ANALYSIS OF THE PHARMACEUTICAL INVENTORY CONTROL SYSTEM USING ABC METHOD (PARETO), VEN CLASSIFICATION, MAXIMUM MINIMUM STOCK LEVEL (MMSL) CATEGORY, AND REORDER POINT (ROP) AT THE PHARMACY UNIT OF RSIA MASYITA MAKASSAR

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Abstract:
Background. Pharmaceutical supply management is a managerial function within the Pharmacy Unit, which is the sole provider of pharmaceutical supplies, including medications, medical devices, and consumables. Inventory management is a method of controlling inventory to ensure timely ordering at optimal costs. Effective and efficient medication purchasing can be achieved through comprehensive management of pharmaceutical supplies, encompassing planning, selection, and procurement. *Aim.* This study aims to determine the differences in inventory values, stagnation, and stockouts of pharmaceutical supplies before and after inventory control was implemented using a combination of the ABC Analysis, MMSL, and ROP methods at RSIA Masyita. *Method.* This research is a quantitative study using a pre-experimental design method. The data was analyzed using the Wilcoxon analysis for inventory data and paired sample t-tests for stagnation and stockout data. *Result.* The results for both the before and after simulation groups showed a p-value of 0.000, indicating that inventory control of medications at the Pharmacy Unit of RSIA Masyita using the combination of ABC Analysis, VEN, MMSL, and ROP methods can improve the effectiveness of inventory quantity and the efficiency of pharmaceutical supply items. *Conclusion.* Drug inventory management through ABC, MMSL, and ROP methods improves ITOR performance, lowers medicine stagnation to 3%, and eliminates stockouts of vital medications.
Keywords: logistics management, ABC, VEN, MMSL, ROP

INTRODUCTION

Effective Inventory management is a method of controlling inventory to ensure timely ordering at optimal costs. Therefore, the concept of effective management is crucial to achieve the goals of effectiveness and efficiency. In inventory control, there are three possible scenarios that may occur: stockout, stagnant, and the availability of required medications in stock.

According to Rosmania and Supriyanto (2015), poor medication management can result in drug inventory experiencing stagnation (excess inventory) and stockouts (insufficient inventory). Drug inventory is considered stagnant if the remaining stock at the end of the period is more than three times the average usage over three consecutive periods (Muzakin, 2008). Drug inventory is considered to be in stockout when the inventory is empty, meaning the stock at the end of the period is zero or less than the safety stock (Rosmania & Supriyanto, 2015).

Based on initial interviews with the Coordinator of the Pharmacy Unit at RSIA Masyita, the pharmaceutical supply planning has been carried out using the consumption method, relying on data from the last 2-3 months or by checking the medication shelves to see which items are already out or are about to run out. This method only predicts the quantity of medication needed, but it does not provide information on when to reorder or under what conditions reordering should occur.

The data on drug stagnation at RSIA Masyita in 2022 was quite high, at around 11%, with an average purchase cost of IDR 26,581,066. Data obtained from the Pharmacy Unit at RSIA Masyita shows that in the first trimester of 2023, there was a decrease in drug stagnation to 8% compared to 2022. This indicates that efforts to control drug inventory have been made, but they are still not optimal, as the stagnation rate remains above the standard threshold of less than 3% (RSIA Masyita's 2023 Minimum Service Standards).

In addition to the occurrence of drug stagnation, there was also a rate of drug stockouts, which led to the purchase of medications outside the RSIA Masyita pharmacy. Furthermore, data shows that stockouts also occurred for medications in the Vital category.

In inventory control, there are two very important issues that must be addressed: deciding when to make a purchase and how much to order. Identification and analysis of these issues are necessary to find a solution for inventory control. The Minimum Maximum Stock Level (MMSL) method is used to control the minimum and maximum inventory levels to prevent stockouts and avoid excessive inventory. Furthermore, Reorder Point (ROP) calculations are performed to determine the optimal time for reordering, which can help address issues of increased inventory value, stagnation, and stockouts (Utari, 2015).

This study will provide recommendations for pharmaceutical inventory management to assist the pharmacy unit in determining when to place orders and how many items to order. It is expected that this will eliminate drug stagnation and prevent stockouts of Category V (vital) medications.

METHODS

This study was conducted using quantitative analysis with a quasi-experimental method. The approach used was a pre-experimental design in the form of a one-group pretest-posttest design.

Location and Research Design

Data collection was conducted by the researcher at RSIA Masyita from January to December 2023

Population and Sample

The population in this study consists of all pharmaceutical supply items in the Pharmacy Unit of RSIA Masyita. The sample in this study was determined using total sampling, where the total number of research samples was 600 items of medication and medical supplies.

Data Analysis

The data obtained was analyzed before and after being input into the SPSS master table and tested using the Wilcoxon test for inventory values, and the paired samples t-test for stagnation and stockout values. The results from the sample were compared with the p-value, and from this comparison, it can be determined whether the sample values are higher or lower than the p-value of 0.05

RESULTS

Drug Classification Based on ABC and VEN Analysis

The control technique using the ABC analysis method focuses on the economic aspects. In this study, ABC analysis was performed based on inventory value.

Table 1: Drug Classification Using ABC Analysis Based on Inventory Data at RSIA Masyita 2022

GROUP	NUMBER OF ITEMS (n)	PERCENTAGE OF ITEMS (%)	USE VALUE (Rp)	PERCENTAGE OF USAGE (%)
A	91	15%	59.598.374	80%
B	122	20%	11.174.695	15%
C	387	65%	3.5724.898	5%
TOTAL	600	100%	74.497.967	100%

Based on the results of the ABC analysis calculation in Table 1, Group A, which represents the accumulation of more than 80% of the usage value, amounts to IDR 59,598,374 out of a total usage of IDR 74,497,967, consisting of 91 items or 15% of the total items. Group B consists of 122 items or 20%, and Group C consists of 387 items or 65% of the total medication items.

Out of the 600 medications managed by the Pharmacy Unit at RSIA Masyita, an analysis was conducted based on their clinical importance to determine which medications fall into the classifications of V (vital), E (essential), and N (non-essential).

Table 2: Drug Classification Using ABC-VEN Analysis Based on Usage Data at RSIA Masyita 2022

ABC-VEN	V		E		N		Total	
	n	%	n	%	n	%	n	%
A	2	0,3	73	12	16	2	91	15,1
B	5	0,8	88	14	29	4	122	20,3
C	4	0,6	190	31	193	32	387	64,5
Total	11	1,8	351	58,5	238	39,6	600	

Source: Primary Data

Based on the analysis of 600 pharmaceutical supply items, 11 items (1.8%) are classified as vital, 351 items (58.5%) as essential, and 238 items (39.6%) as non-essential.

Out of the 91 medications in Category A, an analysis was conducted based on their clinical importance, resulting in 2 items (0.3%) classified as A-Vital, 73 items (12%) as A-Essential, and 16 items (2%) as A-Non-Essential.

Out of the 122 medications in Category B, an analysis was conducted based on their clinical importance, resulting in 5 items (0.8%) classified as B-Vital, 88 items (14%) as B-Essential, and 29 items (4%) as B-Non-Essential.

Out of the 387 medications in Category C, an analysis was conducted based on their clinical importance, resulting in 4 items (0.6%) classified as C-Vital, 190 items (31%) as C-Essential, and 193 items (32%) as C-Non-Essential.

The difference in drug stockout values before and after inventory control was implemented.

Stockout value is the cost that occurs when the existing inventory is insufficient to meet the demand

Table 3: Difference in Drug Stockout Values Before and After Inventory Control Simulation Using ABC Analysis and VEN Classification at RSIA Masyita in 2023.

ABC-VEN	Year 2022 (n)	Year 2023 (n)
AE	1	0
CN	3	6
BE	6	1
CE	9	17
CV	2	0

ABC-VEN	Year 2022 (n)	Year 2023 (n)
BN	4	12

Source: Primary Data

Based on the results of the ABC-VEN analysis, it can be concluded that in 2023, there was a decrease in drug stockouts in groups AE 0, BE 1, and CV 0. However, there was an increase in stockouts for drugs in classifications CN 6, CE 17, and BN 12, where stockouts of essential medications occurred for internal and surgical drugs, which are prescribed to patients outside the specialties of RSIA Masyita.

Table 4: Difference in Drug Stockout Values Before and After Inventory Control Simulation Using MMSL and ROP Methods at RSIA Masyita in 2023.

Group	Number of Drugs (n)	Stockout Value (Rp)	P Value
Before	275	6.008.867	0,000
After	36	2.975.625	
After-Before	-239	-3.033.242	
Percentage	87%	50,4%	

Source: Primary Data

Based on the SPSS test results with the paired samples test, a p-value of (0.000) < α(0.05) was obtained, which indicates a significant difference in the average stockout values before and after the inventory control simulation using the ABC, MMSL, and ROP analyses. From Table 4, it can be seen that there was a decrease in the stockout rate after the simulation, where the stockout medications were those used for patients outside the specialties (internal and surgical).

The difference in drug inventory values before and after inventory control was implemented

Inventory assessment aims to compare income and costs. In this study, the inventory assessment method used is the Maximum Minimum Stock Level (MMSL) and Reorder Point (ROP) methods.

Table 5: Difference in Drug Inventory Values Before and After Inventory Control Simulation Using MMSL and ROP Methods at RSIA Masyita in 2023

Group	Drug Items (n)	Stock Value (Rp)	P Value
Before (O_1)	600	150.118.661	0,000
After (O_2)	620	96.768.817	
After-Before	20	-53.349.844	
Percentage	3%	36%	

Source: Primary Data

In Table, it can be seen that there is a significant difference in the initial inventory values before and after the inventory control simulation using MMSL and ROP. Based on the Wilcoxon test, a p-value of (0.000) < α(0.05) was obtained, which indicates that there is a significant difference in the average inventory values before and after inventory control was implemented. The difference observed is an increase of 3% in the number of medication items available at the Pharmacy Unit of RSIA Masyita on

December 31, 2023, with a decrease in investment value of 36%, equivalent to IDR 96,768,817, resulting in an ending inventory value of IDR 53,349,844.

The difference in drug stagnation values before and after inventory control was implemented.

In pharmaceutical logistics management, the term stagnation refers to the category of remaining medications that exceed three times the average monthly usage.

Table 6: Difference in Drug Stagnation Values Before and After Inventory Control Simulation Using MMSL and ROP Methods at RSIA Masyita in 2023.

Group	Drug Item (n)	Stagnation Value (Rp)	P Value
Before	136	26.581.066	
After	0	0	0,000
After-Before	(136)	(26.581.066)	
Percentage			
	100%	100%	

Source: Primary

Table 6 shows a significant difference in stagnation values before and after the inventory control simulation using the MMSL and ROP methods. Since the p-value (0.000) < α(0.05), it can be concluded that there is a significant difference in the average stagnation values before and after the simulation. This difference is reflected in the decrease in both the number of medication items and the investment value, reaching a value of 0 IDR.

CONCLUSION

Based on the results of the analysis, the difference in the calculations before and after the simulation shows that the implementation of inventory control using the ABC, VEN, MMSL, and ROP analysis methods at the Pharmacy Unit of RSIA Masyita is highly efficient in controlling the items and inventory quantities of pharmaceutical supplies.

1. The stockout value shows a significant difference between the groups before and after the simulation, with a difference of 239 pharmaceutical supply items or 100%, and an investment value of IDR 3,033,242. Based on the ABC-VEN analysis, it can be concluded that in 2023, there was a decrease in stockouts for AE 0, BE 1, and no more stockouts for Vital drugs. Stockouts for essential medications still occurred for internal and surgical drugs, which are prescribed to patients outside the specialties of RSIA Masyita.
2. The inventory value shows a significant difference between the groups before and after the drug control simulation using the combination of MMSL and ROP analysis. There was an increase in the number of medication items by a difference of 20 items or 3%, with an investment value of IDR 53,349,844. This indicates that the implementation of this combination of control methods is considered effective and efficient in reducing the medication inventory at the Pharmacy Unit of RSIA Masyita.

The stagnation value shows a significant difference between the groups before and after the drug control simulation using the combination of MMSL and ROP analysis. There was a decrease in the number of stagnated medication items by a difference of 136 items or 100%, with an investment value of IDR 26,581,066. This indicates that the implementation of this control method is considered effective and efficient in reducing drug stagnation incidents at RSIA Masyita.

LIMITATIONS

This research contributes to the literature on the application of RME with the UTAUT model, especially in the context of hospitals in developing countries. However, limitations of this study include uneven sample distribution and geographical coverage limited to one hospital. Further studies are recommended to explore a broader context with a mixed-methods approach to understand the barriers and opportunities in implementing RME in more depth.

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