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RESEARCH ARTICLE

# ABC-VEN analysis of drug use in outpatients at a neurology department in Indonesia

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## Abstract

**Background:** Drug inventory in hospitals must be maintained appropriately and effectively to promote affordability and sustainable drug availability. **Objective:** To analyse the drug use profile in the neurology department with ABC-VEN. **Method:** A retrospective observational study was conducted with prescription samples of outpatient drugs in the Neurology Department at Airlangga University Hospital, Indonesia, from January to March 2020. An analysis of ABC-VEN was performed. **Results:** From 1,993 prescription samples, the total types of drugs used were 131. The ABC analysis based on the drug use value and investment value found that 16 vs. 6, 16 vs. 10, and 99 vs. 115 types of drugs belonged to the A, B, and C categories, respectively. VEN analysis showed that Group V had 16 types of drugs, Group E had 69 types of drugs, and Group N had 46 types of drugs. ABC-VEN analysis showed that Category I contained 18 types of drugs, Category II contained 68 types of drugs, and Category III contained 45 types of drugs. **Conclusion:** There was a discrepancy between the results of the ABC analysis based on the value of drug use, investment value, and the VEN. Using the ABC-VEN analysis helps improve pharmacy management.

## Introduction

About 35% of the hospital's annual budget purchases supplies and equipment, including medicines. For this reason, effective and efficient drug management is needed (Khurana, Chhilla, & Gautam, 2013). Managing pharmaceutical preparations, procurement, storage, and distribution is vital for health facilities. Health facilities plan the supply of drugs based on needs, where the availability of drugs is essential to ensuring that patients use them appropriately. In addition, medicine acts as a liaison between patients and health services to encourage public trust in these services (Rahem *et al.*, 2021).

Costs are associated with managing medical logistics (Kumar & Chakravarty, 2015). Sometimes, medical

facilities lack the funding to purchase all the necessary medications (Deressa *et al.*, 2022). The ABC (Always Better Control) analysis method is useful in the management of drug purchases. It has been a method for understanding drug use in many countries for a long time. ABC analysis groups drugs into categories based on their relative importance according to the Pareto principle (Nguyen *et al.*, 2022).

The VEN analysis is a method used for prioritising drug purchases and managing inventory. Medicines are divided into life-saving medicines, essential medicines, and non-essential medicines. Life-saving drugs (V) are drugs that have the potential to save lives and must be readily available. Essential medicine (E) is effective for less severe diseases. Non-essential medicines (N) are

used for minor illnesses or diseases that are cured independently (Deressa *et al.*, 2022). Applying ABC-VEN helps to increase the efficiency of the drug inventory management system by optimising the use of limited resources. This provides significant benefits, resulting in significant savings in the hospital's overall budget (Mori *et al.*, 2021).

Analysing ABC or VEN is sometimes not enough. ABC analysis is mainly based on investment amount and value only. However, VEN analysis has a weakness; non-essential drugs are considered drugs of choice even though they are expensive. The ABC-VEN matrix overcomes this limitation by classifying drugs into the categories of I, II, and III. Category I includes all essential and expensive goods (AV, BV, CV, AE, and AN). Category II includes the remaining goods from groups E and B (BE, CE, BN), and Category III includes less critical (preferred) and less expensive (CN) commodity groups. Category I drugs must be monitored and controlled continuously; Category II requires periodic inspections; and Category III does not (Deressa *et al.*, 2022).

ABC-VEN joint analysis will likely produce a valuable and accurate medication use profile, for example, when organising medicine purchases for the upcoming year. This study aimed to provide information on drug use and examine the costs and patterns of drug use in outpatient neurological treatment.

## Methods

### Design

This research is an analytic descriptive observational study using retrospective data. The study was conducted at the Outpatient Pharmacy Installation at the Airlangga University Hospital with a sample of all prescription sheets (e-prescriptions) of JKN Neurology Department patients who visited in from January to March 2020. There were no exclusion criteria. This research methodology passed a review from the Ethics Committee of the Airlangga University Hospital in Surabaya and was declared ethically feasible based on the Certificate of Ethics Review Number 002/KEP/2022.

### Assessment

Data was collected from prescription sheets verified by a pharmacist, including the type of drug prescribed, the

amount of the drug, and the prices. Data analysis included ABC analysis based on a value in use and investment value (group A at 70% cumulative value, group B at 20% cumulative value, and group C at 10% cumulative value), and VEN analysis (the determination of VEN criteria for each type of drug was discussed with justification by a group consisting of neurologists, pharmacists, and the faculty of pharmacy. These criteria were prepared by considering the various aspects, such as the clinical aspects, consumption, target conditions, and costs. Group V was for medicines that must be available for human life-saving, Group E for essential medicines that work on the source of the cause of the disease, and Group N for supporting medicines so that action or treatment is better for dealing with minor complaints), and the VEN-ABC combination (proceed with cross-tabulation of ABC analysis of investment value and VEN analysis to obtain nine groups of ABC-VEN matrix consisting of category I (AV, AE, AD, BV, CV), which is the priority category, category II (BE, CE, BD), which is the main category, and category III (CD), which is the additional category.

## Results

### ABC analysis

#### ABC value usage and investment

In Table I, the ABC analysis, based on the value of drug use, showed that among the total types of drugs in group A, 16 (12.21%) were used for three months, with a total use of 120,186 pcs (69.55%). Group B contained 16 types of drugs (12.21%) were used, with a total use of 35,190 pieces (20.36%). In group C, 99 types of drugs (75.57%) were used, with a total usage of 17,433 pieces (10.09%).

ABC analysis, based on investment value, showed that in group A, six types of drugs (4.58%) among the 16 types of drugs used for three months accounted for an investment value of 69.56% of the total drug investment. In group B, ten different drug types (7.63%) accounted for an investment value of 19.87% of the total amount spent on drugs within the three months. At the same time, Group C had 115 distinct drug types (87.79% of all drug types), accounting for 10.58% of all drug investments. The total investment for outpatients at the neurology department was Rp. 236,617,630.75.

**Table I: ABC analysis results based on drug use and investment value in the period from January to March 2020**

Group	Usage Value				Investment Value		
	Drug		Usage Amount		Drug		Investment Cost (%)
	Type	%	Amount of Drug (Pcs)	%	Type	%	
A	16	12.21	120,186	69.55	6	4.58	69.56
B	16	12.21	35,190	20.36	10	7.63	19.87
C	99	75.57	17,433	10.09	115	87.79	10.58
<b>Total</b>	<b>131</b>	<b>100.00</b>	<b>172,809</b>	<b>100.00</b>	<b>131</b>	<b>100.00</b>	<b>100.00</b>

**VEN analysis**

Table II shows the results of the VEN analysis. In the vital group, 16 types of drugs (12.21%) were used for three months by the Neurology Department, costing 63.74% of the total cost of using drugs. In the essential

group, there were 69 types of drugs (52.67%) of the total types of drugs, with a cost of 31.11% of the total cost of using drugs. Meanwhile, the non-essential group consisted of 46 drug items (35.11%) of the total drug types, with a cost of 5.15% of the total cost of drug use.

**Table II: VEN analysis results for the January-March 2020 period**

Group	Drug Type	%	Amount of Drug (pcs)	%	Amount of costs (%)
V	16	12.21	50,757	29.37	63.74
E	69	52.67	91,543	52.97	31.11
N	46	35.11	30,509	17.65	5.15
<b>Total</b>	<b>131</b>	<b>100.00</b>	<b>172,809</b>	<b>100.00</b>	<b>100.00</b>

**ABC and VEN combination analysis**

Table III shows that in Category I, 18 types of drugs (13.74%) among the total types used for three months for Neurology were used, with a value of drug use costs

of 80.35%. In Category II, 68 types of drugs (51.91%) with a cost of 16.76% were used. In Category III, 45 types of drugs (34.35%) of the total types of drugs, with a cost of 2.89% were used.

**Table III: Distribution of drugs according to categories I, II, and III**

Group	Drug Type (n)	%	Amount of Drug (pcs)	%	Amount of costs (%)
I	18 (AV, BV, CV, AE)	13.74	68,994	39.93	80.35
II	68 (BE, CE, BN)	51.91	80,901	46.82	16.76
III	45 (CN)	34.35	22,914	13.26	2.89
<b>Total</b>	<b>131</b>	<b>100.00</b>	<b>172,809</b>	<b>100.00</b>	<b>100.00</b>

## Discussion

Based on the results of the drug data processing, 131 types of drugs were prescribed at the Neurology Department from January to March 2020. The results of drug grouping, based on the ABC analysis of drug use values, showed that group A, i.e. drugs with the highest usage value, consisted of the antihypertensive drug group, antiplatelet aggregation, and antiparkinsonian. Group B- were drugs with moderate usage value, which included antihypertensive, antiparkinsonian, and antianemia. Group C were drugs with low use value, including non-narcotic analgesic drugs, antiplatelet aggregation, and anti-ulcers. Drugs that belonged to group A need to be supervised to prevent drug shortages due to their very high usage. However, drugs included in groups B and C also cannot be ignored because these drugs are still needed in patients to support the patient's therapeutic needs.

Group A, with the highest investment value in this study, included antiparkinsonian drugs, antihypertensive drugs, drugs for myasthenia gravis, and antiepileptics. The high investment value of the drugs in group A is caused by using such vital drugs with long duration of treatment, and they are also expensive drugs. Group B, with moderate investment value in this study, included antiparkinsonian, antihypertensive, neuropathic pain, vitamins, and antiepileptic drugs. Group C contained drugs with low investment value and included antiplatelet aggregation drugs, antihypertensive, antianemia, and mucolytic drugs.

ABC analysis based on usage value and investment value shows a different pattern. Group A on usage value had 16 types of drugs, while Group A on investment value had six types of drugs. In Group B, each contained 16 types of drugs based on use value and ten types of drugs based on investment value. Group C contained 99 types of drugs based on use value and 115 types of drugs based on investment value. Five types of drugs were shifted from Group A usage value to investment value Group B, eight from Group A usage value to investment value Group C, and three from Group B usage value to Group A usage value.

Other research findings about the prevalence of the ABC group's drug usage revealed a different picture. Categories A, B, and C in cardiology polyclinics at teaching hospitals in Indonesia are 7.45%, 9.58%, and 82.97% (Suprapti *et al.*, 2022). This difference must be considered in planning drug supply to maintain drug availability for the continuity of pharmaceutical services, so analysis is needed in every drug procurement plan (Suprapti *et al.*, 2022).

VEN analysis is used to classify drugs by considering the criticality level of the drug. VEN analysis was performed

on all 131 types of drugs administered at the hospital under study. Group V drugs are known to have high functional importance, such as life-saving, whose unavailability can't be tolerated (Al-Najjar *et al.*, 2020). The types of drugs included in the "Vital Drugs" group belong to the classes of antiplatelet aggregation therapy, antiparkinsonian, antiepileptic, and drugs for myasthenia gravis. Group E drugs are those used for diseases with lower severity but are still used for severe and less threatening cases too. The unavailability of this category is tolerated for two to three days because alternative drugs are used (Al-Najjar *et al.*, 2020).

Drugs included in the essential group include antihypertensive drugs (e.g., nifedipine 30 mg slow release, amlodipine besylate 5 mg, amlodipine 10 mg, candesartan 8 mg and 16 mg), neuropathic pain (e.g., gabapentin 100 mg and 300 mg), non-narcotic analgesics (e.g., paracetamol 500 mg, mefenamic acid 500 mg, diclofenac sodium 25 mg and 50 mg), and antihyperlipidemic (e.g., simvastatin 20 mg, fenofibrate 100 mg and 300 mg). Group N drugs have the lowest importance and are used to treat minor ailments. Drugs included in this group include the vitamins (mecobalamin, folic acid, and vitamin B6) and antipyretics (allopurinol 100 mg). The ABC-VEN analysis helps to identify drug groups that require close monitoring and control because cost and essentiality are considered. Therefore, the ABC-VEN matrix is a more suitable and efficient method of controlling pharmacy drug inventory (Pirankar *et al.*, 2014). In analysing the combination of ABC and VEN, the resulting matrix helped to focus on 18 types of drugs that fell into category I (AV, BV, CV, and AE) for tight management control. Sixty-eight types of drugs are included in category II (AE, BE, and CE), with a cost value of 16.76% of the total drug cost. These drugs are purchased once or twice a year, thereby saving ordering costs with moderate storage costs and reducing management hassles with moderate transportation costs and without capital hindrance (Anand *et al.*, 2013; Devnani *et al.*, 2010).

In category II, some drugs were included in the CE group, such as drugs with the most therapeutic class used in Neurology Polyclinics, so attention is needed in the storage and procurement of drugs to maintain stock availability in hospitals. An example of this type of drug is amlodipine besylate (5 mg and 10 mg). In total, 45 types of drugs were included in the additional category (CN), with a drug cost value of 2.89% of the total drug costs in this study. Drugs in this category are ordered once or twice a year to save on ordering costs with moderate storage costs and without hindering significant capital (Anand *et al.*, 2013). The types of drugs included in the additional category with the

highest number of uses, were vitamin B complex, folic acid 400 mcg, and vitamins.

Research on drug use based on yearly usage and drug expenses in private hospitals in Istanbul in 2016 showed that 46 drugs in Category A accounted for 70.08% of the expenditure, 92 drugs in Category B (19.88%), and 772 drugs in Category C (10.04%) (Yilmaz, 2018). Based on the VEN analysis, it was revealed that 265 drugs were in Category V, 467 drugs in Category E, and 178 drugs in Category N. Based on the ABC-VEN matrix, 298 drugs were in Category I, 446 drugs were in Category II, and 163 drugs in Category III (Yilmaz, 2018). Therefore, their analysis contributed to the management, especially in determining safe drug inventory levels, an essential part of total expenditure (Yilmaz, 2018).

St. Paul's Hospital Millennium Medical College in Addis-Ababa, Ethiopia, received the results of a drug use profile based on ABC-VEN analysis, which found that 34–39% of the elements fall into category I (AV, AE, AN, CV, BV). This accounted for more than 84–86% of annual hospital spending (Legese *et al.*, 2022). About 56–60% of individuals belonged to category II (BE, CE, BN), which accounted for about 13–15% of their annual expenditures during the academic year. Category III (CN) items accounted for 4%–7% of all pharmaceutical products and less than 1% of spending (Legese *et al.*, 2022).

The hospital's medicines and therapeutics committee must update its VEN list of medical supplies and strictly enforce its procurement to comply with the agreed-upon list of medicines. In addition, hospitals must set priorities and determine the volume and frequency of medical supply orders based on routine ABC-VEN results (Legese *et al.*, 2022).

An ABC analysis of drug expenditures at Alzytona Hospital in Sudan revealed that the hospital did not use any inventory methods (Ahmed *et al.*, 2019). The ABC method was not used in the drug inventory. This could be because pharmacists at the Alzytona private hospital lacked knowledge about ABC and VEN applications and

poor inventory control management, resulting in ineffective inventory control, a lack of other necessary medicines, problems making purchasing decisions, and optimising costs. Other possible outcomes included death, disability, and the inability to compensate for and avoid damage, all of which could harm the hospital's image (Ahmed *et al.*, 2019).

The recommendation from the results of this research is that ABC-VEN analysis should be carried out periodically before purchasing drugs to use limited financial budget resources efficiently (Mohammed & Workneh, 2020). More research is needed to examine the profile of drug use in the neurology department, which includes drug use in the outpatient ward, inpatient ward, and intensive care ward, to obtain a very comprehensive profile of drug use patterns in hospitals to support optimal and efficient drug management processes.

## Conclusion

There was a discrepancy between the results of the ABC analysis based on the value of drug use, investment value, and VEN. Using the ABC-VEN analysis showed how to improve pharmacy management, especially in the hospital's planning and procurement of drugs.

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## Conflict of Interest

The authors state no conflicts of interest in this study and the article.

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