

AN ANALYSIS OF DRUG INVENTORY CONTROL EFFICIENCY USING ALWAYS BETTER CONTROL, VITAL ESSENTIAL NON-ESSENTIAL, AND ECONOMIC ORDER QUANTITY METHODS: A CASE STUDY AT ASSALAAM MEDICARE

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ABSTRACT

Effective control of pharmaceutical inventory is essential in ensuring the availability of drugs and preventing stockouts or overstock situations in healthcare facilities. This study aims to analyze drug inventory control at Assalaam Medicare Pharmacy using three key methods: the ABC (Always Better Control) method, which classifies drugs based on their consumption value to prioritize control; the VEN (Vital, Essential, Non-Essential) method, which categorizes drugs by their criticality in treatment; and the EOQ (Economic Order Quantity) method, which determines the most cost-efficient order quantity. Data from January to March 2024 were analyzed. ABC classification showed that 151 drug items fell into group A with the highest investment value (75%). VEN analysis identified 24 vital drugs in group A. EOQ analysis found the optimal order quantity ranged from 17 to 2,061 units per item. This study highlights the importance of combining these methods for efficient inventory control and provides practical insights for improving drug procurement and budgeting strategies in pharmacies.

Keywords: Control, Drugs, ABC, VEN, EOQ

INTRODUCTION

Pharmacy is one of the health services that is most easily accessible to the public. Pharmacy is a place for pharmacists to contribute professionally to improving optimal public health through pharmaceutical services. Services provided in pharmacies must ensure the availability of safe, high-quality, effective, and affordable pharmaceutical products, medical devices, and disposable medical supplies (Yunarti et al., 2024).

In the health sector, especially in pharmacies, controlling drug inventory is very important and must be managed with the right strategy. According to the Regulation of the Minister of Health of the Republic of Indonesia No. 73 of 2016

concerning Pharmaceutical Service Standards in Pharmacies, inVENTORY control aims to preVENT excess stock or stockouts that can interfere with patient services (Indah, 2024; Permenkes No 73, 2016). Good inVENTORY control also ensures the availability of timely inVENTORY and helps predict when inVENTORY is needed, thereby minimizing the risk of excess or lack of stock (Syaiful et al., 2022). Inefficient inVENTORY management can result in drug unavailability and excessive costs due to slow-moving stock (Zowid et al., 2019).

InVENTORY control methods such as ABC (Always, Better, Control), VEN (Vital, Essential, Nonessential), and EOQ (Economic Order Quantity) are commonly used in the pharmaceutical environment. The ABC method helps identify high-priority drugs based on their consumption value, allowing for cost efficiency and effective control (Indah, 2024). This method categorizes drugs into groups A, B, and C, from the most significant to the least significant in terms of budget allocation (Yunisah & Wempi Eka Rusmana, 2022). The VEN method classifies drugs based on their criticality to health: Vital (V), Essential (E), and Nonessential (N) (Darmawan et al., 2021). Meanwhile, the EOQ method calculates the most economical purchase quantity for each ordering cycle (Siboro et al., 2020).

Assalaam Medicare Pharmacy is located on Jalan Garuda Mas, Jalan Mendungan, Mendungan, Pabelan, Kartasura District, Sukoharjo Regency. This pharmacy is quite busy with visitors, serving both general patients and those with prescriptions, leading to a high volume of drug transactions and relatively fast drug turnover. In some instances, the pharmacy has experienced drug shortages due to the increasing number of customers and high demand for certain medicines. To preVENT future stockouts, it is necessary to conduct a drug inVENTORY analysis using the ABC (Always Better Control), VEN (Vital, Essential, Non-Essential), and EOQ (Economic Order Quantity) methods. These three methods complement each other to ensure drug availability in the right quantity, at the right time, and for the right purpose, while also minimizing costs and avoiding stockouts. Efficient inVENTORY management can significantly reduce procurement costs and ensure that drug purchases align with actual needs and the available budget (Widyaprawati & Soehartati, 2024).

Based on these problems, this study aims to analyze the efficiency of drug inVENTORY control at Assalaam Medicare Pharmacy using the ABC, VEN, and EOQ methods. The results of this study are expected to provide practical solutions not only for this pharmacy but also for other pharmacies in increasing inVENTORY efficiency and minimizing the risk of stock shortages, excess stock, and losses due to expired drugs.

METHODOLOGY

This study is a non-experimental descriptive study using quantitative methods. Quantitative research involves the systematic investigation of phenomena by collecting measurable data, which is analyzed using statistical, mathematical, or computational techniques (Rustamana et al., 2024).

This study applied a combination of the ABC (Always Better Control), VEN (Vital, Essential, Non-Essential), and EOQ (Economic Order Quantity) methods to

evaluate drug inVENTORY management at Assalaam Medicare Pharmacy. These three methods were selected because they complement each other and offer a more comprehensive approach to controlling pharmaceutical supplies. The ABC method focuses on drug consumption value, allowing pharmacies to prioritize high-investment items. The VEN method categorizes drugs by their clinical importance, ensuring essential medicines are always available. Meanwhile, EOQ helps determine the most cost-efficient ordering quantity by balancing procurement and storage costs (Alexandri et al., 2021; Indah, 2024).

While each method is useful on its own, they also come with limitations. For instance, the ABC method is great for financial efficiency but doesn't account for medical urgency. The VEN method highlights clinical priorities but doesn't consider economic factors. EOQ offers a practical way to optimize order size but assumes steady demand and doesn't include safety stock considerations (Darmawan et al., 2021; Pratama & Supriyanto, 2022). That's why combining all three methods can give pharmacies a more balanced strategy—ensuring the right drugs are available at the right time and cost.

Several previous studies have shown the value of these methods. For example, (Nurul et al., 2023; Widyaprawati & Soehartati, 2024) that using ABC-VEN helped reduce expired stock and avoid shortages in hospital settings. However, studies that integrate ABC, VEN, and EOQ together—especially in smaller, private pharmacies—are still quite limited. This study aims to address that gap by applying the combined method in a busy community pharmacy where storage space and budget are often limited.

There are several stages of the research procedure, namely:

1. Preparation Stage

Starting with obtaining research permission at the Assalaam Medicare Pharmacy.

2. Observation and interview stages aimed at finding out pharmacy information.

3. Data Collection Stage

This data collection is retrospective, namely looking at drug expenditure/sales data at the Assalaam Medicare Pharmacy.

4. Data Processing Stage

The results of the data obtained are then processed using software in the form of *Microsoft Excel*.

a. ABC (*Always, Better, Control*) Method

The ABC method categorizes drugs based on their consumption value to prioritize inventory control (Fatimah et al., 2022), is a widely adopted approach in pharmaceutical inVENTORY management. It categorizes drugs based on their consumption value or contribution to total inVENTORY cost. Items are classified into three groups: A (roughly 10–20% of items that account for 70–80% of total value), B (20–30% of items with moderate value), and C (the majority of items but with minimal contribution to overall cost) (Indah, 2024). The strength of the ABC method lies in its ability to help pharmacies focus control efforts on the most valuable items, improving financial efficiency (Alexandri et al., 2021). However, one limitation is that it does not take clinical urgency into account (Darmawan et al., 2021). Recent

studies have shown the ABC method to be effective in optimizing procurement budgets and minimizing excess stock in both hospital and community pharmacies (Abbas et al., 2021; Nurul et al., 2023; Yunisah & Wempi Eka Rusmana, 2022). This method is particularly useful as a foundational step in building an efficient inVENTory system.

Here are the steps:

- 1) Calculate the amount of funds needed for each drug by multiplying drug quantum x drug price;
- 2) Determine the ranking from the largest to the smallest funds;
- 3) Calculate the percentage of the total funds needed;
- 4) Calculate the cumulative percentage;
- 5) Group A drugs are included in the cumulative 75%;
- 6) Group B drugs are included in the cumulative > 75% to 95%;
- 7) Group C drugs are included in the cumulative > 95% to 100%.

b. VEN (Vital, Essensial, Non Essensial) Method

This method uses purposive sampling to select informants who are knowledgeable and can provide relevant data (Amin et al., 2023). The VEN method is a clinical-based classification tool that prioritizes drug procurement based on therapeutic importance. "Vital" drugs are life-saving and must always be available, "Essential" drugs are highly effective for common illnesses, while "Non-Essential" drugs have limited therapeutic value or are used for self-limiting conditions (Darmawan et al., 2021). The main advantage of the VEN method is its ability to ensure the consistent availability of critical medications. However, it lacks consideration of inVENTory costs and may not support budget efficiency when used alone (Pratama & Supriyanto, 2022). Research by (Nurul et al., 2023) highlights that integrating VEN with ABC can balance clinical priorities with cost management. Therefore, the VEN method is crucial in helping pharmacists make informed procurement decisions based on medical urgency. Medicines are classified as follows (Kemenkes, 2021):

- 1) V (Vital) are life-saving drugs that must always be available.
- 2) E (Essential) are drugs that are effective for disease management and symptom relief but are not too urgent.
- 3) N (Non-Essential) are drugs used for conditions that can heal on their own or whose efficacy is still questionable.

c. EOQ (*Economic Order Quantity*) Method

The EOQ method is designed to calculate the optimal order quantity that minimizes the total cost of inVENTory, which includes both ordering and holding costs. The formula considers annual demand, order cost per transaction, and annual storage cost per unit (Alexandri et al., 2020). One of its major advantages is enabling pharmacies to maintain efficient ordering cycles, preventing both stockouts and overstocking (Indah, 2024). However, the model assumes a constant demand rate and does not take safety stock or sudden fluctuations in drug usage into account (Pratama & Supriyanto, 2022). Studies such as those by Widyapratwi & Soehartati, (2024) and Abbas et al., (2021) confirm that EOQ can lead to significant savings in operational costs

while improving stock accuracy. When combined with ABC and VEN, EOQ offers an added layer of control that supports better planning and procurement strategies. This EOQ can be calculated using the following formula:

$$Q = \frac{\sqrt{2DS}}{H}$$

Keterangan:

Q = Optimal order quantity

D = Number of request/needs in a year

S = Ordering cost each order

H = Storage cost each item in a year

RESULT AND DISCUSSION

ABC Method Analysis

The application of the ABC method aims to identify drugs that contribute the most to budget usage, so that they can be a top priority in inventory management. With this method, it is hoped that the risk of drug shortages can be minimized, which will ultimately increase patient satisfaction with pharmaceutical services at the pharmacy (Abbas et al., 2021; Zulpadly & Rahayu, 2023). At Assalaam Medicare Pharmacy, the ABC (Always, Better, Control) method was applied to 572 drug items during the period from January to March 2024. Through this analysis, various types of pharmaceutical preparations can be identified and further evaluated.

The evaluation includes a review of the level of drug usage, as well as considerations for replacing it with more efficient alternatives, such as the use of different trademarks, other dosage forms, or equivalent therapeutic substitutions (Kemenkes RI, 2021). The analysis is carried out based on the value of usage and the amount of investment. The following are the results of the grouping based on the ABC Analysis:

Table 1. Results of Drug Grouping Based on ABC Analysis

Category	Number of items	Usage Quantity	Usage (%)	Investment Value	Investment (%)
A	151	27.970	65 %	Rp 69.845.263	75%
B	215	10.236	24%	Rp 18.710.656	20%
C	206	4.521	11%	Rp 4.679.125	5%
Total	572	42.727	100%	Rp 93.235.044	100%

In Table 1, it can be seen that:

1. Group A consists of 151 drug items that show the highest level of use, which is 27,970 units or 65% of the total 572 drug items analyzed. This group also has the largest investment value, which reaches 75% of the total investment value of drugs.

2. Group B includes 215 drug items with a total usage of 10,236 units, or around 24% of the total usage. The investment value is in the range of 20% of the total investment value.
3. Group C consists of 206 drug items, with a total usage of 4,521 units or around 11%. This group has the lowest investment value, which is only 6% compared to groups A and B.

VEN (*Vital, Essential, Non Essential*) Analysis

VEN analysis is a method used to set priorities in drug purchases, determine safe stock levels, and set drug selling prices. Drug classification is divided into three main categories, namely:

1. Vital (V): Drugs that must be available because they function to save patients' lives.
2. Essential (E): Drugs that have been proven effective in curing certain diseases.
3. Non-Essential (N): Drugs used for diseases that are self-limiting or can heal on their own without special treatment (Nurul et al., 2023).

The VEN method helps in categorizing drugs based on their level of urgency and criticality so that it can be used as a basis for planning drug needs, especially to ensure the availability of the Vital (V) group on an ongoing basis (Pamela et al., 2019).

In this study, the VEN analysis focused on the Vital (V) category from group A of the ABC analysis results. Of the 151 drug items included in group A, 24 items were classified as vital drugs based on the results of interviews with Pharmacists at Assalaam Medicare Pharmacy, as shown in Table 2.

Table 2. Results of Analysis of Vital Category Drugs (V)

Number	Drug Name
1	Cefixime 100 Mg
2	Lanzoprazol 30 Mg
3	Neurobion 10's
4	Neurobion Forte 10's
5	Tremenza Tab
6	Spasminal
7	Sanmol 500 Mg
8	Sanmol Syr
9	Mefinal 500 Mg
10	Sucralfat 500mg/5ml 100ml
11	Insto 7,5 Ml
12	Caviplex Tab
13	Cataflam 50 Mg
14	Elang Mkp 15 Ml
15	Domperidon Tab
16	Lodia 2 Mg
17	Nexitra 500 Mg Tab
18	Salycil Gajah Non Menthol Pink 100gr

19	Fresh Care 10 MI Strong
20	Guanistrep Syr 60 MI
21	Nacl 0,9% 500 MI
22	Zink 20mg Tab
23	Cortidex
24	Methyl Pred 4 Mg

Analisis EOQ (*Economic Order Quantity*)

Economic Order Quantity (EOQ) is the most commonly used mathematical model in drug inVENTORY management. This model functions to determine the optimal order quantity by considering the balance between ordering costs and inVENTORY storage costs (Alexandri et al., 2020). The main advantage of the EOQ method lies in the speed of calculation and results that are close to the optimal value. However, this method has limitations, because it assumes that the data is constant and does not take into account the safety stock factor in its calculations (Pratama & Supriyanto, 2022).

In this study, the data used for the EOQ analysis was obtained from the Vital (V) category drug group based on the results of the VEN analysis. Several important variables were successfully collected through interviews with pharmacists at Assalaam Medicare Pharmacy, thus supporting the smooth running of the EOQ analysis process. The variables are as follows:

1. Drug ordering cost

Based on direct interviews with Assalaam Medicare Pharmacists, the estimated cost of ordering by telephone is Rp 120.000/year. In a month, the pharmacy makes orders twice so that the cost of ordering in one order is Rp 5.000/order.

2. Storage cost

The storage cost of inventory in a year at Assalaam Medicare Pharmacy is 20% of each drug item from the interview results.

3. Number of request in a year

Demand data is obtained monthly, so to get the number of annual requests, the data is multiplied by 12 months.

4. Price of each drug

Data on the unit price of drugs is taken from the price record book at Assalaam Medicare Pharmacy.

Calculation of drug inVENTORY control using the EOQ method uses the formula:

$$Q = \frac{\sqrt{2DS}}{H}$$

Keterangan:

Q = Optimal order quantity

D = Number of request/needs in a year

S = Ordering cost each order

H = Storage cost each item in a year

The result of the EOQ calculation can be seen in Table 3 as follows:

Table 3. EOQ Calculation Results

Number	Drug Name	D	S	H	EOQ
1	Cefixime 100 Mg	1800	Rp 5.000,-	* 20%	221
2	Lanzoprazol 30 Mg	4800	Rp 5.000,-	* 20%	464
3	Neurobion 10's	1200	Rp 5.000,-	* 20%	49
4	Neurobion Forte 10's	1200	Rp 5.000,-	* 20%	67
5	Tremenza Tab	4800	Rp 5.000,-	* 20%	451
6	Spasminal	12000	Rp 5.000,-	* 20%	707
7	Sanmol 500 Mg	12000	Rp 5.000,-	* 20%	1516
8	Sanmol Syr	3600	Rp 5.000,-	* 20%	381
9	Mefinal 500 Mg	120	Rp 5.000,-	* 20%	24
10	Sucralfat 500mg/5ml 100ml	120	Rp 5.000,-	* 20%	17
11	Insto 7,5 Ml	120	Rp 5.000,-	* 20%	24
12	Caviplex Tab	16800	Rp 5.000,-	* 20%	1586
13	Cataflam 50 Mg	600	Rp 5.000,-	* 20%	76
14	Elang Mkp 15 Ml	144	Rp 5.000,-	* 20%	41
15	Domperidon Tab	6000	Rp 5.000,-	* 20%	867
16	Lodia 2 Mg	2400	Rp 5.000,-	* 20%	358
17	Nexitra 500 Mg Tab	1200	Rp 5.000,-	* 20%	173
18	Salicyl Gajah Non Menthol Pink 100gr	240	Rp 5.000,-	* 20%	45
19	Fresh Care 10 Ml Strong	144	Rp 5.000,-	* 20%	27
20	Guanistrep Syr 60 Ml	120	Rp 5.000,-	* 20%	38
21	Nacl 0,9% 500 Ml	240	Rp 5.000,-	* 20%	35
22	Zink 20mg Tab	4800	Rp 5.000,-	* 20%	714
23	Cortidex	9600	Rp 5.000,-	* 20%	1432
24	Methyl Pred 4 Mg	28.800	Rp 5.000,-	* 20%	2061

Based on the results of the EOQ method calculation for 24 Vital (V) class drugs at the Assalaam Medicare Pharmacy, the optimum order quantity (Q) values vary. This difference is caused by variations in the amount of demand, ordering costs, and storage costs for each type of drug (Nurul et al., 2023). From the results of the analysis shown in the previous table, it is known that the highest optimum order quantity is for Methyl Prednisolone 4 mg with a total of 2061 items. Meanwhile, the lowest optimum order quantity was obtained for Sucralfate 500 mg/ml in 100 ml packaging, which was 17 items.

The results of this study particularly the classification of 151 drug items into group A and the identification of 24 vital drugs are in line with findings from Nurul et al. (2023) and Darmawan et al. (2021), who also reported that a relatively small number of items accounted for a significant portion of inVENTory investment and clinical importance. Similarly, the EOQ calculations in this research, such as the highest optimal order quantity for Methylprednisolone (2,061 items), support the

findings of Widyapratwi & Soehartati (2024), which demonstrated that the EOQ method is highly effective in optimizing procurement for fast-moving, high-demand drugs. However, there are some differences when compared to the study by Abbas et al. (2021), where EOQ values appeared more stable due to monthly ordering cycles, as opposed to the biweekly ordering schedule at Assalaam Medicare Pharmacy. These similarities and differences highlight the importance of context such as pharmacy scale, procurement patterns, and stock rotation frequency when applying the ABC, VEN, and EOQ methods in pharmaceutical inventory management. Therefore, while this study supports the overall effectiveness of combining these methods, it also underscores the need to adapt the approach based on the operational characteristics of each pharmacy.

The variation in the number of items and investment values across categories A, B, and C can be explained by the drug consumption patterns observed at Assalaam Pharmacy. Category A consists of high-cost and frequently used medications that, although limited in number, account for a large portion of the total procurement budget. On the other hand, category C includes a broader range of low-cost or rarely used drugs, resulting in a smaller investment share. One of the influencing factors at Assalaam is its strategic location next to Assalaam Medicare clinic, which contributes to a steady demand for symptomatic and acute care medications. This proximity increases the frequency of prescriptions and walk-in purchases for common illnesses. It is also important to note that the data in this study were collected only between January and March 2024. This limited time frame does not capture seasonal trends or changes in disease patterns that may affect drug usage and procurement decisions. Future studies with longer observation periods and consideration of external factors would provide a more comprehensive understanding of inventory needs.

CONCLUSION

Based on the results of the research conducted at Assalaam Medicare Pharmacy, the following conclusions can be drawn:

1. ABC (Always Better Control) analysis shows that of the total 572 types of drugs used during the January–March 2024 period, group A consists of 151 types of drugs with an investment contribution of 75% of the total usage value. Group B consists of 215 types with an investment share of 20%, and group C consists of 206 types with only 5% contribution.
2. VEN (Vital, Essential, Non-Essential) analysis of group A from the ABC results shows that there are 24 types of drugs categorized as Vital (V), which are crucial to always be available due to their important role in saving patients.
3. EOQ (Economic Order Quantity) analysis produced optimal order quantities (Q) that vary by drug type, influenced by differences in demand, price, and ordering and storage costs. The highest Q value was found for Methylprednisolone 4 mg (2,061 items), while the lowest was for Sucralfate 500 mg/ml (17 items).

In addition, the results of this study offer practical implications for stakeholders. By applying the combined ABC–VEN–EOQ methods, pharmacy managers can make more informed decisions in prioritizing which drugs to procure,

how much to order, and when to restock. This can help optimize the use of procurement budgets by focusing spending on high-impact items and reducing excess or low-priority stock. Ultimately, this approach supports more efficient, cost-effective, and patient-centered pharmaceutical inventory management. Suggestions that can be given are in-depth calculations regarding Safety Stock (SS) and ROP (Reorder Point) to minimize the risk of stock shortages and improve the timeliness of drug orders at the pharmacy.

DECLARATION OF COMPETING INTEREST

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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