

Enhancement of supply chain factors affecting health care delivery in public hospitals in Africa: A case of selected hospital in Zambia

Caroline Simbeza^{1*}
Romeo Yohane²

^{1*}carolinemasaiti29@gmail.com

²romeo.yohane@unza.ac.zm

^{1, 2}The University of Zambia

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ABSTRACT

The purpose of this research paper is to assess the how Supply Chain factors affecting Health Care Delivery at selected public University Teaching Hospitals can be mitigated and enhanced. This enhancement is argued in terms making processes flexible and responsive in ordering and delivery processes, while maintaining transparency and achieving value-for-money in the procurement of essential medicines and health commodities. This research paper was guided by the theoretical development of Supply Chain Management (SCM). In its methodological consideration, the research paper employed an embedded mixed method design with qualitative playing a more dominant role. The research had a population of 540, and then obtained a sample size of 110 respondents and 10 participants. These were selected using a combination of expert purposive sampling and simple random sampling techniques. Data were collected using a semi-structured interview guide and a questionnaire, and the analysis was conducted both thematically and descriptively using SPSS version 22. A major finding of this research paper is that the enhancement of supply chain management can be achieved through proper personnel training, structured scheduling, reduction of medicine prices, and providing reliable high-speed internet connectivity significantly improves the availability, accessibility, and efficiency of healthcare delivery in Zambia. The research study concluded that addressing these challenges is critical to ensuring the timely and efficient delivery of essential medical supplies and services. Implementing technology solutions such as inventory management systems, electronic health records, and supply chain analytics could significantly improve visibility and tracking across the supply chain. These advancements would enable better forecasting, real-time monitoring of stock levels, and the early detection of potential issues, thereby enhancing efficiency and responsiveness. The study recommends that Supply chain managers should proactively incorporate risk management techniques during the planning stages of the supply chain to mitigate potential disruptions. The government should also invest in advanced information technology systems to manage supply chain risks effectively and enhance supply chain resilience, particularly in the healthcare sector.

Keywords: Current Practices, Health Care Delivery System, Public Hospitals, Supply Chain, Zambia

I. INTRODUCTION

The procurement and supply management function plays a critical role in healthcare delivery by ensuring the timely availability of essential medicines, medical equipment, and other health commodities. Failure to safeguard consistent supply can undermine the objectives of a health institution, as the procurement function is meant to support clinical service delivery and overall organisational performance (Grose & Richardson, 2014). Over the years, local media in Malawi and Zambia has reported persistent drug shortages in public hospitals, raising concerns about the efficiency and resilience of procurement systems and highlighting both internal and external forces (Edward et al, 2021) affecting the ability of public hospitals to guarantee uninterrupted access to medicines.

The Auditor General's 2024 report for Zambia's public accounts revealed extensive weaknesses in procurement and supply functions, including undelivered drugs and medical supplies costing significant sums that were not received by intended health facilities, under deliveries on dispatched supplies, delayed distribution of essential equipment, and broader failures to ensure that procured items reached health centres on time, all indicating lapses in planning, contract oversight, inventory control, and compliance with procurement regulations that directly compromise service delivery (Office of the Auditor General, 2024 report findings). Such shortages can have fatal consequences as they compromise treatment continuity and may result in failure of healthcare delivery systems (Jedermann, 2014). Dependence on a single supplier increases supply risk because any disruption affecting that supplier directly impacts all procuring entities (Bode, et al, 2011)), in contrast to contexts such as India where hospitals engage multiple suppliers and maintain diversified sourcing strategies that enhance resilience and sustain higher levels of availability of medical supplies (Smith, 2008).

Increasing the effectiveness, efficiency, and compliance of Health care delivery has become an ongoing concern for governments. Public administrations at different levels are realising that in order for public procurement to

fulfil its mission appropriate control and diagnostic systems must be put in place. According to Bennett, and Muraleedharan (2000), Procurement on the other hand, is the process of finding, agreeing terms and acquiring goods, services or works from an external source, often via a tendering or competitive bidding process. The process is used to ensure the buyer receives goods, services or works at the best possible price, when aspects such as quality, quantity, time, and location are compared.

Grose and Richardson, (2014) emphasize that procurement activities are often split into two distinct categories, direct and indirect spend. Direct spend refers to the production-related procurement that encompasses all items that are part of finished products, such as raw material, components and parts. Direct procurement, which is the focus in supply chain management, directly affects the production process of manufacturing firms). In contrast, indirect procurement concerns non-production-related acquisition: obtaining “operating resources” which a company purchases to enable its operations. Indirect procurement comprises a wide variety of goods and services, from standardized items like office supplies and machine lubricants to complex and costly products and services like heavy equipment, consulting services, public health services and outsourcing services (Grose & Richardson, 2014)

Government or public procurement on the other hand is, the purchase of goods and services or constructions on behalf of a public institution or entity (World Economic Forum, 2016). Further, Government procurement accounts for a substantial part of the global economy accounting about 10 to 20% of Gross Domestic Product (GDP). To prevent fraud, waste, corruption, or local protectionism, the law in most countries regulates government procurement more or less closely. It usually requires the procuring authority to issue public tenders if the value of the procurement exceeds a certain threshold Mark Schlesinger, (1987). Every year, health Institutions in Zambia spend around 14% of GDP on the purchase of services, works and supplies (Government of the Republic of Zambia, 2021). In sectors such as the energy, transport and the provision of health or education services, public institutions are the principal buyers. There are many examples of public procurement in Zambia such as building of a government schools, purchasing furniture for a public office, contracting Nemchem for the cleaning of a public university. Public Procurement in Zambia is governed by the Zambia Public Procurement Authority (ZPPA) Act No. 12 of 2008 and the Public Procurement Regulations of 2011 in accordance with the Public Procurement Act of 2008.

The ZPPA, formerly known as the Zambia National Tender Board, is an independent body responsible for regulating the procurement of goods, works, and services by all procuring entities. The ZPPA supervises the bidding process and monitors the accomplishments of contracts entered into by procuring entities to ensure accountability, transparency and extreme competition for value for money in the use of public funds. The sole mission of public procurement, especially in Zambia, is to ensure and enable that all contracting authorities meet their policy and business objectives in the delivery of better public services. Johns and Torres (2005) argues that public-sector entities responsible for procuring essential medicines and health commodities in developing countries often lack the technical capacity to ensure efficient supply security. Under strict public scrutiny and pressures to be transparent, many agencies continue to use archaic procurement methods and to depend on inflexible forecasts and cumbersome tendering processes. Framework agreements are long-term contracts that provide the terms and conditions under which smaller repeat purchasing orders may be issued for a defined period Kimathi (2017). Such agreements are common in U.S. and United Nations procurement systems and in other developed countries and multilateral organizations.

At a broader level, the health care system in many sub Saharan African countries continues to face persistent procurement and supply chain challenges that undermine the consistent availability of essential medicines. Empirical studies and policy reports have identified weaknesses in forecasting and quantification, fragmented procurement planning, inadequate technical capacity, delayed tender processes, weak contract management, limited supplier performance monitoring, and poor inventory control as major constraints affecting public health supply chains (Yadav, 2015). These challenges are often compounded by bureaucratic approval procedures, funding delays, and overreliance on single or centralized suppliers, all of which contribute to long lead times and frequent stock outs (Fenton & Cali, 2020).

In many contexts, procurement systems remain largely transactional rather than strategic, focusing on repeated short-term tenders instead of long-term contracting mechanisms that could improve efficiency and supply security. In contrast, framework agreements remain seldom used in the procurement of health commodities in countries such as Zambia, despite global evidence suggesting that strategic contracting mechanisms can reduce transaction costs, shorten procurement cycles, and improve supplier responsiveness (OECD, 2016). The current practice of floating tenders multiple times a year not only prolongs lead times but also limits suppliers’ ability to plan production and distribution in line with government demand, thereby increasing the risk of stock disruptions (Choi, et al, 2016). To date, the use of strategic contracting approaches in the public procurement of health commodities has received limited attention in many developing countries, yet it presents a significant opportunity to enhance procurement efficiency and commodity availability. Strengthened enabling legislation, improved technical capacity in contract design and

management, and institutional reforms to support long term framework agreements could enhance supply security, reduce costs, and ultimately improve health care delivery outcomes.

1.1 Statement of the Problem

Despite the Ministry of Health's mission to provide cost-effective, quality health services that are accessible and equitable and to contribute to national development, significant gaps persist in the procurement and supply of essential medicines in public health facilities, undermining these policy goals. Historically, Zambia's national availability of essential medicines has fluctuated well below recommended standards, with availability levels recorded between approximately 40 per cent and 60 per cent in 2021 and 2022, far below the World Health Organization's benchmark of 70 per cent to 80 per cent at all levels of care. By July 2023, national stock positions had improved to an average of around 75 per cent at hospitals and above 80 per cent at health centres following bulk deliveries, but these figures still reflected gaps in continuity of supply (Parliament of Zambia report on availability 2021–2023). In the first distribution cycle of 2025, national availability of medicines and medical supplies was reported at 68.4 per cent, with key commodities such as antiretroviral drugs at 88 per cent but overall availability below optimal levels (WHO, 2023).

The persistence of sub-optimal stock levels highlights ongoing supply chain weaknesses that likely affect tertiary facilities, where inconsistent inventory retention and delayed deliveries can cascade into stock-outs of life-saving drugs and supplies. Prior research has shown that such stock-outs contribute to adverse outcomes including patient deterioration, increased referrals, and in some cases death, due to failure of the procurement function to ensure availability of drugs (Haruta & Radu, 2010). The current procurement practice in Zambia of floating tenders multiple times a year is associated with long lead times and increased supply risk, limiting manufacturers' ability to plan production and respond to public sector demand. In contrast, strategic contracting tools like framework agreements, which are seldom used in sub-Saharan African health procurement, have been shown in other settings to shorten procurement cycles, reduce transaction costs, and improve supplier responsiveness. Yet little attention has been given to the use of long-term contracting mechanisms within Zambia's public health supply chain. Understanding how sourcing modes contribute to or mitigate supply risk is therefore critical, as non-availability or delays in delivery of essential medicines continues to compromise health care delivery and impede attainment of national health priorities.

1.2 Research Objective

Generally the research paper tries to understand the factors affecting supply chain management (SCM) on Health care delivery System at the University Teaching Hospital (UTH) in Lusaka District. Hence, the main objective of this paper is: To propose measures that can enhance health service delivery at the University Teaching Hospital (UTH) in Lusaka District.

II. LITERATURE REVIEW

2.1 Theoretical Review

This research paper was guided by the theoretical development of Supply Chain Management (SCM). This theory was primarily derived from insights of public health organizations. Nirai et al (2001) noted that the purpose of this theory is to examine the causal linkages among supply chain practices, effectiveness of supply chain performance (SCP) and organizational performance (OP) in healthcare industries. The theory provides insights into the significance of procurement operations in healthcare delivery. It recommends a strategy shift from single sourcing to dual sourcing in order to avert the persistent drug stock outs in public hospitals.

There are two main arguments in favour of multiple sourcing. One is that it reduces dependence on individual suppliers. Using alternative sources, a buying company is supposed to improve the reliability in the flow of goods on the supply side. If one supplier has the problem in delivering according to plan, an alternative source may be used at short notice. The other argument is that having multiple sourcing helps the firm to be more flexible to cope with unexpected events that could jeopardise capacity of the firm to meet its objectives. Shekar and Kate (2014) argue that a traditional culture that emphasises seeking good, short-term performance appears to be in conflict with the objectives of supply chain management. The single most important prerequisite is a change in the corporate cultures of all members in the value chain to make it conducive to supply chain management. The most appropriate strategy for a buying firm would be to take advantage of both approaches and at the same time trying to avoid the main disadvantages (Michael Ian Morrison, 2013).

The other key element of this theory to any successful SCM effort is the involvement of top-tier suppliers from two to six (Ranganathan et al. 2004.). This group often accounts for a large percentage of a company's spending. It allows a company to plan on the basis of a longer lead-time, becoming more efficient by working with the best suppliers and developing a better strategic sourcing capability. In the process supply chain management, companies are also advised to implement vendor review programs, which promote finding suppliers with operational excellence so the company can ascertain which suppliers are serving them better. Having too many partners' means few repeat

transactions and no time to close relationship to develop. At the same time partners avoid becoming over dependent to one relationship. A company can always keep potential partners on reserve (Das, 2017).

A fundamental requirement for the development of partnerships and networks is trust and common objectives amongst all parties. However, this trust and common objectives can be developed; individual companies must show their desire and commitment in the organisation Woods and Bochman (2018). Based on the elements of supply chain management theory advanced above, it was prudent to apply it when assessing Supply Chain Management (SCM) factors on Health care delivery System. This study envisions flexibility and responsiveness while maintaining transparency and achieving greater value-for-money in the procurement of essential medicines and health commodities as such, the profound of this theory should be tested by carrying out this empirical study.

2.2 Empirical Review on Measures that Can Enhance Health Service Delivery

In an effort to improve health service delivery, Minior et al. (2017) conducted a study on Public procurement of health care in Europe. Specifically, the research focused on procurement of medical devices. This process was informed by analysing the legal framework laid down by the EU Procurement Directives, especially with regard to awarding procedures and contractual forms. Findings revealed that Procurement of Healthcare Innovations is among key factors considered for any company to supply medicine and medical devices in Europe. It was reported that research and innovation, including eco-innovation and social innovation, are among the main drivers of future growth and have been put at the centre of the Europe 2020 strategy for smart, sustainable and inclusive growth. The rapid lifecycles and continuous improvement which characterise the medical technology industry present a particular challenge in procurement. The desired outcome of the process is to achieve the optimal compromise between quality and price, but that is difficult to achieve without an accurate appraisal of the value of innovation. Recent studies show that one of the main barriers to innovation in medical devices is represented by procurement systems that do not focus on procuring innovation Grose and Richardson (2014). From this point of view, one would argue that if procurement rules do not properly recognise and reward innovation, then there will be fewer incentives to innovate. In as much as the survey in Europe shows the importance of recognising innovation in the awarding of contracts in health sector, there is still scant information on how innovative companies are that have been awarded tenders to supply medicine, drugs and medical devices hence this current study.

Further empirical evidence in the area of procurement has been provided. For instance, in Sweden, Grose and Richardson (2014) conducted a study on sustainable public procurement as a driver of change. The study specifically focused on procurement of surgical instruments. Methodologically, the study is grounded in an exploratory design and employs in-depth interviews with multiple stakeholders to gain a holistic understanding of the phenomena being studied. The study revealed that SPP mainly influences suppliers by requiring them to evaluate their own sustainability practices, engage in collaborative actions and make alterations when they fail to comply with the contractual terms. The most significant challenge reported was lack of resources, resulting in the inability to perform sufficient follow-ups, engage in meaningful conversations with suppliers and procurers having to buy unsustainable products because of their tight budgets. Another major challenge reported was Sweden's forerunner position when it comes to SPP on an international level, resulting in reluctance on the part of international suppliers to alter their sustainability practices. Given the severity of the problems that this industry faces, Kimathi (2017) argues that it is crucial that both public buyers and suppliers assess their operational models and work collaboratively towards a more sustainable future in public procurement of health delivery.

In reference to the above argument, Sustainable Public Procurement was preceded by an initiative in the 1990s in the Rio Summit. The Initiative was then called Green Procurement, which was developed as a guideline to encourage sustainable development. Green Procurement puts emphasis on environmental issues in the supply chain and focuses on reducing the environmental impacts caused by procurement (Douglas, et al (2022). This move was re-established following the World Summit on Sustainable Development in 2002, as more environmental goals were being integrated into formal procurement policies (Mensah, 2014). Environmental Preferable Purchasing was defined as "Purchasing products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose" (Curran, 2001).

III. METHODOLOGY

3.1 Research Design

This study employed an embedded mixed-method design, in which qualitative methods played a more dominant role to amplify some of the key voices for strategic stakeholders in the procurement value chain. Mixed-methods research is particularly appropriate for healthcare supply chain studies in LMICs, as it allows researchers to capture both the quantitative dimensions of procurement performance especially in terms stock out rates, lead times and costs among others and the qualitative dimensions of amplifying stakeholder perceptions, organisational processes, and contextual factors (Mbwasi et al., 2022). In an embedded design, qualitative data set provides a

supportive, secondary role while quantitative is a subset embedded in qualitative within a single study (Creswell 2014; 2009). The qualitative component was prioritized to have deeper insights into the lived experiences of supply chain staff, clinicians, and administrators in the UTH value chain. The quantitative component provided descriptive statistics to consolidate and triangulate the qualitative findings.

3.2 Purpose and Study Area

The purpose of this study was to assess the factors affecting supply chain management (SCM) on Health care delivery System can be mitigated at the University Teaching Hospital (UTH) in Lusaka District. The study was conducted at the University Teaching Hospital (UTH) which is a public hospital in Zambia. The specific objective was to propose measures that can enhance health service delivery at the University Teaching Hospital (UTH) in Lusaka District.

3.3 Population and Sample

The population comprised of 540 respondents and 10 Participants in which a sample of 110 was drawn composed of the following: supply chain staff (40), clinicians (22), nurses (23), pharmacists (25), and hospital administrators (10) involved in or affected by procurement and supply management processes in the value chain. These were selected using a combination of expert purposive sampling and simple random sampling techniques. Simple random sampling was deployed to select a broader sample of clinical and administrative staff to ensure representativeness and reduce selection bias. The research paper employed a combination of expert purposive sampling and simple random sampling techniques were used to select participants and respondents. Expert purposive sampling was employed to identify key informants with specialised knowledge and experience in supply chain management, procurement, and healthcare delivery system (Urassa et al.1997).

3.4 Instruments, Data Analysis and Ethics

Data were collected using a semi-structured interview guide and a questionnaire, and the analysis was conducted both thematically and using descriptive statistics using SPSS version 22. All Ethical consideration were taken on board in that ethical clearance was conducted before embarking on this research and all ethics related to anonymity and informed were strictly adhered to.

IV. FINDINGS & DISCUSSION

4.1 Qualification and Work Experience of respondents

Table 1 presents the educational qualifications of the respondents, highlighting the highest level of education attained by each participant

Table 1

Qualification of Respondents

Qualification of Participants	Number	Percentage (%)
Certificate/Diploma Holder	8	7
Bachelor Degree	66	60
Masters	25	23
PhD/ Doctorate	11	10
Total	110	100

The findings as show in Table 1 indicate that the majority of respondents, accounting for 60% (66), possessed a bachelor's degree. This suggests that most participants had acquired a solid foundation of higher education, equipping them with relevant knowledge and skills in their respective fields.

Following this, 23% (25) of the respondents held a master's degree, reflecting a significant proportion of individuals who had pursued advanced studies beyond the undergraduate level. These respondents likely had a deeper level of expertise and specialization in their disciplines, which may have influenced their perspectives and contributions to the study. Additionally, 10% (11) of the respondents had attained a PhD, indicating a small but notable group of highly educated individuals with extensive academic and research experience. Their insights may have provided valuable contributions to the study, particularly in areas requiring critical analysis and specialized knowledge. Lastly, 7% (8) of the respondents had a college certificate as their highest qualification. This represents the smallest group in the sample, suggesting that fewer participants had only a foundational level of post-secondary education. Despite their lower representation, their perspectives remain relevant in understanding the broader educational landscape of the respondents.

4.2 Work experience

Figure 2 illustrates the distribution of respondents based on their work experience. The data reveals that the majority of respondents, accounting for 55%, had more than six years of work experience. This indicates that a significant portion of the participants had extensive professional exposure, which may have contributed to their depth of knowledge, expertise, and insights relevant to the study. Following this, 25% of the respondents reported having between four to five years of work experience. This group represents professionals who had accumulated a moderate level of experience in their respective fields, suggesting they had gained substantial practical knowledge while still being in the early-to-mid stages of their careers. Additionally, 13% of respondents had work experience ranging between one to three years. This category comprises individuals who were relatively new to the workforce but had already started to develop industry-specific skills and competencies. Their perspectives may reflect fresh insights, adaptability, and emerging trends in their areas of expertise. Lastly, the smallest group, representing only 7% of the respondents, had less than one year of work experience. This minority group likely consisted of early-career professionals or recent graduates who were still in the initial stages of their professional journey. While their experience was limited, their inclusion in the study offers valuable perspectives on challenges faced by newcomers in the workforce.

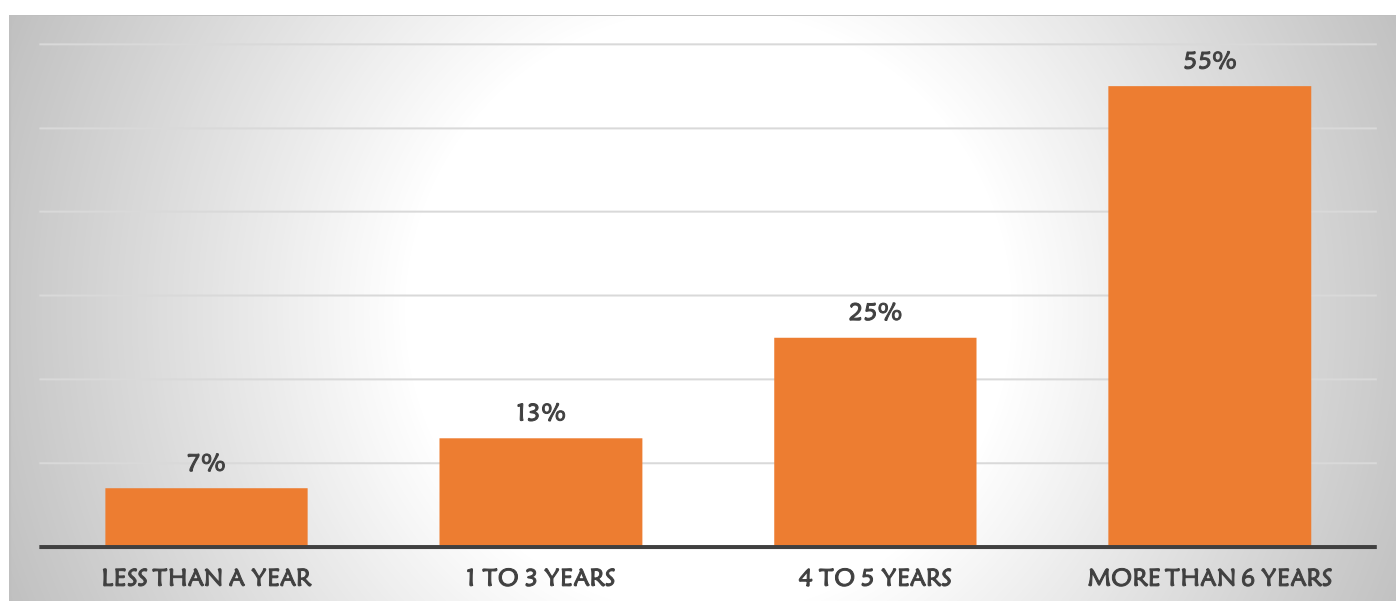


Figure 2
Qualification of respondents

Table 1
Demographic Profile of Qualitative Participants (Key informants)

ID	Age (Years)	Gender	Position/Role	Years of Experience	Department	Highest Qualification
KI1	45	Male	Procurement Manager	15	Supply Chain	Master's in Supply Chain Management
KI2	38	Female	Pharmacy Officer	10	Pharmacy	Bachelor of Pharmacy
KI3	50	Male	Hospital Administrator	20	Administration	Master's in Health Administration
KI4	32	Female	Nurse-in-Charge	8	Nursing	Bachelor of Nursing
KI5	41	Male	Medical Store Officer	12	Stores	Diploma in Logistics
KI6	36	Female	Finance Officer	9	Finance	Bachelor of Accounting
KI7	48	Male	Supply Chain Analyst	18	Supply Chain	Master's in Operations Management
KI8	29	Female	Pharmacist	5	Pharmacy	Bachelor of Pharmacy
KI9	55	Male	Senior Procurement Officer	25	Procurement	Master's in Business Administration
KI10	34	Female	Clinical Services Coordinator	7	Clinical	Bachelor of Health Sciences

The demographic profile of the respondents reveals a diverse group of ten key informants involved in various aspects of healthcare and supply chain management at at University Teaching hospital. The participants' ages ranged

from 29 to 55 years, reflecting a mix of early-career and highly experienced professionals. Gender representation was balanced, with five males and five females, ensuring input from both perspectives. Respondents held different positions across the hospital, including procurement managers, pharmacy officers, hospital administrators, nurses, medical store officers, finance officers, supply chain analysts, pharmacists, and clinical services coordinators, highlighting the multidisciplinary nature of healthcare supply chain operations. The number of years of professional experience varied from 5 to 25 years, indicating that the study captured insights from individuals with both emerging and extensive expertise. Educational qualifications among the respondents ranged from diplomas to master's degrees in relevant fields such as supply chain management, health administration, pharmacy, nursing, operations management, accounting, and business administration, demonstrating that the respondents possessed the necessary academic and professional background to provide informed perspectives on supply chain management and its impact on healthcare delivery.

4.2.1 Enhancement of Supply Chain Management Practices to improve service delivery at University Teaching hospital in Lusaka District

The research paper findings indicate that several strategies are critical for enhancing supply chain management practices to improve service delivery at University Teaching hospital in Lusaka District. Among the strategies, reducing the prices of medicines and essential commodities was identified by the majority of respondents (39%) as the most significant factor, highlighting that affordability directly influences the availability of sufficient stock and uninterrupted healthcare services. Political interference was also noted as a major challenge, with 31% of respondents suggesting that minimizing political influence in procurement and supply decisions is essential to improve efficiency and transparency. Proper training of procurement staff accounted for 13% of the responses, emphasizing the need to equip personnel with the technical knowledge and skills required for effective procurement, inventory management, and distribution. Scheduled progress in supply chain activities, reported by 9% of respondents, was viewed as important for coordinating orders, maintaining stock balances, and ensuring accountability. High-speed internet connectivity, identified by 8% of respondents, was recognized as a key enabler for real-time communication, digital inventory management, and evidence-based decision-making.

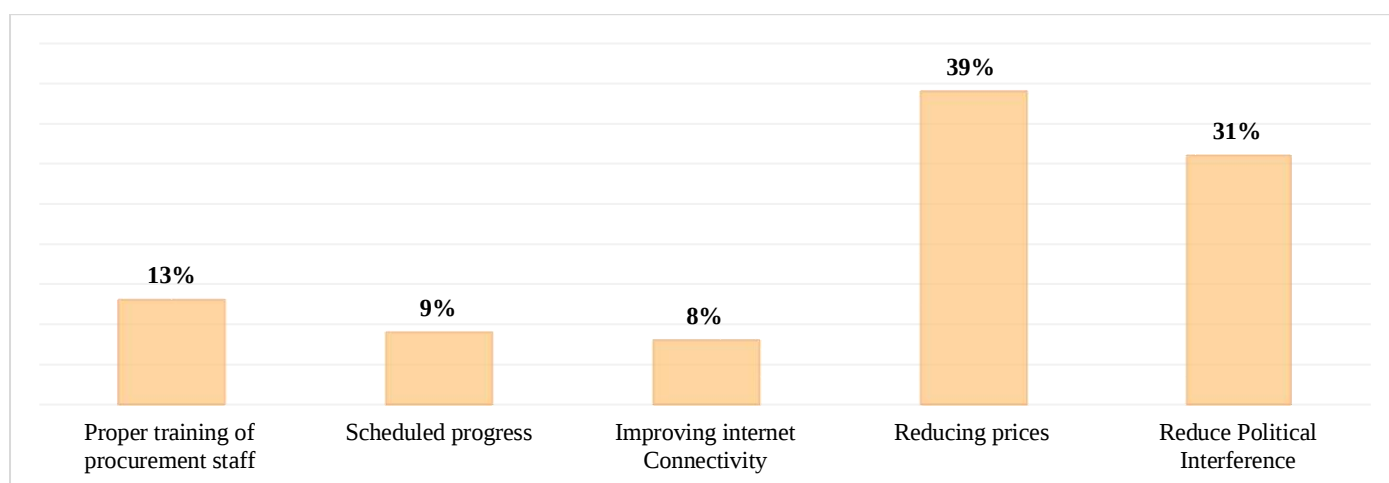


Figure 3

Enhancement of Supply Chain Management on Health care delivery System

4.2.2 Proper training of procurement staff

Regarding the factors of supply chain management on health care delivery system, some participants alluded that some individuals in the procurement department require training in supply chain management. To validate this, one of the participants stated that;

A critical component of the supply chain process, training is required in some of the personnel engaged in the procurement process. The proper, well-trained individuals must be present. Employee training is required through capacity building and training. Employee training is a critical component (K I5, 4th March, 2025).

In a similar vein, another respondent added that;

Procurement specialists are required. This will facilitate the procedure of obtaining medications and other goods in a unique way. It's about placing appropriately qualified individuals in the right positions so they can act appropriately when called upon (K I2, 7th March, 2025).

One of the key informants further added that;

The ability of the health facility to have enough human resources to gather data on the required medicines and essential commodities in the appropriate manner will have a positive impact. I am certain if sufficient efforts have been made in that domain to guarantee that all individuals designated for data collection are knowledgeable about their tasks. Thus, the data itself and the capacity building and the quantity of individuals gathering the data are complementary (K19, 28th Feb, 2025).

4.2.3 Strictly Scheduled Procurement

Scheduled progress emerged as an essential factor in strengthening supply chain management at University Teaching hospital. Participants explained that when activities such as ordering, delivery, inventory checks, and distribution are guided by a clear timetable, the facility is better able to anticipate demand, avoid stock imbalances, and maintain consistent availability of essential medical supplies. Scheduled monitoring of stock levels and routine verification of records were also viewed as critical practices that support accountability and timely decision-making. In addition, having structured timelines improves coordination among pharmacy staff, procurement officers, and administrative personnel, thereby reducing delays and preventing last-minute emergency purchases. This systematic approach was perceived to promote efficiency, transparency, and continuity in service delivery, ultimately contributing to improved patient care. To validate this, one of the participants avowed that;

When we follow a clear schedule for ordering and checking stock, we rarely experience shortages because everything is planned and monitored in advance. The schedule helps us know exactly when to review our inventory, when to place new orders, and when deliveries are expected. This makes it easier to avoid last-minute rushes or emergency purchases. Even when there are delays from suppliers, we are able to adjust because we have already planned ahead. Scheduled progress also allows us to track what has been used and what is remaining, which improves accountability and reduces wastage. Working with a structured timetable makes the entire supply chain process more organized and reliable (K14, 14th March, 2025).

Another participant added that;

Having a fixed schedule for stock reviews and ordering keeps everyone on the same page and prevents confusion. We know the exact dates for checking supplies, updating records, and submitting requests, which reduces delays and duplication of work. It also helps us detect potential shortages early and take corrective action before services are affected. Because the process is routine and predictable, staff are more accountable and documentation is easier to verify. In the end, the schedule improves coordination, saves time, and ensures that essential medicines and supplies are consistently available for patients (K, 17, 12th March, 2025).

4.2.4 Reducing prices to Enhance Effectiveness

Reducing the prices of medicines and other essential commodities emerged as a critical strategy for enhancing supply chain management within the health care delivery system. Participants indicated that lower procurement costs enable health facilities to stretch limited budgets and procure adequate quantities of essential supplies without compromising quality. When medicines are affordable, facilities can maintain sufficient buffer stocks, minimize stock-outs, and ensure continuous service delivery. Price reductions were also associated with improved accessibility for patients, as lower costs lessen the financial burden on households and encourage timely treatment seeking. Furthermore, cost savings generated through reduced prices can be redirected toward strengthening storage systems, transportation, and inventory management processes. Participants emphasized that transparent procurement practices, bulk purchasing, and strategic supplier negotiations can significantly reduce costs while promoting efficiency, accountability, and sustainability within the supply chain. One of the participants said;

When the prices of medicines are reduced, we are able to purchase larger quantities with the same budget, which helps us maintain adequate stock and avoid frequent shortages. Instead of ordering small amounts that run out quickly, we can buy enough to last until the next scheduled delivery. This reduces the pressure on staff to make emergency orders and allows us to plan our inventory more effectively. As a result, patients are less likely to be turned away due to stock-outs, and services continue without disruption (K19, 18th Feb, 2025).

In the same vein, a key informant added that;

Affordable medical supplies make it easier for the facility to provide treatment consistently because we do not have to delay services while waiting for additional funds to procure essential items. When prices are high, we sometimes have to prioritize certain medicines over others, which can affect the comprehensiveness of care. However, when costs are manageable, we can ensure that a wider range of essential medicines is available at all times. This improves patient confidence in the health system and supports timely treatment (K 16 2nd Feb, 2025).

4.2.5 Improving internet Connectivity

As regards high internet connectivity, one of the key informants emphasized its critical role in strengthening the healthcare supply chain, particularly in ensuring the timely access, coordination, and delivery of medical supplies. The participant noted that reliable internet connectivity enables healthcare facilities to communicate efficiently with suppliers, regulatory agencies, and other facilities, facilitating the quick resolution of procurement and distribution challenges. High-speed internet also supports the use of digital inventory management systems, allowing staff to accurately track stock levels, monitor expiration dates, place orders electronically, and generate real-time reports on supply consumption and availability. To validate this, one of the key informants added that;

High internet connectivity can have significant improve the health supply chain, particularly in healthcare settings where timely access to medical supplies and information is critical. Efficient communication due to high internet connectivity can lead to timely coordinating orders, sharing important updates, and resolving supply chain issues. This can result in collaboration between healthcare facilities, suppliers, and regulatory agencies, impacting the flow of essential medical supplies (K 12, 11th March, 2025).

Similarly, another respondent added that;

Reliable connectivity not only improves operational efficiency but also enables evidence-based decision-making, strengthens accountability, and ensures that essential medicines and medical supplies are consistently available to meet patient needs (K 18, 11th March, 2025).

The participant further indicated that;

Online ordering systems are commonly used to procure medical supplies from suppliers and distributors. High speed internet connectivity will enable to place orders in a timely manner, resulting in timely delivery of essential supplies and potentially improve patient care (K 11, 2nd March 2025).

When emphasising the importance internet connectivity, another respondent added that;

High speed Internet connectivity is essential for collecting, analyzing, and reporting data on health supply chain performance, including stock levels, distribution patterns, and consumption rates. Without reliable internet access, healthcare organizations may struggle to monitor supply chain metrics effectively, leading to inefficiencies and suboptimal resource allocation (K, 19, 27th Feb, 2025).

In addition, another informant pointed that;

Addressing the factors of high speed internet connectivity in the health supply chain requires investment in infrastructure development, technology solutions, and capacity-building initiatives. This may involve deploying alternative communication technologies, such as offline data synchronization tools or satellite internet connectivity, as well as strengthening local network infrastructure in underserved areas. Additionally, building resilience into supply chain systems through diversification of suppliers, buffer stock management, and contingency planning can help mitigate the impact of connectivity disruptions on healthcare delivery (K110, 3rd Feb, 2025).

4.2.6 Reduced and Management of Political Interference

In order to have an enhanced Supply Chain Management System there must be reduced political interference and give autonomy to procuring entities. As can be seen from data gathered, almost all the key informants indicated that the supply chain is hampered by government or political interference. In light of this, one of respondents added that;

The government intervenes in the procurement process; certain medications that are not on the list of essential medications are compelled to be included in the list of medications that are purchased; the government acknowledges that certain medications fall into the category of special medications; choosing where to source is difficult; this is made easier by the influence of the government and donors, as the majority of donors choose where to purchase medications (KI 4, 15th Feb, 2025).

Additionally, another respondent expounded that;

One major area where the government still feels it has a voice is political meddling. They may wish to sway some purchases in order to benefit themselves (KI7, 13th Feb, 2025).

The respondent further espoused that;

Political interference in the health supply chain can have profound consequences for public health systems, patients, and healthcare providers. This interference refers to actions taken by governments or political entities that impact the availability, accessibility, affordability, or quality of healthcare products and services (K15, 5th March, 2025).

In a similar vein, one of the respondents stressed that;

Political decisions regarding healthcare funding and budget allocations can impact the availability of resources for purchasing essential medicines, medical supplies, or equipment, potentially leading to shortages or disparities in access to healthcare (K 13, 21st March, 2025).

In a quest to address the aforementioned problem, a key informant echoed that;

Addressing political interference in the health supply chain requires transparent governance, robust regulatory frameworks, effective oversight mechanisms, and international cooperation to ensure equitable access to healthcare resources and strengthen health systems' resilience in the face of challenges (K16, 26th Feb, 2025).

4.3 Discussion

The findings of this research paper demonstrated that the enhancement of supply chain management is central to improving the healthcare delivery system. The discussion is grounded in four major factors that emerged from the findings: proper training of personnel, scheduled progress in supply chain activities, reduction of medicine prices, high-speed internet connectivity and reduce political interference. Each of these elements was perceived by participants as directly influencing the availability, accessibility, and reliability of essential medicines and medical supplies within health facilities. The findings suggest that when these factors are effectively addressed, the supply chain becomes more efficient, responsive, and capable of supporting uninterrupted healthcare service delivery.

4.3.1 Proper training of personnel

The research paper revealed that proper training of procurement and supply chain personnel is a foundational requirement for strengthening healthcare delivery systems. Respondents consistently indicated that some individuals involved in procurement require specialized training in supply chain management to carry out their responsibilities effectively. Participants emphasized that capacity building ensures that well-qualified individuals are placed in appropriate positions, enabling them to manage procurement processes competently. The presence of trained procurement specialists was viewed as critical in improving how medicines and essential commodities are sourced, recorded, and distributed within the facility. This finding aligns with a study conducted by Douglas, et al (2022), which established that inadequate training in supply chain management leads to inefficiencies in procurement, weak inventory control, and poor logistics coordination. The current findings further suggest that training enhances data collection processes, particularly in forecasting medicine requirements and determining consumption trends. When staff responsible for gathering and analyzing supply data understand their roles and possess the necessary technical skills, planning becomes more accurate and proactive rather than reactive. This finding is supported by Yadav (2015), who argued that workforce development strengthens forecasting accuracy, improves procurement decisions, and reduces the likelihood of stock imbalances. Therefore, investing in structured training programs and capacity-building initiatives contributes significantly to strengthening supply chain performance and, ultimately, improving patient care outcomes.

4.3.2 Scheduled progress in supply chain activities

Scheduled progress also emerged as a significant factor in enhancing supply chain management within the healthcare delivery system. Participants explained that adherence to clear and structured timetables for ordering, delivery, stock reviews, and distribution promotes consistency and predictability in supply chain operations. When activities are guided by defined schedules, health facilities are better positioned to anticipate demand fluctuations and prevent stock shortages or overstocking. This finding is in tandem with Douglas et al (2022) who observed that structured coordination and systematic supply chain processes improve medicine availability and strengthen accountability mechanisms. The respondents noted that routine stock verification and documentation checks help identify discrepancies early and allow corrective action before service delivery is affected. Moreover, having scheduled timelines improves coordination among pharmacy personnel, procurement officers, and administrative staff, thereby reducing confusion and duplication of tasks. This structured approach minimizes the need for emergency procurement, which is often associated with higher costs and logistical inefficiencies. The finding is further supported by Erixon et al. (2015) who asserted that efficient procurement scheduling enhances operational efficiency and reduces unnecessary expenditures within healthcare systems. In this regard, the implementation of routine and predictable supply chain schedules fosters transparency, accountability, and continuity in service delivery, ultimately contributing to improved healthcare outcomes.

4.3.3 Reduction of medicine prices

The study further established that reducing the prices of medicines and essential commodities plays a crucial role in strengthening supply chain management and healthcare delivery. Participants indicated that lower procurement costs allow health facilities to maximize limited financial resources and procure adequate quantities of medicines without compromising quality. Affordable medicines enable facilities to maintain buffer stocks, thereby minimizing stock-outs and ensuring continuous service provision. This finding aligns with the World Health Organization (2017), which emphasized that medicine affordability is fundamental to improving access and ensuring uninterrupted treatment. Respondents also highlighted that when prices are manageable, facilities can avoid prioritizing certain

medicines over others, thereby offering more comprehensive healthcare services (Gunasekaran, et al. 2014). Cost savings generated through price reductions can be reinvested in strengthening other components of the supply chain, such as storage facilities, transportation systems, and inventory management technologies. This finding is supported by the Organisation for Economic Co-operation and Development (2011), which noted that efficient procurement practices and cost control strategies enhance sustainability and resource optimization in healthcare systems. The findings therefore suggest that transparent procurement processes, bulk purchasing, and effective supplier negotiations are critical strategies for achieving cost efficiency while maintaining service quality.

4.3.4 High-speed internet connectivity

High-speed internet connectivity was also identified as a key enabler of efficient supply chain management within the healthcare delivery system. Participants emphasized that reliable internet access supports timely communication, coordination of orders, and the sharing of critical information among healthcare facilities, suppliers, and regulatory agencies. The use of internet-connected inventory management systems facilitates accurate tracking of stock levels, monitoring of expiration dates, and electronic submission of procurement requests. This finding is supported by the Organisation for Economic Co-operation and Development (2011), which highlighted that digital connectivity strengthens information flow and enhances coordination within modern supply chains. Respondents further noted that disruptions in internet connectivity can result in inaccurate inventory data, delayed orders, and potential stock imbalances, which negatively affect patient care. Conversely, reliable high-speed internet enables real-time data analysis, performance monitoring, and evidence-based decision-making. This finding aligns with the World Health Organization (2017), which underlined the importance of digital systems in enhancing supply chain visibility, transparency, and traceability. Participants also indicated that improving connectivity requires investment in infrastructure development, technology solutions, and resilience-building measures such as offline synchronization tools and contingency planning mechanisms (Mensah, 2014).

Another significant factor identified in this study was the reduction of political interference in procurement processes. Respondents emphasized that undue political influence often results in inefficiencies, favoritism in supplier selection, and delays in both the procurement and distribution of essential medical supplies. Such interference can disrupt planned supply chain operations, leading to irregular stock levels, delayed deliveries, and missed opportunities for bulk purchasing or strategic supplier negotiations. Participants noted that when procurement decisions are influenced by political considerations rather than actual needs, health facilities may end up receiving supplies that do not align with patient demand or clinical priorities. This not only compromises the effectiveness of resource utilization but also creates an environment where accountability is weakened, and operational processes are undermined. In this way, political interference poses a direct threat to the reliability, transparency, and efficiency of supply chain management within healthcare facilities.

4.3.5 Reduce political interference

This finding is in tandem with different authors such as Mensah (2014) who argued that governance challenges, including political pressures, negatively affect supply chain performance and overall healthcare service delivery. Respondents suggested that minimizing political interference requires the establishment of clear institutional policies, adherence to standardized procurement procedures, and the promotion of independent oversight mechanisms. Implementing these measures can ensure that procurement decisions are guided by actual needs and best practices rather than external pressures. Moreover, reducing political influence supports fair competition among suppliers, enhances transparency, and strengthens accountability, ultimately improving the timeliness, quality, and consistency of medical supply distribution. By creating a governance framework that shields procurement from undue external influence, health facilities can maintain more effective and responsive supply chains, contributing to better service delivery and improved patient outcomes (Michael Ian Morrison, 2013).

4.3.6 Applicability and Implication of the theory

The theoretical framework of Supply Chain Management (SCM) is highly applicable to the study of factors affecting healthcare delivery systems, particularly in the context of the at University Teaching hospital. This theory offers a robust lens through which to examine the relationships between procurement processes, supply chain practices, and their impact on healthcare outcomes. The application of SCM theory in this study is relevant for several reasons. Healthcare delivery systems often face challenges like drug stock outs, delays, and inefficiencies in the flow of goods and services. SCM theory emphasizes the importance of procurement practices and suggests the shift from single sourcing to dual sourcing as a strategy to mitigate these issues. This is particularly applicable to the selected, where stock outs of essential medicines and medical supplies can severely impact patient care Nirai et al. (2001).

SCM theory posits a direct relationship between supply chain performance and overall organizational performance. In the context of the hospital, effective supply chain practices, such as strategic sourcing and vendor management, can lead to better healthcare outcomes. If the supply chain operates efficiently, delivering medicines and

supplies on time and within budget, the hospital is more likely to achieve its primary goal: providing quality healthcare to its patients. Therefore, assessing the barriers within SCM practices using this theory could lead to insights into how procurement inefficiencies hinder performance and what steps can be taken to optimize the supply chain. The SCM theory stresses the importance of engaging with top-tier suppliers to enhance supply chain efficiency. At the hospital, involving reliable suppliers for a critical portion of the hospital's procurement needs can significantly improve lead times, reduce costs, and enhance the overall performance of the healthcare delivery system. The hospital should focus on developing strategic relationships with a select group of suppliers, based on their operational excellence, which can lead to better coordination and trust in the supply chain.

Flexibility and responsiveness are key components of SCM theory and are highly relevant to healthcare settings, where unforeseen disruptions (such as pandemics, emergency cases, or economic downturns) may occur. The hospital must be able to adapt quickly to changes in demand, supply shortages, and other unpredictable challenges. Focusing on dual sourcing and efficient vendor management, the hospital can remain responsive and adaptable, thus reducing the negative impact of such disruptions on healthcare service delivery WHO (2023). The theory of SCM also emphasizes the importance of trust and shared objectives in building successful supply chains. This is especially important in healthcare settings, where multiple stakeholders (hospital management, suppliers, healthcare workers, and patients) must collaborate to ensure the system functions effectively. Fostering a culture of trust between procurement departments, suppliers, and healthcare professionals is essential for achieving optimal results. The theory's emphasis on building trust and aligning objectives can guide the hospital in developing stronger relationships with its supply chain partners, ultimately leading to improved healthcare delivery.

4.3.7 Implications for Policy and Practice

The findings of this research paper have several significant implications for policy and practice in Zambia's health care sector and beyond. Primarily, there might be need for sustained investment in procurement capacity building across all levels of staff active in the procurement value system. Several theoretical and empirical studies emphasises that procurement capacity development should be a priority for governments seeking to improve public service delivery to critical stakeholders. In Zambia especially at UTH, this means investing in training programmes for procurement staff, developing professional standards and certification schemes. There is further need to creating incentives for continuous learning and improvement across board.

Another implications for policy and practice, is based on having stronger governance mechanisms needed to reduce political interference and corruption in procurement value chain. The Office of the Auditor General as shown in 2024 report, has documented persistent procurement irregularities in Zambia's public sector, suggesting that current oversight institutional mechanisms are inadequate. Atiende and Ndolo (2025) have clearly argued that transparency can be enhanced through the use of digital procurement platforms. These platforms ensure transparent and make procurement decisions visible to the public. The Zambia Medicines and Medical Supplies Agency Act (2019) provide a legal framework for improving procurement governance even though effective implementation requires political will and sustained commitment by different stakeholders.

Last but not least, there is a need for investment in digital infrastructure to support the use of contemporary supply chain management tools. The Rwanda Health Information System Study (2024) has established the potential of digital tools to improve supply chain performance. Reliable internet connectivity is a prerequisite and central increasing the much desired efficiency. In Zambia, this means investing in broadband infrastructure, mainly in rural and underserved areas, and ensuring that healthcare amenities have access to dependable and reasonable internet services.

V. CONCLUSION & RECOMMENDATION

5.1 Conclusion

In conclusion, this study established that the enhancement of supply chain management is central to improving healthcare delivery, with proper training of personnel, structured scheduling of activities, reduction of medicine prices, and reliable high-speed internet connectivity emerging as critical enablers. Properly trained staff ensures accurate forecasting, efficient procurement, and effective inventory management, while scheduled operations promote accountability, coordination, and continuity of services. Affordable medicines allow facilities to maximize limited resources and maintain buffer stocks, and reliable internet connectivity facilitates timely communication, real-time monitoring, and informed decision-making.

5.2 Recommendations

The following recommendations have been made in light of the research findings; Supply chain managers ought to consider proactively integrating risk management techniques, particularly throughout the supply chain's planning stages. In order to effectively implement the goals, healthcare management and supply chain managers

should guarantee collaborative efforts among all supply chain partners through supply chain integration. Advanced information technology should be acquired by government, purchasing officers and healthcare managers to manage supply chain risks and increase supply chain resilience, particularly in the healthcare industry. Healthcare personnel specifically supply chain managers and procurement officers should receive the appropriate training and knowledge on how to use fourth-generation ICT to reduce risks in the supply chain.

Regular monitoring and evaluation mechanisms should be established by Ministry of Health and ZPPA to assess supply chain performance, identify potential bottlenecks, and ensure timely corrective actions, thereby enhancing efficiency and reducing disruptions in healthcare delivery. The government should implement and enforce clear legal and regulatory frameworks that limit political influence in healthcare procurement and supply chain management. This may include establishing independent procurement oversight bodies, strengthening transparency and accountability mechanisms, and enforcing penalties for undue interference in procurement decisions.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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