

## Review Article

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## Impact of Supply Chain Management Practices on Surgical Outcomes at Mpilo Central Hospital

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### ABSTRACT

**Background:** Efficient Supply Chain Management (SCM) is critical for ensuring timely and safe surgical care, particularly in resource-constrained settings. This study investigated the impact of SCM practices, including inventory management, procurement efficiency, demand planning, and logistics and distribution, on surgical outcomes at Mpilo Central Hospital, Zimbabwe.

**Methods:** A cross-sectional survey was conducted among 83 healthcare professionals, including surgeons, nurses, anesthetists, and inventory managers, achieving a 92% response rate. Data were analyzed using descriptive statistics, chi-square tests, ANOVA, and Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine relationships between SCM practices and surgical outcomes. Reliability of the survey instrument was confirmed with a Cronbach's alpha of 0.705.

**Results:** Respondents reported significant challenges in SCM: 91% indicated that surgical delays were due to missing supplies, and 95% reported surgery cancellations resulting from supply shortages. Poor inventory management, procurement inefficiencies, inadequate demand planning, and ineffective logistics were all negatively associated with surgical outcomes. Chi-square analyses revealed significant associations between demographic variables (age, length of employment, and department) and perceptions of SCM impact. PLS-SEM confirmed that inventory management ( $\beta = -0.175$ ,  $p = 0.0195$ ), procurement efficiency ( $\beta = -0.192$ ,  $p = 0.015$ ), and logistics and distribution ( $\beta = -0.121$ ,  $p = 0.04$ ) significantly influenced surgical outcomes, whereas demand planning was not statistically significant ( $\beta = -0.00674$ ,  $p = 0.959$ ).

**Conclusion:** Deficiencies in SCM practices at Mpilo Central Hospital negatively impact surgical outcomes, contributing to delays, cancellations, and compromised patient care. Strengthening inventory control, procurement processes, and logistics systems, alongside targeted training and resource allocation, is essential to enhance surgical efficiency and patient outcomes in similar low-resource settings.

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### Acronyms

**ANOVA:** Analysis of Variance

**COVID 19:** Coronavirus Disease 19

**MCH:** Mpilo central Hospital

**MoHCC:** Ministry of Health and Child Care

**PLS-SEM:** Partial Least Path Modelling Structural Equation Models

**RFID:** Radio Frequency Identification

**SCM:** Supply Chain Management

**UNIAIDS:** United Nations Programme on HIV/AIDS

### Introduction

Supply Chain Management (SCM) plays a critical role in ensuring timely access to medical supplies, pharmaceuticals, and equipment

required for quality patient care. In surgical departments, efficient SCM is especially vital, as supply shortages or procurement delays often result in postponed or canceled procedures, prolonged wait times, and compromised patient outcomes [1]. Globally, healthcare systems rely on robust SCM to reduce risks of stockouts, improve efficiency, and sustain continuity of care [2]. High-income countries have adopted advanced SCM systems supported by digital inventory tracking and predictive analytics, significantly reducing surgical disruptions. However, in Low- and Middle-Income Countries (LMICs), challenges such as unreliable suppliers, weak infrastructure, and constrained budgets continue to undermine effective SCM [3].

Across Africa, stockouts of anesthetics, surgical instruments, and essential drugs are frequent, often leading to surgery cancellations and adverse outcomes [4,5]. The Abuja Declaration of 2001 committed African Union member states to allocate at least 15%

of national budgets to health, but Zimbabwe has not consistently met this target, with allocations fluctuating between 9% and 13% in recent years [6,7]. Economic instability, currency volatility, and dependence on external funding further constrain procurement and inventory systems, resulting in persistent shortages [8,9].

Mpilo Central Hospital (MCH), one of Zimbabwe’s largest referral hospitals, illustrates these systemic SCM challenges. Frequent stockouts of critical supplies, long procurement lead times, and poor inventory accuracy have disrupted surgical services, leading to cancellations, delays, and increased patient dissatisfaction [10]. Reports suggest that these inefficiencies contribute to prolonged suffering, heightened morbidity, and in some cases mortality, particularly when urgent surgical interventions are delayed [11]. Furthermore, healthcare staff face increased workloads and inefficiencies in rescheduling procedures due to unreliable supply systems.

Despite recognition of SCM as a determinant of healthcare efficiency, limited empirical research has been conducted in Zimbabwe on its direct impact on surgical outcomes. Existing studies in LMICs largely address hospital efficiency and cost reduction rather than surgical performance indicators such as cancellation rates, patient recovery, satisfaction, morbidity, and mortality [1,10].

This gap underscores the need for focused research at MCH to quantify how procurement delays, stockout frequency, and inventory management practices affect surgical outcomes. This study investigates the impact of Supply Chain Management (SCM) practices on surgical outcomes at Mpilo Central Hospital (MCH). The primary objective is to assess overall SCM effects, while secondary objectives focus on inventory management, procurement efficiency, demand planning, and logistics/distribution. Research questions explore how these practices influence surgical outcomes, with hypotheses predicting positive associations. The study is significant for hospital administrators, healthcare professionals, policymakers, patients, and academics, as it identifies critical SCM gaps, offers strategies to reduce surgery cancellations and delays, enhances patient care, and contributes to limited literature on healthcare SCM in resource-constrained settings.

**Materials and Methods**

This study adopted a positivist philosophy, emphasizing objectivity, quantifiable evidence, and generalizable findings. A deductive approach was used to test hypotheses derived from established SCM and healthcare theories. The research design was descriptive and correlational, examining SCM practices and their relationships with surgical outcomes.

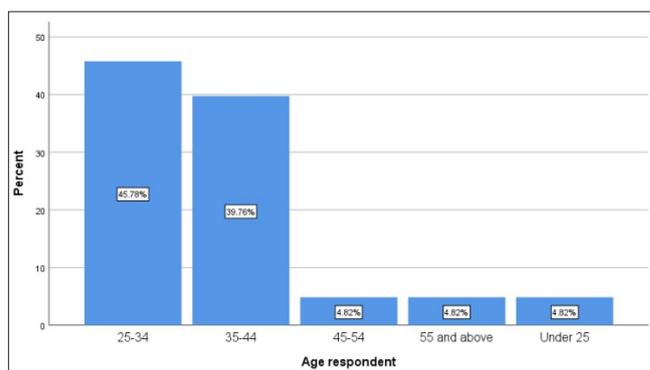
The population included 110 staff members at Mpilo Central Hospital involved in surgery and SCM (surgeons, nurses, procurement officers, administrators). Using Slovin’s formula at a 5% margin of error, a sample of 83 was selected through stratified random sampling.

Data were collected via structured questionnaires targeting inventory management, procurement, demand planning, logistics, and surgical outcomes. Descriptive and inferential statistics (including regression, ANOVA, PLS-SEM, and normality tests) were applied. Validity was ensured through pilot testing, triangulation, expert review, and construct clarity, while reliability was assessed using Cronbach’s alpha.

Ethical standards included informed consent, confidentiality, voluntary participation, and adherence to the National University of Science and Technology’s ethics policies. Approval was obtained from the hospital’s ethics board.

**Results**

A total of 110 questionnaires were distributed, with 83 returned (75% response rate). Respondents were predominantly male (57%), aged 25–34 years (46%) and 35–44 years (40%), mainly surgeons (29%), and had 1–3 years (36.8%) or 4–6 years (28.9%) of employment.



**Figure 1:** Distribution by Age of Respondent

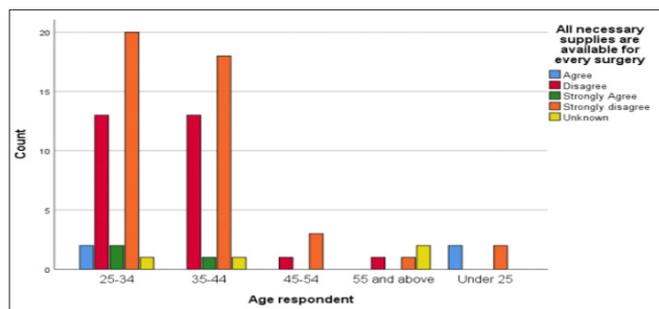
The questionnaire reliability was acceptable (Cronbach’s  $\alpha = 0.722$ ). Frequency analyses showed strong agreement that poor inventory management, procurement inefficiencies, weak demand planning, and ineffective logistics contribute to delays, cancellations, and unsafe surgeries, with respondents rejecting claims that current systems were effective.

**Table 1: Demographic analysis of variables in Impact Supply Chain Practices on Surgical Outcomes at Mpilo Hospital**

Demographic Variable	Frequency	Percentage
<b>Gender of respondent</b>		
Male	43	57%
Female	36	43%
<b>Age of respondent</b>		
Under 25	4	4.8%
25-34	38	46%
35-44	33	40%
45-54	4	4.8%
55 and above	4	4.8%
<b>Position at Mpilo Central</b>		
Surgeon	24	29%
Theatre Nurse	10	12%
Anaesthetist	8	9.6%
Inventory Manager	3	3.6%
Other (please specify)	35	42.2%
<b>Length of Employment</b>		
Less than 1 year	10	12%
1-3 years	32	38.6%
4-6 years	24	28.9%

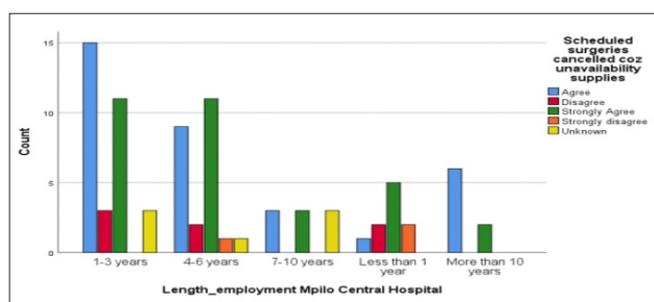
7-10 years	9	10.8%
More than 10 years	8	9.6%

Source: Empirical Data (2024)



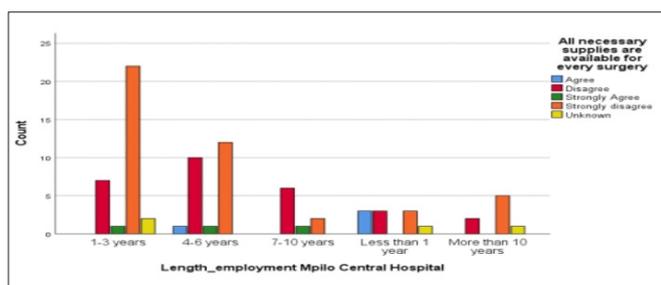
Source: Empirical Data (2024)

**Figure 2:** Test of Association Between Age of Respondent and Impact of Inventory Management on Surgery Outcomes



Source: Empirical Data (2024)

**Figure 3:** Test of Association Between Length of Stay at Mpilo Central Hospital and Impact of Inventory Management on Surgery Outcomes



Source: Empirical Data (2024)

**Figure 4:** Test of Association Between Length of Stay at Mpilo Central Hospital and Impact of Inventory Management on Surgery Outcomes Based on All Necessary Supplies Are Available for Every Surgery

Chi-square tests revealed significant associations between age, length of employment, and department with perceptions of supply availability and surgery cancellations. Normality tests indicated the data were not normally distributed, validating the use of non-parametric and PLS-SEM methods. ANOVA tests showed significant differences between groups.

PLS-SEM analysis indicated that inventory management ( $p=0.0195$ ), procurement efficiency ( $p=0.015$ ), and logistics/distribution ( $p=0.04$ ) had negative and significant impacts on surgical outcomes, while demand planning was not significant ( $p=0.959$ ).

**Table 2: Regression coefficients and Structural model path coefficients**

Indicator	Estimate	Std.error	p-value
Impact of inventory Management	-0.175	0.1343	0.0195
Procurement Efficiency	-0.192	0.133	0.015
Demand Planning	-0.00674	0.131	0.959
Logistics and Distribution	-0.121	0.142	0.04

Source: Empirical Data (2024)

Overall, the study concludes that poor SCM practices—inventory, procurement, planning, and logistics—negatively affect surgical outcomes at Mpilo Central Hospital, leading to cancellations, delays, longer hospital stays, complications, and reduced satisfaction. These findings contradict the initial hypotheses, highlighting the urgent need for stronger SCM systems.

### Discussion

This study revealed substantial supply chain management (SCM) deficiencies at Mpilo Central Hospital (MCH), significantly compromising surgical outcomes. Inventory management emerged as a critical challenge. Over 90% of respondents reported that missing supplies caused surgical delays or cancellations, while 79.6% believed outcomes would improve with better systems. Similar findings in Zimbabwe highlight that poor data accuracy, staff shortages, and weak professionalism drive stockouts [12,13]. The Global Fund has recognized these weaknesses, investing in infrastructure and training to strengthen supply chains nationally [14].

Procurement inefficiencies were also strongly associated with surgical delays and cancellations. Respondents indicated that 95% believed improved procurement could enhance outcomes, yet most denied the presence of effective systems. Studies confirm that corruption, financial constraints, and bureaucratic tendering at NatPharm undermine procurement, resulting in chronic stockouts [15-17]. The COVID-19 pandemic further exposed fragilities in procurement, delaying access to surgical supplies [18].

Demand forecasting and planning were found to be inadequate, with 85.6% noting poor forecasting affects surgical readiness. Broader systemic issues, including economic crises, weak health workforce capacity, and fragmented supply chains, have undermined effective planning [19-21]. Logistics and distribution inefficiencies were highlighted by most respondents, with frequent shortages leading to cancellations. NatPharm's outdated systems, corruption, and financial instability contribute to delayed deliveries [22-24].

Consequently, surgical outcomes remain poor, with high rates of cancellations, prolonged hospital stays, complications, and dissatisfaction among staff and patients. Mpilo recorded an 8.4% mortality rate in 2024, the highest among referral hospitals [25]. Broader studies show that weak surgical supply chains in low- and middle-income countries consistently undermine safe surgical care [26]. Overall, strengthening inventory systems, procurement efficiency, demand planning, and logistics is essential to improve patient outcomes at MCH and across Zimbabwe.

## Conclusion

This study demonstrates that deficiencies in supply chain management practices, specifically in inventory management, procurement efficiency, demand planning, and logistics/distribution, are major contributors to poor surgical outcomes at Mpilo Central Hospital. High rates of surgery cancellations, prolonged hospital stays, complications, and dissatisfaction among both patients and staff are strongly linked to systemic weaknesses in SCM. Structural inefficiencies, financial constraints, and governance challenges within Zimbabwe's health sector, particularly through NatPharm, further exacerbate these problems. Strengthening SCM practices through improved transparency, workforce capacity, timely procurement, and robust logistics systems is essential to enhance surgical outcomes, patient safety, and overall healthcare delivery.

## Acknowledgments

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## Ethical Considerations

The study adhered to ethical standards by ensuring participant confidentiality, informed consent, voluntary participation, non-maleficence and data integrity through honest and accurate reporting of findings was maintained, avoiding any fabrication or manipulation of data. Approval was sought from the hospital's ethics board to conduct the research, and all data was anonymized to protect participants' privacy. National University of Science and Technology's specific ethical policies and procedures, which included avoiding plagiarism in all its forms was observed

## Conflict of Interest

None

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