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INVENTORY MANAGEMENT STRATEGIES AND HEALTHCARE DELIVERY IN HOSPITALS IN THE MASHONALAND REGION OF ZIMBABWE

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Abstract:
This study examined the effect of inventory management strategies on healthcare delivery in provincial hospitals in the Mashonaland Region of Zimbabwe. A pragmatism research philosophy, mixed-method approach and a descriptive survey design were used in the investigation. The target population was drawn from three provincial hospitals in the Mashonaland Region: Bindura, Chinhoyi and Marondera. A total of 80 people comprised of patients and employees working in procurement, stores and dispensary departments were selected using stratified and convenience sampling techniques. A sample size of 66 people was obtained using the Krejcie and Morgan (1970) formula. Structured questionnaires and semi-structured interviews were used to collect data from participants. Descriptive statistics included mean (M) and standard deviation (SD) while Spearman's rank correlation coefficient and regression analysis were used to establish the relationship between research variables. The findings revealed a positive correlation between inventory management strategies and healthcare delivery in provinical hospitals in Mashonaland Region. To improve the diagnosis, treatment of diseases and restoration of patients' health, the study recommended that there is need for a collaborative approach involving all relevant stakeholders to improve inventory of drugs and other consumables in hospitals. Furthermore, a similar study targeting all provincial hospitals in the country is required to compare results and bridge the results gap.

Key words:
Service Delivery, Healthcare, Inventory Management, Strategy

INTRODUCTION

For an economy to function properly, a well-functioning health-care delivery system is essential. A well-functioning health system promotes good health by making optimal use of available resources and successfully responding to citizens' realistic expectations (McCarron et al., 2020) (Pan, 2021). However, a variety of factors impact how health-care systems

delivery services in an effective manner. The in ability to delivery healthcare services is exacerbated by failure to coordinating a number of stakeholders who make up the health care supply chain (Kritchanchai et al., 2019). Failing to coordinate stakeholders makes it difficult to implement effective inventory management strategies. (Leaven et al., 2017) assert that as the population ages, their health deteriorates and health-care spending naturally rises. For example, (Bochenek et al., 2017) observed that the European Union (EU) dedicated approximately 10% of its GDP to its health-care delivery system between 2015 and 2016. On the other hand, Zambia spends 5% while South Africa spends 9% of its GDP on healthcare (World Health Organization, 2015) (Fagan and Zeng, 2015). The public healthcare delivery system is critical in increasing access to essential medicines to the public. However, public healthcare facilities are far from meeting essential medicine availability targets, particularly in low-income settings (Vohra, and Thakur, 2022) (Mathewos et al., 2021). Inventory investment in public hospitals accounts for a significant portion of the total budget, yet inventory control is one of the most neglected management area (Fernandez et al., 2021). Many public hospitals in developing countries have had drug shortages for a long time due to poor inventory management or an inability to control inventory efficiently. Poor inventory management directly translates into poor service delivery (Abu Zwaida et al., 2021). This is echoed by (Cooper, 2016) who pointed out that the unavailability of drugs in public hospitals is not due exclusively to theft, bribery, and corruption, but rather was as a result of poor management of pharmaceutical inventories. Using data from Malaysian hospitals, (Ahmad , et al., 2015) observed that hospitals use a single inventory management policy to all types of drugs resulting in shortages for critical drugs. On the other hand, (Mbiriri, 2018) examined the influence of inventory management systems on service delivery in public hospitals in Kenya and found a positive relationship between study variables. By the same token, (Oballah, et al., 2015) revealed that inventory investment and inventory record accuracy positively influence the performance of public hospital.

In Zimbabwe, health care delivery is based on the Public Health Act (Chapter 15:16) and the fundamental right to health care in Section 76, sub-section 1-4, of the Zimbabwe Constitution, which focuses on providing health care to everyone. Despite its constitutional obligation to offer healthcare to the citizens, the level of service delivery offered by provincial hospitals in the Mashonaland Region has remained below expectations. Hospitals continue to run out of critical medications on a regular basis (Nhapi, 2019). This is a clear indicator of a lack of or ineffective inventory management strategies, which, if allowed unchecked, will lead to a loss of faith on the part of patients in the government. This has prompted use of the cold chain system and increased budgetary allocations for essential medicine and health supplies, as well as reforms in the medicinal supply and distribution chain, stock outs of these drugs have persisted. If effective inventory management strategies are not prioritized, healthcare delivery will continue deteriorate in provincial hospitals in Mashonaland Region.

A relatively well developed body of research have investigated the effect of inventory management strategies. For instance, (Nzioka and Were, 2017) investigated inventory management and the performance of Kenya's education sector, whereas (Kong and Masud, 2019) investigated inventory management as well as customer service and satisfaction in the banking industry. Ref (Muchaendepi, et al., 2019) investigated the effect of inventory management strategies on performance of Small to Medium Enterprises in the manufacturing industry. Empirical review shows that there is a lack of research on healthcare delivery in Zimbabwe. This sectorial distinction generated a contextual research gap, which this study aims to fill by conducting a study on the effect of inventory management strategies on health care delivery in the Mashonaland Region of Zimbabwe. The study provides basis for procurement and public health professionals to decide about issues of healthcare delivery, and thus serve as a basis for reforms in inventory management strategies in provincial hospitals. In

addition, the findings contribute to existing empirical knowledge on inventory management strategies in Zimbabwe, and hence reduce a gap in knowledge. Furthermore, the study's findings will be similarly beneficial to future researchers in comparable research areas, as well as serving as reference material. The rest of this paper is organized as follows: The methodology is described in Section 2. Section 3 contains the findings and discussion. Section 4 gives the conclusions and implications.

2. RESEARCH METHODOLOGY

The research used a pragmatism research philosophy, a mixed-method methodology, and a descriptive survey design. Ref (Creswel, 2014) notes that pragmatism allows the researcher to view the topic from either or both points-of view with regards to the influence of social actors and uses these to create a practical approach to research. This applies to mixed methods research in that inquirers draw liberally from both quantitative and qualitative assumptions when they engage in their research. This implies that pragmatism provides a fuller and more comprehensive approach to solving the research problem than other research philosophies. In addition, the mixed-method approach was considered the best approach for the study because qualitative and quantitative methods alone were insufficient to fully understand the research problem. The study sought to to give a statistical analysis on the effect of inventory management strategies on healthcare delivery. In doing so, the study required the use of a regression model which make use of a lot statistical analysis. A descriptive survey approach was deemed the most appropriate since it assured that the data collected provide adequate responses to the study objectives. In addition, the design was chosen after taking into account elements such as the study audience, time, available resources, access to information, and the character of respondents (Zohrabi, 2013). For quantitative data collection, the research used a structuredquestionnaire whereas for qualitative data, the study utilised an interview guide. The researcher used a structured questionnaire with a Likert scale: 5-Strongly Agree, 4-Agree, 3-Not sure, 2-Disagree and 1-Strongly Disagree. The use of the questionnaire helped respondents to have greater trust in their anonymity, and as a result, they felt free to express themselves without fear of being victimized. The researcher ensured that the questionnaires were relevant to the extent that all research questions were included.

The study population was drawn from three provincial hospitals in Mashonaland Region namely Bindura Hospital, Chinhoyi Hospital and Marondera Hospital. A total of 80 people comprised of patients and employees from procurement, stores and dispensary department. A sample size of 66 people while was obtained using the Krejcie and Morgan (1970) formula. These were selected based on stratified and purposive sampling. Stratified was used in this study because it helped the researcher to divide the target population into homogeneous groups or strata so that all the groups from the population are represented in the sample (Rahi, 2017). The strata were comprised of managers, supervisors and officers in the selected departments. Ref (Kanyakam et al., 2016) described purposive sampling as a thoughtful choice of selecting participants based on the qualities they possess. Ref (Creswel, 2014) suggested that under purposive sampling, participants should conform to a certain specified criteria. In light of this recommendation, key informants were selected based on their knowledge on inventory management and healthcare delivery. Structured questionnaires and semi-structured interviews were used to collect data. The Statistical Package for Social Sciences (SPSS) version 23 was used to analyze data from the surveys, while thematic narrative analysis was utilized to deduce meaning from the interview guides. To obtain answers to the study questions, descriptive statistics such as mean, standard deviation (SD),

and frequencies) were utilized, while Spearman's Rank Correlation Coefficient and regression analysis were used to examine the link between study variables.

3. RESULTS AND DISCUSSION

This section presents descriptive statistics to provide answers for the research questions.

3.1 Inventory Management Strategies used by hospitals in Mashonaland Region

Table 3.1 shows the inventory management strategies used by hospitals in Mashonaland Region.

Tab. 3.1 *Inventory Management Strategies*

	Mean Score	**Mean Response**	**Std Deviation**
Economic Order Quantity	4.21	Agree	0.870
Just In Time	3.53	Agree	0.925
Activity-Based Cost Analysis	3.97	Agree	0.778
Vendor Managed Inventory	3.61	Disagree	0.851
Overall	**3.63**	**Agree**	**0.856**

Source: Survey Data (2021)

The study established that provincial hospitals in Mashonaland Region used various inventory management strategies as evidenced by the overall mean score of (M=3.63, SD=0.856). Respondents indicated to a large extent that EOQis widely used in public health care delivery (M=4.21, SD=0.870). This implies that EOQ was mainly used in determining re-order points for pharmaceuticals and supplies as well as in predicting drug demand. (Kanyakam et al., 2018) cautioned that drug consumption from the EOQ must be monitored and governed by an adequate safety stock level in order to avoid drug shortages in medical shops. Respondents agreed, to a lesser extent, that healthcare practitioners used a JIT inventory approach, as shown by a mean score of (M=3.53, SD=0.925). This demonstrates that JIT is not extensively used in healthcare operations since healthcare providers cannot stock their services and only offer a limited number of services or products, as other traditional service organizations do. Furthermore, healthcare decision-makers find it difficult to estimate demand since it is based on a daily patient census with no consistent trend. As a result, high buffer levels are frequent in healthcare operations. The study also revealed that an overwhelming majority of the respondents agreed that healthcare providers have adopted the activity-based cost analysis as an inventory management strategy. This was represented by a mean score of (M=3.97, SD=0.778). This implies that as the range of products in healthcare delivery increases, inventory managers in these institutions were able to classify inventory items in terms of spending value. Lastly, the study findings publicized that respondents agreed to a lesser extent that provincial hospitals in Mashonaland Region used vendor managed inventory. This implies that VMI was used in some instances. Most interviewees revealed that despite its limited use, VMI allowed suppliers of drugs and other pharmaceutical products to have real time data on inventory levels.

3.2 Challenges faced by hospitals in Mashonaland Region in effective inventory management.

Table 3.2 shows the challenges of effective inventory management in provincial hospitals.

Tab. 3.: *Challenges of effective inventory management*

Challenges	Mean Score	Mean Response	Std Deviation
Supply chain disruptions	4.23	Agree	0.885
Lack of professionalism in inventory management	4.01	Agree	0.758
Inaccurate data	3.87	Agree	0.812
Lack of employee training on inventory management	3.94	Agree	0.874
Poor top management commitment	3.87	Agree	0.745
Lack latest Information Technology (IT) deployment	4.41	Agree	0.925
Overall	4.06	**Agree**	0.833

Source: Survey Data (2021)

Table 3.2 shows challenges associated with effective inventory management in provincial hospitals in Mashonaland Region. The study findings revealed that respondents agreed to a lesser extent that inaccurate data was a challenge hindering effecting inventory management if the public health care delivery with a mean score of (M=3.87, SD= 0.812). This result implies that institutions were unable to create a balance between the supply and demand of drugs and other supplies due to inaccurate data. This result ties in well with findings of (Fournier, 2019) who established that demand estimations create challenges with regards to consumption patterns and re-order and buffer stock levels. The study also publicized that lack of professionalism had a mean score of (M=4.01, SD= 0.758) indicating that inventory management duties was performed by people who not do have relevant qualifications. In addition, poor top management commitment had a mean score of (M=3.87, SD=0.745) indicating that respondents agreed that there was poor top management commitment towards inventory management. This is supported by data from interviews in which interviewees stated that senior management employees at hospitals do not always prioritize inventory management. The inventory function is frequently viewed as just supporting the hospital's core business; as a result, inventory operations and resource allocation are given less emphasis. Furthermore, lack of latest information technology deployment had a mean score of (M=4.41, SD=0.925) implying that inventory management in provincial hospital is not highly automated. This is in agreement with findings of (Neve and Schmidt, 2022) (Kim et al., 2017).

3.3 Testing the Relationship

This section tests the relationship between inventory management strategies and healthcare delivery. Spearman's Rank Correlation Coefficient was employed in this study to determine the direction and significance of the association between variables. The results are shown on Table 3.3.

Tab. 3.3 *Correlation Analysis*

			Healthcare Delivery
Spearman's rho	Health Care Delivery	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
	Inventory Management Strategy	Correlation Coefficient	.582
		Sig. (2-tailed)	.001

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Survey Data (2022)

Results on Table 3.3 provide sufficient evidence that there is a statistically significant relationship between inventory management strategies and health care delivery (β= 0.582, $p<0.05$).

3.4 Regression Analysis

Table 3.4 Regression model for inventory management as a predictor of health delivery

Tab. 3.4 *Regression Model*

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.918	.844	.787	.224

a. Predictors: (Constant), inventory management

Source: Survey Data (2021)

Table 3.4 shows that there is a significant link (R^2=.844) between inventory management strategies and healthcare delivery. The result also shows that an adjusted R-square of 0.787 was attained. This suggests that inventory management can explain 78.7% of the variation, while the remaining 21.3% may be explained by other factors not included in the model.

Tab. 3.5 *ANOVA*

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	119.646	1	19.946	21.834	.001[b]
	Residual	58.858	62	.912		
	Total	178.504	63			

a. Dependent Variable: healthcare delivery

b. Predictors: (Constant), inventory management strategies

Source: Survey Data (2021)

As can be seen from the ANOVA statistics, the regression model had a significance level of 0.1% indicating that the data was suitable for drawing conclusions about the population parameters because the p-value was less than 5%. The computed value of the dependent variable exceeded the critical threshold, showing that inventory management strategies have a statistically significant effect on healthcare delivery within provincial hospitals in Mashonaland Region. The model was significant and a decent predictor for the obtained data because the significance value was less than 0.05.

Tab. 3.6 *Coefficients of Determination*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.548	.647		2.302	.000
	Inventory Management	.478	.213	.474	5.304	.000

a. Dependent Variable: Healthcare Delivery

Source: Survey Data (2021)

As can be seen on Table 3.6, at a 95% confidence level inventory management strategies have a positive relationship with healthcare delivery (t=5.304, p=0.000). The constant value of 1.548 indicates that if inventory management strategies are rated zero, health care delivery in Mashonaland Region will be reduced by 1.548. This result ties in well with findings of (Osei-Mensah, 2016) and (Karani and Osoro, 2020) that inventory management strategies significantly influence service delivery in hospitals.

4. CONCLUSIONS AND IMPLICATIONS

The study concludes that provincial hospitals in Mashonaland Region employed economic order quantity and activity-based cost analysis to manage inventory for drugs and other consumables. The study also concludes that VMI and JIT are not extensively used because hospitals find it difficult to estimate daily demand for drugs and manage risks resulting in dealing with a particular supplier. In addition, the study revelaed that supply chain disruptions lack of professionalism, inaccurate data, lack of employee training on inventory management, poor top management commitment and lack of latest information technology (IT) deployment hinder effective inventory management of hospitals in the Mashonaland Region of Zimbabwe. Furthermore, the study confirmed the existence of a direct relationship between inventory management strategies and healthcare delivery suggesting that the way inventory is ordered, stored and used affect healthcare delivery.

Findings of this study may be translated into a set of indicators that can be used to guide policymakers in public healthcare delivery. The implementation of inventory management strategies requires actions and participation from all stakeholders. This means that there is need for progressive actor-factor analysis- starting from government level, employees, suppliers, to hospital administration and then reaching to patients by devising policies that practically link all the stakeholders from the top-to-the bottom. Top management particularly, hospital administrators and the parent Ministry should put in place additional measures to encourage suppliers to consider sustainable inventory management as the lifeblood of the healthcare supply chain. Furthermore, to provide quality service righto the patients, hospital should automate their inventory management strategies. It is critical to emphasize that the present body of knowledge lacks empirical insights into the effect of inventory management strategies on public healthcare delivery in Sub-Saharan African nations, notably Zimbabwe. As a result, the findings of this study are critical because they give new knowledge and contribute to the existing body of knowledge about inventory management strategies in public healthcare delivery. Although this research provides important insights, there are a number of limitations and opportunities for future research (e.g. research methodology, context and analysis). Such limitations provide a foundation for other researchers to build on and expand on the knowledge gained from this study. As a result,

additional research is required to strengthen the findings of this study and to broaden practical and academic understanding of inventory management strategies in healthcare delivery.

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