ABC, VEN and ROP Analysis of Drug Procurement Control in Klaten

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ABSTRACT

Background: Drug availability is a crucial aspect in the delivery of pharmaceutical services. Suboptimal procurement control can lead to stockouts, excess stock, and inefficient budget utilization. **Objective:** this study aims to evaluate drug procurement using ABC-VEN and Reorder Point (ROP) at the Pharmacy Installation of the Klaten District Health Office. **Methods:** A retrospective descriptive study used drug use and investment data for 2025. ABC analysis identified investment priorities, VEN determine drug criticality, and ROP to determine reorder time based on daily needs, lead time, and safety stock. **Results:** The study shows that category A includes 12 drug items (7.79%) accounting for 70.70% of the total investment value. Meanwhile, categories B and C account for 20.04% and 9.26%, respectively. VEN analysis showed that the Essential category dominates with 115 items (74.68%), followed by the Vital category with 22 items (14.29%) and the non-essential category with 17 items (11.04%). The ABC-VEN analysis shows that the Priority (P) and Main (U) groups absorb 42.02% and 50.66% of the total investment value, respectively. The ROP analysis shows that Paracetamol 500 mg tablets have the highest ROP value, 580,089 units. **Conclusion:** Implementation of the ABC-VEN and ROP methods may improve efficiency and ensure sustainable drug availability

Keywords ABC Analysis; Drug Procurement; Inventory Control; Reorder Point; Vital Essential Nonessential Analysis.

INTRODUCTION

Procurement control plays a role in ensuring the suitability between the procurement process and the real needs that have been planned. Through effective control, the availability of drugs can be maintained optimally while minimizing the risk of excess and shortage of inventory (1).

The availability of drugs is one of the important aspects in ensuring the quality of health services. The availability of drugs that are timely and in accordance with needs is very important to ensure that the clinical service process runs smoothly, as well as have an impact on the efficiency of budget use (2).

Less than optimal management of drug supplies can cause various problems, such as stock *outs*, overstock, and an increase in the number of expired or damaged drugs (3). This condition is generally caused by inaccurate needs planning, limited information system integration, and the use of planning methods that only refer to historical consumption data, thus potentially causing an imbalance in drug supplies (2).

Effective inventory control must be able to answer three main aspects, namely determining the drug items that need to be prioritized, determining the right number of orders, and determining the optimal time to reorder (4)

One of the methods that is widely used in inventory control is ABC analysis, which is a method to group drugs based on the amount of investment value so that their management priorities can be determined. Based on the ABC theory, group A generally only covers about 10-20% of the total drug items, but absorbs 70% of the total investment value. Meanwhile,

group B is a group with a moderate level of interest, and group C consists of many items with a relatively small contribution to the investment value so that its control can be carried out more simply (5).

In addition to ABC analysis, VEN analysis is used to group drugs based on their level of clinical importance, so that it can help optimize budget use and ensure the availability of drugs that have the greatest impact on health services (6). The analysis method by combining ABCs and VEN allows the prioritization of oabt procurement by considering aspects of investment value and clinical interest simultaneously, so that resource allocation becomes more effective (7). The result of the combination of the two methods resulted in the classification of drug prorites into priority, main and additional (PUT) categories (6).

Once the drug priority is determined, inventory control can be supplemented by the Reorder Point (ROP) method. The ROP is a minimum inventory limit that indicates when reorders must be made so that the availability of drugs is maintained as needed and able to balance the level of inventory with demand, so that the risk of stockout and overstock can be minimized (8)

The availability of essential drugs in Central Java Province, especially Klaten Regency, has reached the target of 100% availability of essential drugs by 2024 (9). However, it was found that the efficiency of drug procurement was not optimal. In Klaten Regency, the realization of the budget for the procurement of drugs, consumables, and vaccines in 2024 will reach 73.93% of the total budget ceiling provided (10)

Based on previous studies, there are several research gaps in the study of drug logistics management within the Health Office. The research conducted by Trianingrum and Raharjo (11) focused on the storage and distribution of drug logistics at the Pharmaceutical Installation of the Health Office (IFDK) of Klaten Regency. Meanwhile, Miranti's research (12) emphasizes more on the development of an inventory information system at the Karangnongko Health Center, Klaten Regency. Another study by Susilawati (13) and Prisanti (14) conducted a procurement analysis using the ABC method at Aisyiyah Islamic Pharmacy and Hospital (RSIA), but the two studies have not integrated the calculation of ROP.

Furthermore, Sutejo *et al*., (15) through *a literature review* mapped the problems of drug logistics management in general in various Health Offices, one of which was in IFDK Klaten Regency, but this study is global and has not been based on retrospective quantitative data on one specific location. So far, no comprehensive research has been found applying the ROP method in controlling drug procurement at IFDK Klaten Regency.

Based on this explanation, there is a gap in the study, namely there has not been a study that combines the ABC-VEN analysis with the Reorder Point (ROP) method in controlling drug procurement at the Pharmaceutical Installation of the Klaten Regency Health Office, which is also a novelty carried out by this research. This is certainly expected to provide more comprehensive advice in improving the efficiency of procurement management and ensuring the availability of drugs in a sustainable manner. Therefore, this study aims to analyze procurement control with the integration of three methods, namely ABC, VEN and Reorder Point (ROP) at the Pharmaceutical Installation of the Klaten Regency Health Office.

METHODS

This study is a descriptive research using quantitative methods and retrospective data collection. The population in this study is all types of drugs available and distributed at IFDK for the period of January 2025-December 2025. The samples in this study are all types of drugs

that are available and distributed at the Pharmaceutical Installation of the Klaten Regency Health Office during the period of January 2025-December 2025. The sampling technique uses *total-sampling* or saturated samples, where all members of the population are used as research samples. All drug data that met the research criteria were analyzed using the ABC, VEN, and ABC-VEN combination methods, which were then calculated using the *Reorder Point* (ROP) method.

The variables used in this study are free/X variables such as ABC Analysis Method, VEN analysis, ABC-VEN combination *Reorder Point* (ROP) method. As for the bound variables, among others, the effectiveness of drug procurement control (drug availability, *stockout* and *overstock*).

Data collection in this study was carried out using several techniques, namely literature studies, interviews, direct observations, and documentation studies. The data is analyzed through several stages. First, drug classification is carried out using the ABC method based on the annual consumption value to determine groups A, B, and C. ABC analysis steps include the preparation of drug lists, usage calculations, investment value calculations, investment value sequencing, percentage and cumulative percentage calculations, and drug grouping.

Second, drug grouping was carried out using the VEN (Vital, Essential, Non-essential) method based on the level of clinical importance. Category V is a drug that must always be available because it is related to patient safety, category E is a drug for general therapy, while category N is a supporting drug with lower priority. The classification of VEN refers to the National List of Essential Medicines (DOEN) and the Technical Instructions of the Ministry of Health of the Republic of Indonesia.

Third, a joint ABC-VEN analysis was carried out to determine the priorities of drug procurement and control more comprehensively. Furthermore, safety stock (SS) is calculated as a safety inventory to anticipate demand uncertainty and lead time. Finally, a Reorder Point (ROP) calculation is carried out to determine the reorder point for drugs.

The presentation of data in this study was carried out in a quantitative descriptive manner using tables. The initial data was compiled in a table containing the name of the drug, the unit price, the amount of use, and the investment value. Furthermore, the results of the ABC analysis are presented based on the order of investment value, percentage of contribution, and cumulative percentage to determine categories A, B, and C.

The results of the classification are then combined with the analysis of the VEN presented in a table based on the level of clinical importance (V, E, N). The combination of ABC and VEN results is displayed in the ABC-VEN matrix to determine drug control priorities.

Finally, data is presented for the calculation of *Reorder Point* (ROP) based on daily needs, lead time, and safety stock to determine drug reorder points. All results are then narrated to clarify the interpretation and support the study's conclusions.

As an illustration of the flow of concepts and relationships between variables in the research, the research framework is presented in the following figure:

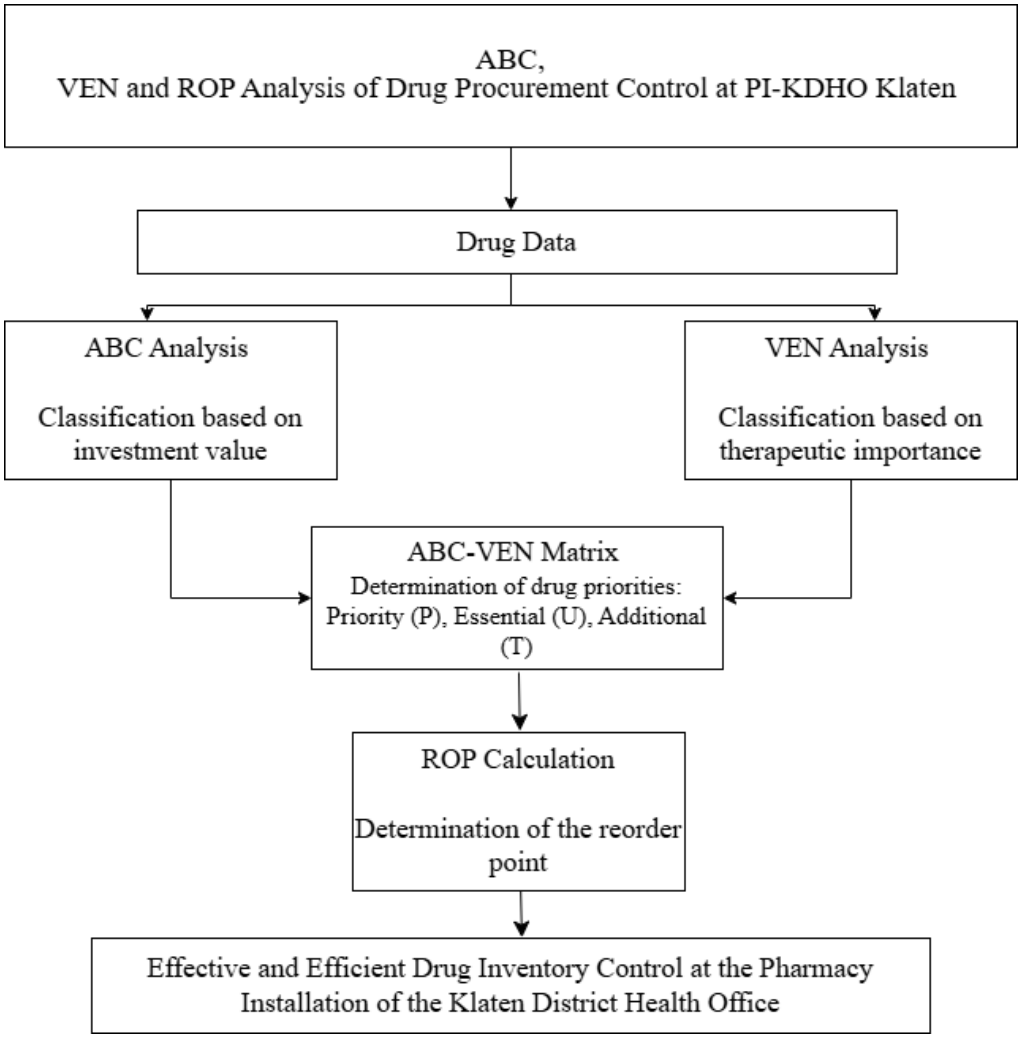

Figure 1. Research Stages Flowchart

RESULTS

Based on the research, the following results and analysis data were obtained:

Table 1. Results of ABC analysis at the Pharmacy Installation of the Klaten District Health Office for the period January 2025-December 2025

Category	Number of Items	Percentage of Total Items (%)	Investment Value (Rp)	Percentage of Investment Value (%)
A	12	7,79%	11.932.704.260	70,70%
B	27	17,53%	3.381.841.374	20,04%
C	115	74,68%	1.562.383.464	9,26%
TOTAL	**154**	**100%**	**16.876.929.098**	**100%**

Table 2. Results of VEN Analysis for the period January 2025-December 2025

Category	Number of Items	Percentage (%)
V	22	14,29%
E	115	74,68%
N	17	11,04%
TOTAL	**154**	**100%**

Table 3. Classification Using Combination Analysis

Category	Items	% Items	Cost (Rp)	% Cost
AV	4	2,60%	6.857.885.247.	40,64%
Yes	7	4,55%	4.205.689.373	24,92%
AN	1	0,65%	869.129.640	5,15%
BV	2	1,30%	225.530.200	1,34%
BE	22	14,29%	3.562.685.180	21,11%
BN	3	1,95%	115.140.300	0,68%
CV	16	10,39%	8.452.800	0,05%
CE	86	55,84%	781.884.115	4,63%
CN	13	8,44%	250.532.243	1,48%
TOTAL	**154**	**100%**	**16.876.929.098**	**100%**

Table 4. ABC-VEN Combination Analysis in IFDK Klaten Regency for the period January 2025-December 2025

	A	B	C	Category	Total Items	% Items	Investment value	% Investment
V	4	2	16	P	22	14,29%	7.091.868.247	42,02%
E	7	22	86	U	115	74,68%	8.550.258.668	50,66%
N	1	3	13	T	17	11,04%	1.234.802.183	7,32%
Total	12	27	115	-	154	100%	**16.876.929.098**	100%

Table 5. Range of Reorder Point (ROP) Values for Each Drug Group Based on ABC–VEN Analysis.

Drug Group	Number of Items	ROP Range (Units)
AV	4	206722 - 580089
Yes	7	133473 - 247212
AN	1	196.724
BV	2	21999 - 36864
BE	22	11204 - 130097
BN	3	11261 - 34849
CV	16	4 - 3633
CE	86	1 - 8887
CN	13	17 - 8821

DISCUSSION

Data was obtained on 252 drugs, 98 of which were eliminated according to the inclusion and exclusion criteria. So that 154 drugs were obtained that were further analyzed.

The ABC analysis method is a technique of grouping inventories based on the amount of investment value, starting from the highest to the lowest value. Based on this method, drug items are classified into three groups, namely group A with a high investment value, group B with a medium investment value and group C with a low investment value (16).

Based on the results of ABC analysis in this study, a total investment of IDR 16,876,929,098 was obtained. The results of the analysis showed that drugs included in category A amounted to 12 items out of 154 drug items or 7.79% of the total drug items with an investment value of IDR 11,932,704,260 of the total investment value or 70.70% of the total investment value. Drugs included in category B amounted to 27 items out of 154 drug items or 17.53% of the total drug items with an investment value of IDR 3,381,841,374 of the total drug investment or around 20.04% of the total drug investment. Most of the drugs in the Pharmaceutical Installation of the Klaten Regency Health Office are included in category C, namely 115 items (74.68%) of 154 drug items, but the investment value is only IDR 1,562,383,464 or 9.26% of the total investment value. Items that are included in

group A are dominated by vaccines, such as the HPV 1 DS vaccine, rotavirus vaccine, PCV Valenina 1 DS vaccine, MR+ solvent vaccine, PCV vaccine, DPT-HB-Hb vaccine, and IPV polio vaccine. In addition, there are several essential drugs with high use such as amoxicillin caplet 500 mg, blood supplement tablets and paracetamol tablets 500 mg.

The high investment value in group A shows that these items require strict inventory supervision to prevent *stockouts* and *overstocks*. The management of drug supplies in this category must be carried out carefully and effectively to save the drug investment budget. Because poor management can lead to unexpected stock shortages (17).

Group B consists of 28 drug items and includes items such as BCG+ solvent vaccine, Hepatitis B vaccine, Td vaccine, lactate ringer, albendazole tablets 400 mg, mefenamic acid 500 mg, and several HIV program drugs. Meanwhile, group C consists of 114 drug items and includes items such as dexamethasone tablets 0.5 mg, antacids DOEN I chewable tablets, supplements and vitamins.

ABC analysis will not be effectively implemented in Pharmaceutical Installations if it stands alone because not only the issue of funds is a priority, but also drugs that are included in the vital, essential, and nonessential groups that must also be classified. VEN analysis is a method used to determine the order of priority in the purchase of drugs as well as to establish the safe amount of stock and selling price of the drug (18).

The determination of drug categories in this study uses the Vital, Essential, and Non-essential (VEN) method by referring to the National List of Essential Drugs (DOEN) (19) as the main reference. The 2023 Technical Guidelines for Drug Procurement Planning issued by the Ministry of Health of the Republic as a supporting reference in the drug classification process, especially in determining the selection of essential drugs nationally.

Based on the VEN analysis for the period of January 2025-December 2025, there were 154 drug items consisting of 22 items (14.29%) of category V (Vital), 115 items (74.68%) of category E drugs (Essential) and 17 items (11.04%) of category N (Non-essential) drugs. The results of the analysis of the combination of ABC-VEN in drug planning at the Pharmaceutical Installation of the Klaten Regency Health Office during the period January 2025-December 2025 obtained 22 items (14.68%) of drugs included in category P (priority) with an investment value of IDR 7,091,868,247 or 42.02% of the total investment value. In category U (Main) as many as 115 items (74.68%) with an investment value of IDR 8,550,258,668 or 50.66% of the total investment value and 17 items (11.04%) of drugs are included in category T (Additional) with an investment value of IDR 1,234,802,183 or 7.32% of the total investment value.

Category P (Priority) consists of 4 items of AV group, 2 items of BV group drugs, and 16 items of CV group drugs. Category U (Main) drugs consist of 7 items of AE drugs, 22 items of BE drugs, and 86 items of CE drugs. Category T (Additional) drugs consist of 1 item of drugs of group AN, 3 items of drugs of group BN and 13 items of drugs of group CN.

Combining both ABC and VEN analysis methods is considered more efficient to be able to consider the level of drug importance and adjust to the existing budget (20). The ABC-VEN integration offers an effective and comprehensive solution to a common problem that management often faces, namely between "cost" and "life". The ABC analysis itself does not pay attention to urgent medical needs, while the VEN analysis does not pay attention to its impact on finances. The ABC-VEN matrix combines both aspects, forming a strategic map that helps in balanced decision-making (21)

Safety stock is additional inventory that is added to procurement to prevent or reduce the risk of a stock *shortage* (22). Meanwhile, lead *time* is the average time needed to get stock of drugs or goods, starting from the time the order is placed until the goods are received. The work achievement target or *service level* used to calculate *safety stock* is 95%, so the Z value is 1.64. *A service level* of

95% means that the probability of all requests being fulfilled is 95%, but there is a 5% chance that the request cannot be fulfilled (23).

To prevent drug vacuum, it is necessary to calculate ROP (*Reorder Point*), which is a method used to determine the point or time of reordering goods so that the ordered goods arrive on time where in the *safety stock* inventory (24) This method considers *the safety stock* and the waiting time when ordering (25)

Based on the table above, the number of *safety stocks* and ROP for each drug item is obtained. The calculation results show that the amount of *Safety Stock* and ROP value is influenced by the average number of drug needs per day. The higher and larger the level of drug use, the greater the *safety stock* and ROP that must be provided.

The drug with the highest daily requirement is paracetamol tablets 500 mg by 7.297 tablets per day. After the safety stock calculation was carried out , the results were 361,188 tablets and ROP of 580,089 tablets. This means that health service facilities must immediately reorder when the supply of paraetamol reaches 580,089 tablets, so that shortages of stock during the procurement process can be avoided.

In contrast, some special program drugs and drugs with low levels of use have relatively small ROP values. For example, the combination of sefixim 400 mg + azithromycin 1 gram which has a daily requirement is only around 0.0055 units, with *a safety stock* of 0.27 units and ROP 1 unit. Another example is the pediatric MB category leprosy drug with 2 units of ROP, and 5 mg/ml infusion metronidazole which only has 2 units of ROP. This value shows that the need for these drugs is relatively low, causing the supply provided to be relatively small.

The results of the *Reorder Point* (ROP) calculation based on the ABC-VEN classification show differences in reorder points between drug groups. The AV group has the largest ROP range of 206,722 to 580,089 units, followed by the AE group with a range of 133,473 to 247,212 units. This shows that the supply of these two groups needs to be managed more tightly because they have a high investment value and a large level of drug importance. The BV, BE, and BN groups had a medium ROP range, while the CV, CE, and CN groups showed a relatively low ROP range. The high ROP value in the AV and AE groups is due to the high number of drugs consumed and the need to maintain stock availability during the procurement waiting time.

The ROP method can help pharmacy plan in calculating and ordering drugs, so that there is no shortage of drugs and minimizes costs on orders (26)

Based on information from the Head of Pharmaceutical Installation of the Klaten Regency Health Office, the time needed from the time the order is placed until the medicine arrives is 30 days. Meanwhile, drug procurement planning is only carried out once a year, so it is not possible to reorder even though the stock has reached the predetermined ROP value. This condition makes the results of the ROP calculation more useful as an indicator to determine inventory needs and the level of risk of stock depletion compared to if it is used to reorder. This happens because after the procurement is determined, pharmaceutical installations cannot increase the number of drugs in the current year. These findings suggest that although theoretically safety *stock* and ROP calculation methods can be used to estimate uncertainties in demand and delivery times, the application of such methods faces the limitations of procurement policies that are only carried out once per year.

The calculation of ROP and *safety stock* of drug supplies must always be carried out in order to ensure the availability of drugs so that quality services to patients can be sustainable (27).

CONCLUSION

The results showed that most drug investments were concentrated in the group of drugs with high investment value, while based on the VEN analysis of essential category drugs dominated the number of items managed. The integration of the ABC-VEN method successfully identified priority

and major drug groups, while the ROP analysis provided a basis for determining the timing of reorders so as to minimize the risk of stock shortages. Overall, the application of the ABC-VEN and ROP methods contributes to increasing the effectiveness of drug procurement control, budget use efficiency, and the sustainability of drug availability at the Klaten Regency Health Office Pharmaceutical Installation. The limitation of this study is that it only uses the ABC, VEN, ABC-VEN combination, and ROP methods, conducted at one research location, namely the Klaten Regency Health Office Pharmaceutical Installation, and uses retrospective data for the January-December 2025 period. Therefore, further research is recommended to combine other inventory control methods, such as Economic Order Quantity (EOQ), in order to obtain a more optimal, efficient, and economical drug procurement policy.

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Author Contribution: Yuslikha plays a role in the conceptualization of research, data collection, data analysis, interpretation of results, and manuscript preparation. Supervisors play a role in supervising research, method validation, critical review of manuscripts, and improving the substance of articles. All authors have read and approved the final manuscript.

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