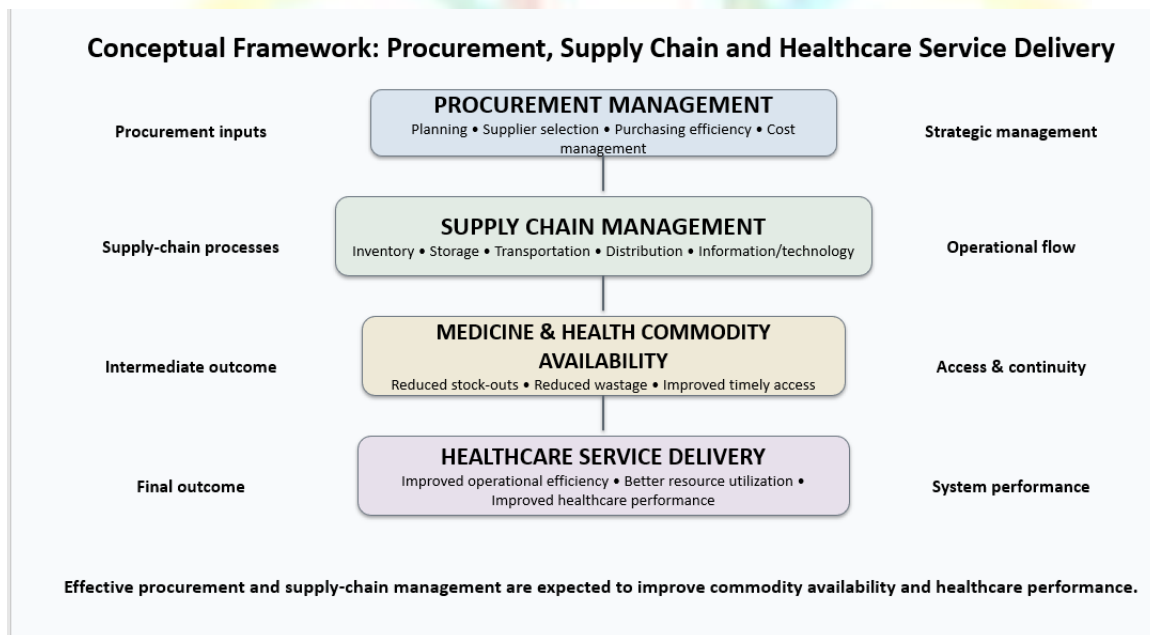
2.8 Supply Chain Sustainability and Institutional Capacity

Sustainable healthcare supply chains require more than short-term improvements in procurement and distribution because systems must maintain their effectiveness over time (Itiola & Agu, 2018). Country ownership, institutional coordination, accountability, and adequate management capacity are important considerations for sustaining health commodity supply systems in Nigeria (Itiola & Agu, 2018).

The experience of Nigeria's HIV/AIDS supply-chain system demonstrates the importance of institutional ownership and sustainability in maintaining improvements in health commodity management (Itiola & Agu, 2018). Similarly, effective planning and resource allocation are necessary for maintaining operational efficiency within organizations and projects (Agumalu, 2021). These factors suggest that sustainable healthcare supply-chain improvement requires both operational reforms and stronger institutional management.

2.9 Conceptual Framework

Based on the reviewed literature, the relationship examined in this article can be conceptualized as follows:



The framework indicates that procurement and supply-chain practices function as interconnected processes rather than isolated activities. Effective procurement provides the commodities required by the healthcare system, while logistics, inventory management, distribution, and information

systems determine whether those commodities reach healthcare facilities efficiently and remain available when required (Seidman & Atun, 2017; Chukwu et al., 2017; Egharevba et al., 2019).

2.10 Empirical Gap

The reviewed studies provide evidence on individual aspects of healthcare supply chains in Nigeria, including medicine supply management, stock-outs, logistics, pharmaceutical distribution, vaccine procurement, digital tracking, and supply-chain performance (Mohammed et al., 2008; Jatau et al., 2015; Umoren et al., 2021; Chukwu & Nnogo, 2021; Egharevba et al., 2019). However, these dimensions are often examined separately rather than as interconnected determinants of healthcare service delivery.

3. METHODOLOGY

3.1 Research Design

This article adopted a structured narrative literature review design to examine the impact of supply chain and procurement management on healthcare service delivery in Nigeria. The approach was considered appropriate because the study focuses on synthesizing existing evidence concerning procurement efficiency, medicine availability, logistics, cost efficiency, and healthcare supply-chain challenges rather than collecting new primary data (Seidman & Atun, 2017).

3.2 Sources of Data

The study relied on the 15 scholarly references provided for the review as its principal sources of evidence. The references covered healthcare procurement, pharmaceutical supply chains, medicine availability, logistics, healthcare performance, resource allocation, counterfeit medicines, digital tracking, and health-commodity management in Nigeria and other low- and middle-income settings (Mohammed et al., 2008; Jatau et al., 2015; Seidman & Atun, 2017).

The selected literature included empirical studies, systematic review evidence, conceptual contributions, and studies examining specific healthcare supply-chain interventions and challenges. This range enabled the article to consider both general evidence on healthcare supply chains and issues that are specifically relevant to Nigeria (Seidman & Atun, 2017; Chukwu et al., 2017).

3.3 Review Procedure

The references were examined according to four major analytical areas: procurement efficiency, medicine and health-commodity availability, supply-chain and logistics challenges, and healthcare service performance. Evidence from each reference was extracted and compared according to its major findings and relevance to the objectives of the study.

The review also considered the role of technology, institutional capacity, resource allocation, and supply-chain sustainability because these factors influence the effectiveness of procurement and healthcare commodity management (Itiola & Agu, 2018; Egharevba et al., 2019; Agumalu, 2021).

3.4 Data Analysis

A thematic analysis approach was used to synthesize the literature. Findings from the selected studies were grouped into recurring themes, including:

- procurement efficiency;
- medicine availability and stock-outs;
- inventory and resource management;
- logistics and distribution;
- pharmaceutical supply-chain challenges;
- counterfeit medicine control;
- digital technology and supply-chain visibility; and
- healthcare service performance.

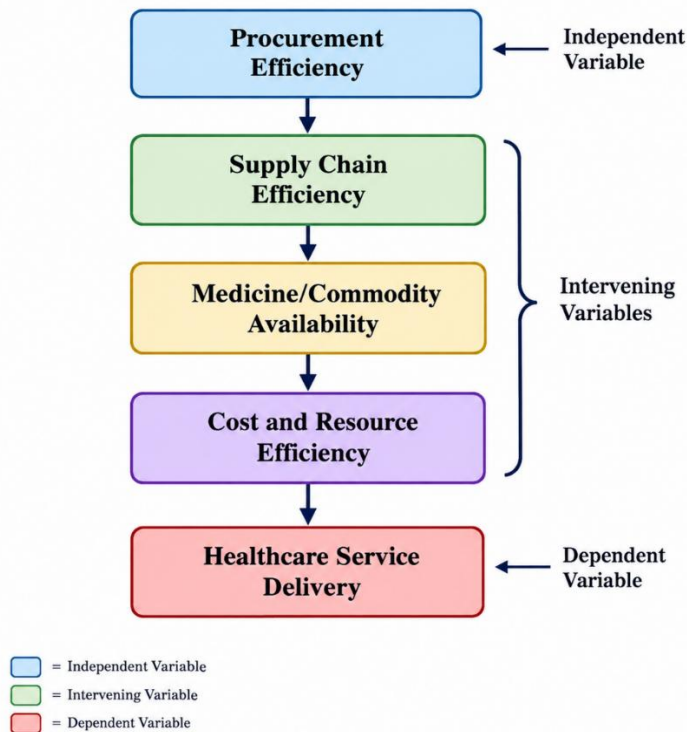
The findings were subsequently compared to identify common patterns, major challenges, and potential strategies for improving healthcare supply-chain performance in Nigeria (Jatau et al., 2015; Aigbavboa & Mbohwa, 2020; Umoren et al., 2021).

3.5 Analytical Framework

The analysis assumes that effective procurement contributes to efficient supply-chain operations, which in turn improves the availability of medicines and healthcare commodities and ultimately supports healthcare service delivery (Seidman & Atun, 2017; Chukwu et al., 2017).

The relationship is represented as:

However, this relationship can be weakened by factors such as poor planning, inadequate logistics, stock-outs, overstocking, weak information systems, distribution problems, and pharmaceutical supply-chain vulnerabilities (Jatau et al., 2015; Aigbavboa & Mbohwa, 2020; Yakubu, 2020).



4. RESULTS

The literature reviewed demonstrates that procurement management and supply-chain performance are closely associated with the availability of healthcare commodities and the efficiency of healthcare service delivery in Nigeria. The findings were organized into five major themes: procurement efficiency, medicine availability, cost and resource efficiency, logistics and distribution, and technology and supply-chain control.

4.1 Procurement Efficiency and Healthcare Supply

The reviewed evidence indicates that procurement is a fundamental determinant of healthcare commodity availability. Inefficient procurement processes can contribute to delays, shortages, and increased costs, while improved procurement and supply-chain processes have the potential to improve product availability and generate savings (Seidman & Atun, 2017). Nigerian evidence similarly indicates that weaknesses in medicine supply management can affect the effectiveness of healthcare commodity provision (Mohammed et al., 2008).

Procurement efficiency is also closely related to planning and resource allocation. Effective allocation of available resources allows healthcare organizations to prioritize essential commodities and reduce avoidable expenditure (Adenike, 2017; Agumalu, 2021).

4.2 Medicine Availability and Inventory Management

Medicine availability emerged as one of the most important outcomes of healthcare supply-chain performance. Evidence on multidrug-resistant tuberculosis in Nigeria demonstrates the continuing importance of monitoring stock-outs and overstocking within medicine supply systems (Jatau et al., 2015). Overstocking can result in unnecessary inventory accumulation and potential wastage, whereas stock-outs can interrupt treatment and reduce the ability of healthcare facilities to provide continuous services (Jatau et al., 2015).

The evidence therefore suggests that effective forecasting, inventory monitoring, procurement planning, and distribution are necessary to maintain appropriate stock levels (Mohammed et al., 2008; Chukwu et al., 2017).

4.3 Cost and Resource Efficiency

The literature indicates that supply-chain efficiency has important implications for healthcare costs. Procurement systems that are poorly coordinated can increase purchasing and operational costs, while improvements in procurement and supply-chain processes can generate potential cost savings (Seidman & Atun, 2017).

Resource allocation is also important because healthcare organizations operate within limited financial and material resources (Adenike, 2017). Efficient planning and allocation can improve operational performance and reduce the potential for resources to be wasted through inappropriate procurement or ineffective distribution (Agumalu, 2021).

4.4 Logistics and Distribution Challenges

Logistics and distribution constitute significant challenges within the Nigerian healthcare supply chain. The literature identifies transportation, distribution, coordination, and geographical factors as important considerations in ensuring that medicines and health commodities reach healthcare facilities efficiently (Umoren et al., 2021; Aigbavboa & Mbohwa, 2020).

Vaccine procurement and distribution also demonstrate the importance of effective logistics, coordination, and planning when delivering essential health products at scale (Chukwu & Nnogo, 2021). These findings indicate that procurement alone cannot guarantee availability if distribution systems are unable to move commodities efficiently to healthcare facilities.

4.5 Technology and Supply-Chain Visibility

Technology represents an important opportunity for improving healthcare supply-chain management. Smartphone-based medicine tracking has demonstrated potential for improving the monitoring and management of medicines within African supply chains (Egharevba et al., 2019).

Digital systems can improve information availability and enable supply-chain managers to monitor commodity movement and inventory levels more effectively (Egharevba et al., 2019). Improved

visibility can also support earlier identification of potential shortages and strengthen decision-making within the supply chain (Jatau et al., 2015).

Table 1. Summary of Major Findings from the Reviewed Literature

Major area	Key finding	Implication for healthcare delivery
Procurement	Efficient procurement can improve availability and reduce avoidable costs	Better access to essential commodities
Inventory management	Stock-outs and overstocking remain important challenges	Risk of treatment interruption and wastage
Logistics	Transportation and distribution affect commodity availability	Delays can reduce service efficiency
Resource allocation	Poor allocation can reduce operational efficiency	Better planning can improve resource utilization
Pharmaceutical control	Supply-chain weaknesses can create vulnerabilities to counterfeit medicines	Need for stronger monitoring and control
Technology	Digital tracking can improve supply-chain visibility	Better monitoring and decision-making
Supply-chain performance	Effective supply-chain management supports organizational performance	Potential improvement in healthcare service delivery

4.6 Overall Result

Overall, the reviewed literature indicates that healthcare service delivery in Nigeria is influenced by the efficiency of procurement and the broader supply-chain system. The strongest recurring challenges are inadequate procurement and planning, stock-outs and overstocking, distribution and logistics difficulties, resource constraints, weak supply-chain visibility, and pharmaceutical supply-chain vulnerabilities (Mohammed et al., 2008; Jatau et al., 2015; Aigbavboa & Mbohwa, 2020).

The evidence further indicates that strengthening procurement processes alone may not be sufficient. Improvements need to extend across inventory management, logistics, distribution, information systems, resource allocation, and institutional coordination to achieve sustained improvements in medicine availability and healthcare service delivery (Itiola & Agu, 2018; Umoren et al., 2021; Egharevba et al., 2019).

5. DISCUSSION

The findings demonstrate that procurement and supply-chain management are important determinants of healthcare service delivery in Nigeria. The evidence indicates that the availability of medicines and healthcare commodities depends not only on the procurement process but also on inventory management, logistics, distribution, information management, and institutional coordination (Seidman & Atun, 2017; Chukwu et al., 2017). This suggests that supply-chain performance should be considered as an integrated system rather than as a series of independent activities.

The finding that procurement efficiency affects healthcare commodity availability is consistent with the evidence presented by Seidman and Atun (2017), who found that improvements in procurement and supply-chain processes can contribute to cost savings and improved availability of health products. The Nigerian experience reported by Mohammed et al. (2008) similarly indicates that weaknesses in medicine supply management can affect the reliability of pharmaceutical supplies. Effective procurement therefore requires accurate planning, appropriate purchasing decisions, and coordination with subsequent storage and distribution activities.

The problem of stock-outs and overstocking identified in the results is particularly important for healthcare service delivery. Jatau et al. (2015) demonstrated the relevance of early-warning mechanisms for identifying stock-outs and excessive stocks within Nigeria's MDR-TB medicine supply system. These findings suggest that procurement decisions should be supported by accurate demand forecasting and continuous inventory monitoring. A procurement system that purchases medicines without adequate information about consumption patterns can contribute either to shortages or unnecessary accumulation of stock.

The results also show that logistics and distribution remain important constraints. Umoren et al. (2021) emphasized the importance of logistics optimization for efficient healthcare supply-chain management in the Niger Delta, while Aigbavboa and Mbohwa (2020) identified challenges affecting pharmaceutical outbound value chains in Nigeria. These findings indicate that even when medicines are successfully procured, weaknesses in transportation, warehousing, and distribution can prevent them from reaching healthcare facilities when required.

The findings concerning cost efficiency further demonstrate that supply-chain management has financial implications for healthcare organizations. Seidman and Atun (2017) associate improvements in procurement and supply-chain processes with potential cost savings, while Adenike (2017) emphasizes the importance of strategic resource allocation and financial management. Agumalu (2021) similarly highlights the role of resource allocation and planning in organizational operational efficiency. Consequently, reducing healthcare supply-chain costs requires more than negotiating lower purchase prices; it also requires effective planning, inventory control, logistics, and resource utilization.

Another important finding concerns the vulnerability of pharmaceutical supply chains. Yakubu (2020) identifies loopholes within Nigeria's pharmaceutical supply chain that can create opportunities for counterfeit medicines. Aigbavboa and Mbohwa (2020) also highlight challenges within pharmaceutical outbound value chains. This suggests that supply-chain efficiency must be considered alongside product quality and security. Stronger monitoring and traceability can help improve control over pharmaceutical products as they move through the supply chain.

The results concerning digital technology are consistent with Egharevba et al. (2019), who demonstrated the potential of smartphone-based applications for medicine tracking and supply-chain management in Africa. Digital systems can improve information visibility and support more timely decisions concerning inventory and product movement. Their application may therefore help address some of the information gaps that contribute to stock-outs and inefficient distribution.

The findings also support the importance of institutional sustainability. Itiola and Agu (2018) emphasize country ownership and sustainability in Nigeria's HIV/AIDS supply-chain system, indicating that improvements in supply-chain performance require institutional commitment and effective coordination. This is important because short-term interventions may have limited impact if healthcare institutions lack the capacity to maintain improved procurement, inventory, and distribution practices.

The relationship between supply-chain management and healthcare performance is further supported by Gbadeyan et al. (2017), whose study links supply-chain management with performance in selected private hospitals in Ilorin. Kress et al. (2016) also demonstrate the importance of system-level factors in assessing primary healthcare performance in Nigeria. Together, these findings suggest that supply-chain efficiency should be viewed as part of broader health-system performance rather than merely as an administrative function.

Overall, the evidence suggests that improving healthcare service delivery in Nigeria requires an integrated approach to procurement and supply-chain management. Improving procurement without addressing inventory management, transportation, distribution, information systems, and institutional capacity may not adequately resolve medicine availability problems (Chukwu et al., 2017; Umoren et al., 2021). A coordinated approach involving better planning, stronger monitoring, improved logistics, digital tracking, effective resource allocation, and institutional ownership is therefore necessary to achieve sustainable improvements in healthcare commodity availability and service delivery (Itiola & Agu, 2018; Egharevba et al., 2019).

6. CONCLUSION

Effective supply chain and procurement management are essential to the delivery of reliable healthcare services in Nigeria. The review shows that procurement efficiency influences the availability and cost of medicines and healthcare commodities, while inventory management,

logistics, distribution, information systems, and institutional coordination determine how effectively those commodities reach healthcare facilities.

The major challenges identified include stock-outs, overstocking, inefficient distribution, logistical constraints, inadequate planning, resource-management difficulties, weak supply-chain visibility, and vulnerabilities within pharmaceutical distribution systems. These challenges can reduce the efficiency and reliability of healthcare service delivery.

Improving Nigeria's healthcare supply chain therefore requires a coordinated approach that strengthens procurement planning, inventory management, logistics, distribution, digital monitoring, resource allocation, and institutional accountability. Such improvements can contribute to more reliable medicine availability, better use of healthcare resources, reduced supply-chain inefficiencies, and improved healthcare service delivery.

7. RECOMMENDATIONS

1. **Strengthen procurement planning:** Healthcare institutions should improve demand forecasting and procurement planning to reduce shortages, excessive purchasing, and unnecessary expenditure.
2. **Improve inventory management:** Appropriate inventory-monitoring systems should be strengthened to identify stock-outs and overstocking early and facilitate timely corrective action.
3. **Improve logistics and distribution:** Healthcare supply chains should strengthen transportation, warehousing, and distribution systems, particularly in geographically difficult areas.
4. **Expand digital supply-chain systems:** Digital and smartphone-based tracking systems should be encouraged to improve inventory visibility, product tracking, and supply-chain decision-making.
5. **Strengthen pharmaceutical supply-chain controls:** Monitoring and traceability mechanisms should be improved to reduce vulnerabilities to counterfeit and poor-quality medicines.
6. **Improve resource allocation:** Available financial and operational resources should be strategically allocated toward priority medicines, essential healthcare commodities, and critical supply-chain activities.
7. **Strengthen institutional coordination:** Government agencies, healthcare facilities, suppliers, development partners, and other supply-chain actors should improve coordination and accountability to support sustainable supply-chain performance.

8. **Promote continuous monitoring:** Healthcare supply-chain performance should be regularly evaluated using indicators such as medicine availability, stock-out frequency, procurement lead time, inventory levels, distribution efficiency, and supply-chain costs.

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