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Analysis of BPJS Drug Inventory Control Using ABC-VEN Methods at Dr. Moewardi Surakarta Hospital in 2023

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ABSTRACT

Background: The implementation of JKN by BPJS Kesehatan, drug inventory management has become a crucial thing to ensure the efficiency and effectiveness of healthcare services. However, delays in BPJS claims these payments often disrupt drug procurement in hospitals. This study is aimed to prevent stock outs so that an effective inventory control method is needed at Dr. Moewardi Surakarta Hospital.

Objectives: This study is aimed to analyze the management of BPJS drugs at the Pharmacy Installation of Dr. Moewardi Surakarta Hospital using the ABC-VEN, dan EOQ methods to optimize inventory control, ordering, and, storage.

Methods: This descriptive-analytical study used retrospective data from pharmacy record documents, inventory systems, stock levels, usage, costs, and interview results. Data accuracy was ensured through triangulation, cross-checking records with financial documents, and respons of interviews in 2023. The inventory value was calculated by multiplying the quantity of drugs procured and remaining stock (on their own puchasing prices) at the end of the year. Inventory Turnover Ratio was calculated by dividing the COGS by the average inventory value. The data were analyzed using Microsoft Excel software version 2021.

Results: Findings showed that ABC-VEN methods were 8% of drugs which were classified as AV, 6% as BV, 43% as CV, 5% as AE, 5% as BE, and 57% as CE out of 288 items, with CE dominating. The final inventory value was Rp 6,947,818,985 with an ITOR of 7.53 times per year.

Conclusion: The findings show that the ABC-VEN method can improve inventory control, reduce stockouts, and align drug procurement with finance.

Keywords: ABC-VEN; BPJS; Drug Inventory Management; Dr. Moewardi Hospital.

INTRODUCTION

Healthcare is a fundamental human right which is important for individual well-being and national development, as mentioned in Pancasila and the 1945 Constitution of the Republic of Indonesia. The Health Law No. 17 of 2023 emphasized that health encompasses physical, mental, spiritual, and social well-being, enabling every individual to live productively. Hospitals, whether they are public or private, are pivotal in providing [1].

The research of BPJS Kesehatan in 2014 under the National Health Insurance (JKN) scheme obliged the participating hospitals to operate with greater efficiency, particularly in drug procurement processes [2]. In a hospital, over 90% of the services relied on pharmaceutical consumables and drug management contributed to 50% of hospital revenue [3]. Effective pharmaceutical logistics and patient-centered pharmacy services were now critical components of hospital management, designed to prevent medication-related issues and ensure cost-effective drug distribution [4].

However, hospitals face considerable challenges in managing drug inventories due to fluctuations in demand and delays in BPJS claim payments. These delays, particularly under the Indonesian Case Based Groups (INA-CBGS) payment system, often disrupt the procurement of essential drugs, impacting in service quality [5]. The

complexity of BPJS's tiered referral system further worsen these challenges and therefore it is required to have some reliable inventory management strategies to ensure the optimal availability and accessibility of medications for patients.

Hospitals are increasingly adopting the ABC-VEN analysis method for inventory management to deal with these challenges. ABC analysis categorizes drugs based on their consumption value, while VEN analysis classifies them based on their therapeutic importance (Ranganathan 2017). This combination of methods offers a systematic approach to drug inventory management, helping hospitals prioritize stock levels, minimize stockouts, and maximize resource utilization [7]. There is also a need for a perpetual inventory control system or the Economic Order Quantity (EOQ) method. The EOQ method determines the inventory order quantity to minimize ordering and holding costs. However, this method has a weakness: all items need to be calculated EOQ one by one. This is difficult for a large company that has many items [4].

The effectiveness of the ABC-VEN method in improving drug management has been demonstrated in several studies. For instance, research by Rofiq, Oetari, and Widodo (2020) and Utomo, Darmawan, and Hartono (2023), showed that applying the ABC-VEN method enhanced the efficiency of BPJS drug management by reducing inventory costs and improving service levels. Similar findings were reported by Doso, Sunarni, and Herdwiani (2020) and Melizsa, Kasumawati, and Nuryamin (2021) who found that ABC-VEN analysis effectively prevented stockouts and maintained a stable drug supply in BPJS hospitals.

Considering the demonstrated benefits of ABC-VEN analysis, this study aims to prevent stock outs so that an effective inventory control method is needed at Dr. Moewardi Surakarta Regional Hospital. By doing so, this research seeks to provide insights into optimizing drug procurement processes and serve as a reference for other hospitals managing BPJS drug inventories, particularly to face the challenges such as delayed payments and fluctuating drug demands.

METHODS

Study design

This study is a descriptive-analytic research designed to analyze BPJS drug inventory management at Dr. Moewardi Surakarta Hospital using qualitative method by ABC-VEN.

Population and samples

Population of this includes all BPJS-covered drugs managed by the Pharmacy Installation of Dr. Moewardi Surakarta Hospital during the period of January to December 2023. The samples were selected using total sampling technique by involving all populations in the sample category. The included drugs are BPJS-covered drugs available in the Pharmacy Installation of Dr. Moewardi Hospital during the study period and drugs that are part of the hospital formulary in 2023, whereas drugs not covered by BPJS and drugs with incomplete or missing inventory records are excluded.

Data collection

Data collection was conducted from January to December 2023, focusing on 288 BPJS drugs at the Pharmacy Instalation of Dr. Moewardi Surakarta Hospital. Retrospective data were obtained from secondary data, namely pharmacy records and inventory systems providing information on procurement, stock levels, usage, and costs, and primary data in the form of interviews with the Head of the Pharmacy Department about qualitative insights of inventory management. Data accuracy was validated by triangulation, cross-verifying records with financial documents, and interview responses.

Data Analysis

The data analysis process involved several steps to ensure accurate classification and evaluation of druginventory management at Dr. Moewardi Surakarta Hospital. The steps were as follows:

1. Drug planning data were collected, including the name of the drug, the number of proposed drugs, and the purchase price per unit. The data comprised all drugs distributed to both BPJS and non-BPJS patients, covering both generic and patented drugs.
2. The required funds for each drug were calculated by multiplying the quantity of medication by its price as obtained from the supplier.

3. The calculated funds were sorted from the largest to the smallest. The total budget for all drugs was then summarized without adjusting for price differences between the year of purchase and the year of research.
4. The percentage of funds required for each drug was calculated, followed by the cumulative percentage for each drug.
5. ABC Grouping, drugs were grouped based on their investment value:
   a. Group A: Drugs contributing to 70% of the total drug investment (cumulative up to 70%).
   b. Group B: Drugs contributing to 20% of the total drug investment (cumulative 71–90%).
   c. Group C: Drugs contributing to 10% of the total drug investment (cumulative 91–100%).
6. VEN Classification, drugs were further classified based on their therapeutic importance using the VEN (Vital, Essential, Non-Essential) classification.
7. ABC-VEN Matrix Grouping, drugs were grouped according to the ABC-VEN analysis matrix:
   a. Priority (P): Medicines in the AV, BV, and CV categories.
   b. Primary (M): Medicines in the AE, BE, and CE categories.
   c. Complementary (S): Medicines in the AN, BN, and CN categories.
8. The inventory value was calculated by multiplying the quantity of drugs procured and remained at the end of the year based on their own prices. This provided an estimation of the initial and final inventory values, which were then used to determine the average inventory value over the year.
9. Inventory Turnover Ratio (ITOR) was calculated by dividing the Cost of Goods Sold (COGS) by the average inventory value. This ratio measures how frequently the inventory is replenished within a year, so that it provides many insights about the efficiency of the inventory management system.
10. The data were analyzed using Microsoft Excel software version 2021 to ensure accurate and efficient process of the results.

RESULTS AND DISCUSSION

ABC Analysis

The ABC analysis combination classifies drugs based on consumption value and cost into three categories: A (high consumption value and cost), B (medium consumption value and cost), and C (low consumption value and cost [12]. The ABC analysis categorizes 288 BPJS drug items based on their contribution to the total drug investment. The result at **Tabel I** reveals that 13% of the drugs (37 items) are categorized in Group A and it contributes to 81% of the total drug cost (Rp42,135,344,410). Group B comprises of 11% of the drugs (31 items) representing 10% of the cost (Rp5,442,240,252), while Group C comprises of 76% of the drugs (220 items), representing only 9% of the cost (Rp4,733,227,598). This distribution is in line with the Pareto principle, indicating that a small proportion of high-value (Group A) significantly impacts the overall budget so that it is needed a reliable inventory control. Similar findings were reported by Devnani et al,[12] who emphasized the importance being focus on Group A drugs to optimize the resource allocation in hospital pharmacies.

Table I. Classification of BPJS Drugs Using ABC Method Based on Usage Value in 2023

Group	Drug Items	Percentage(%)	Cost Value (IDR)	Percentage (IDR)
A	37	13	42,135,344,410	81
B	31	11	5,442,240,252	10
C	220	76	4,733,227,598	9
Total	288	100	52,310,812,260	100

Drugs classified as slow-moving typically fall into category C in the ABC analysis. Category C includes the largest number of drug items (76%) but only contributes 9% of the total cost value. These are often drugs that are rarely used or have slow turnover, resulting in a higher risk of expiration and requiring a more careful inventory management. In contrast, category A drugs in the ABC analysis are high-value items. Despite their small quantity (13% of total drug items), they contribute the largest portion of the total cost value (81%).

Due to the high cost of these drugs, the management of category A inventory is so important for hospital cost efficiency and control. These drugs are often vital or have high usage rates so that it is needed a reliable planning and inventory control. According to Susanto, Kristin, and Agastya (2017), several factors such as procurement practices, supplier reliability, and hospital size significantly influenced the total inventory costs for

A-class drugs. It apparently in line with our findings that A-class drugs result in a disproportionate cost of the total budget at Dr. Moewardi Surakarta Hospital. Meanwhile, Category B drugs require moderate inventory management as they are neither as crucial as category A drugs nor as low-value as category C drugs. The number of drugs in category B is average, contributing 10% of the total cost value. These drugs are categorized in the middle in terms of value and usage, so that the inventory management strategy for category B have to balance the cost efficiency and the availability.

Table II. List of Top 5 Drug Groupings for BPJS Using the ABC Method

Drugs	Usage Quantity (units)	Purchase Price (IDR)	Cost Value (IDR)	Pareto
Afatinib tab sal selaput 40 mg	22,187	282,800	6,274,482,934	A
Trastuzumab serb inj 440 mg/vial	621	6,050,000	3,757,050,000	A
NaCl 0,9%	482,383	6,941	3,348,220,403	A
Rituksimab Inf 10 mg/ml (vial 50 ml)	478	6,600,000	3,154,799,995	A
Sildenafil Tab 20 mg	65,386	36,000	2,353,896,000	A
Bleomisin serb inj 15 mg/ml	757	382,799	289,778,873	B
Oksaliplatin serb inj 50 mg/vial	1,160	225,000	261,000,000	B
Gemsitabin inj 200 mg/vial	2,895	89,600	259,392,000	B
Alektinib kaps 150 mg	1,904	122,832	233,872,128	B
Atorvastatin tab 20 mg	478,180	481	230,038,053	B
Topiramat tab 25 mg	34,381	2,950	101,423,950	C
Karvedilol tab 25 mg	62,440	1,600	99,904,000	C
Siklofosfamid inj 1,000 mg/vial (i.v)	477	205,350	97,951,950	C
Asam traneksamat tab 500 mg	63,944	1,440	92,072,326	C
Bendamustin powder inj 100 mg	107	850,000	90,950,000	C

Based on the ABC analysis in **Table II,** drugs in category A, included trastuzumab and rituximab, have high-cost values although they are few in number. These drugs are crucial in cancer therapy so that it is needed a reliable management to avoid significant losses. Meanwhile, drugs such as afatinib, NaCl solution, and sildenafil, despite their relatively lower costs, are widely used and must be carefully managed to avoid shortages or overstocking. Category B drugs include bleomycin, oxaliplatin, gemcitabine, alectinib, and atorvastatin have moderate cost values. Although their costs are lower than category A, these drugs still require moderate inventory management to avoid shortages and overstock, and to ensure availability and efficient use.

Meanwhile, category C includes topiramate, carvedilol, cyclophosphamide, tranexamic acid, and Bendamustine. These drugs have low-cost values although they are available in high quantity. Due to their low cost, category C drugs have to be managed as well to avoid overstock and expiration, and also to ensure the efficient inventory management in order to support the availability of necessary drugs. However, it is important to note that hospitals cannot comprehensively apply ABC analysis alone. Some category C drugs, despite having low usage costs, are essential and difficult to obtain. Thus, category C drugs must be concerned as well in procurement and planning priorities to prevent stockouts.[14]

VEN Classification

The VEN classification further categorized the drugs based on their therapeutic importance [15]. The VEN method categorizes drugs into three types: Vital (V), Essential (E), and Non-Essential (N). Vital drugs are crucial for managing patients in emergency or critical conditions, such as antibiotics for severe infections, or cardiovascular drugs for patients with acute heart disease. Essential drugs are effective in reducing morbidity and managing chronic conditions, such as antihypertensives or antidiabetics. Non-essential drugs, although they also have values, are less important in basic healthcare and can often be substituted with other medications. Vital drugs (V) in **Tabel III**, though only 29% of the total items (83 drugs), cover 52.47% of the total drug costs (Rp27,447,767,994). These drugs are essential and lifesaving, and they particularly in the form of injection used for severe conditions like cancer and cardiovascular diseases. Essential drugs (E) comprise 67% (192 drugs) of all items, with the cost of Rp24,611,467,582 (47.05%). Non-essential drugs (N) comprise only 5% (13 drugs) of all items and they only cost low in budget (0.48%) which shows their limited role in patient care. These results are

consistent with what Afni Kartika et al (2023) had been found. She found that vital drugs, while fewer in number, took a significant portion of the budget due to their crucial role in patient care.

Vital drugs are lifesaving drugs that are essential and irreplaceable. They are used for life-threatening conditions or they are critically important for patient health. Prabowo, Satibi, and Gunawan Pamudji (2016), identified several factors affecting drug availability in regional hospitals during the JKN era. They are Funding delays, procurement inefficiencies, and regulatory hurdles. These factors are in line with the challenges faced by Dr. Moewardi Surakarta Hospital, particularly in maintaining the availability of vital drugs (V). Among the 83 vital drugs, most are in the therapeutic classes of antineoplastics, immunomodulators, and cardiovascular drugs. All these drugs are in the form of injection, which are crucial in treating severe diseases and critical conditions.

Table III. Classification of BPJS Drugs Using VEN Classification Based on Usage Value in 2023

Group	Drug Items	Percentage (%)	Cost Value (IDR)	Percentage (IDR)
V	83	29	27,447,767,994	52.47
E	192	67	24,611,467,582	47.05
N	13	5	251,576,684	0.48
Total	288	100	52,310,812,260	100

Antineoplastics and immunomodulators are primarily used in cancer treatment and autoimmune diseases while Cardiovascular drugs are used to manage various heart and blood vessel conditions that require quick and precise care. Drugs in the form of injection ensure that they work faster and more efficient in the body, providing a quicker response than other forms such as tablets or capsules. Additionally, the use of injection ensures more accurate dosage and can be adjusted according to the patient needs. The presence of these injectable drugs in hospitals supports the effectiveness of healthcare services, especially in emergency situations. Kartika in her research (2023) showed that essential drugs were in the first place for their amount (69.50%) while the next place were for vital drugs and non essential drugs [16].

ABC-VEN Combination Analysis

The combination of the VEN (Vital, Essential, and Non-Essential) and ABC (consumption value and cost) methods was used to classify and evaluate drugs at Dr. Moewardi Surakarta Hospital, aiming to adjust the budget with the efficiency of drug usage. The analysis in **Table IV** shows that the AV (A Vital) category comprises of 8% of drug items, but it contributes 44.69% of the total cost value which indicates that vital drugs in category A require significant concern for stocking and distribution. Drugs in this category include those for critical conditions such as chemotherapy drugs for cancer or antiviral drugs for HIV/AIDS. The BV (B Vital) category comprises 6% of drug items with 5.92% of the total cost value, while the CV (C Vital) category comprises 15% of drug items with 1.87% of the total cost value. Although these vital drugs are used regularly, they are not used in high volumes per use, such as drugs for common infectious diseases like tuberculosis or malaria.

Table IV. BPJS Drug Analysis Based on ABC-VEN Combination

ABC-VEN Combination	Number of Drug Items	Percentage (%)	Cost Value (IDR)	Percentage (%)	Group
AV	24	8	23,376,123,600	44.69	
BV	16	6	3,095,535,511	5.92	Priority
CV	43	15	976,108,883	1.87	
AE	13	5	18,759,220,809	35.86	
BE	15	5	2,346,704,741	4.49	Primary
CE	164	57	3,505,542,031	6.70	
CN	13	5	251,576,684	0.48	Complementary
Total	288	100	52,310,812,260	100	

Essential drugs, the AE (A Essential) category, comprise of 5% of drug items with 35.86% of the total cost value. This indicates that the importance of efficient stock management for these drugs. Some examples of drugs in this category are insulin for diabetes and antihypertensives for hypertension. The BE (B Essential) category

comprises of 5% of drug items with 4.49% of the total cost value, while the CE (C Essential) category comprises of 57% of drug items with 6.70% of the total cost value. Most of the essential drugs are used regularly but they are not given in high volumes, such as multivitamins or drugs for mild conditions.

[18] demonstrated the effectiveness of the ABC-VEN combination method in optimizing drug inventory control, particularly in balancing the cost efficiency with the essential drug availability. Their findings strengthen this research which indicates Priority (P) drugs as the focus of inventory management. The final aim of this is to ensure the sustainability of Dr. Moewardi Surakarta Hospital.

Non-essential drugs in the CN (C Non-Essential) category comprises of 5% of drug items with 0.48% of the total cost value and this indicates that the quantity is larger than its cost value. These drugs often include supplements or drugs used for non-life-threatening conditions.

Based on the analysis, procurement and inventory management priorities can be divided into three groups: Priority, Main, and Additional. Drugs in the Priority group include categories AV, BV, and CV, which require high attention due to their critical use and need for adequate stock. Drugs in the Main group include categories AE, BE, and CE, which are important for efficient stock management and support long-term treatment for chronic conditions. The Additional group includes non-essential drugs in the CN category, which do not require high priority in stock management.

By combining VEN and ABC analysis, hospitals can not only optimize their drug procurement budget but also ensure the availability of essential drugs for patient care. This approach allows for more efficient stock management and responsiveness to urgent clinical needs and reduces the risk of shortages of essential drugs.[16] The Hospital General Royal Prima Marelan Hospital also did a similar thing, which showed that the stock of class A drugs could absorb around 70% of funds with the ABC method. In contrast, the VEN method showed that essential drugs could absorb 69.50% of funds. The basis for classifying drugs into VEN is determined by macro factors (including government regulations and regional epidemiological data) and micro factors (in the form of types of health services available at the hospital where the study was conducted).

Based on information from the hospital, Trastuzumab 440 mg has an EOQ of 6 units, which is the optimal order quantity based on usage of 621 units and remaining stock of 63 units. The required lead time is 30 days, with SS of 51 units and ROP of 102 units. This shows that the order is made when the stock reaches 102 units, in order to avoid emptiness during the procurement period. Based on an interview with the head of the pharmaceutical installation, the lead time is estimated to be 30 days. Average usage data is the amount of use of each type of drug per day for a year. Safety stock is the amount of safety stock for each type of drug. In this study, the calculation of the EOQ and ROP methods cannot be done automatically, but it certainly shows whether its application can increase efficiency in controlling drug inventory. The average reported lead time was about one month based on interviews with the Head of the Pharmaceutical Installation, this instability makes it difficult to accurately assess the impact of implementing the EOQ and ROP methods in the context of this study.

Inventory Value and Inventory Turnover Ratio (ITOR)

To calculate the inventory value, the required data include the number of drug procurements and the remaining st at the end of the year. The initial inventory value is calculated by multiplying the quantity of procurement with the purchase price, while the final inventory value is obtained by multiplying the remaining stock with the price. The following Table V shows the initial and final inventory values for 288 drug items at the Pharmacy Installation of Dr. Moewardi Surakarta Hospital**.**

Table V. Inventory Value Results

Initial Inventory Value (IDR)	Final Inventory Value (IDR)	Average Inventory Value (IDR)
58,081,964,374	6,947,818,985	32,514,891,679

Inventory Turnover Ratio (ITOR) is a measure that compares the Cost of Goods Sold (COGS) within a year to the average inventory value in the same period. ITOR also indicates how frequent the inventory is used or sold during a certain period. The higher inventory turnover ratio indicates the more efficient drug management. The ITOR value at the Pharmacy Installation of Dr. Moewardi Surakarta Hospital is shown in the **Table VI** below.

Based on the ITOR analysis, the average ratio of inventory turnover at the Pharmacy Installation of Dr. Moewardi Surakarta Hospital in 2023 is 7.53 times per year, which is considered low. This could be due to the

presence of dead stock, which also affects inventory value. According to Hartih,[19] ITOR is the key of sustainable efficiency of inventory control.

Table VI. Inventory Turnover Ratio (ITOR) Value

Total COGS (IDR)	Final Inventory Value (IDR)	ITOR
52,310,812,260	6,947,818,985	7.53

The ideal ITOR in hospital pharmacies is usually between 8-12 times per year, while in community pharmacies, it ranges from 6-8 times per year. The accumulation of inventory at the end of the year could be due to unsold drugs. However, a large inventory is not always resulted from dead stock or unsold drugs; it may also be influenced by purchasing strategies that consider the bonus obtained from the quantity of drug purchases. The inventory turnover ratio of 7.53 times per year is based on the data from the Pharmacy Installation of Dr. Moewardi Surakarta Hospital. This ITOR value measures how frequent the drug inventory is sold or used within a year. In other words, the hospital's drug inventory is refreshed approximately every 1.5 months.

Listyorini[20] emphasized the importance of integrating ABC analysis with EOQ and ROP methods to enhance the efficiency of generic drug inventory management in hospital pharmacies. Although this study primarily focused on BPJS drugs, the principles of inventory control, as highlighted by Listyorini, are applicable and could be considered for improving ITOR at Dr. Moewardi Surakarta Hospital.

CONCLUSION

Based on the analysis of BPJS drug inventory management at Pharmacy Instalation of Dr. Moewardi Surakarta Hospital, high-value drugs (Group A) significantly contribute to revenue of the hospital. The VEN classification shows that vital drugs can increase hospital revenue. The combination of ABC-VEN analysis emphasizes the importance drugs such as AV as a priority for stock management efficiency. The findings also show that the ABC-VEN method can improve inventory control, reduce stockouts, and align drug procurement with finance. Furthermore, The ITOR shows that there is still a room for a discussion about improving inventory management efficiency.

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STATEMENT OF ETHICS

This study was approved by the Health Research Ethics Committee of Dr. Moewardi General Surakarta Hospital with approval number: 557/II/HREC/2024 on February 27, 2024.

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