

INVENTORY CLASSIFICATION OF MEDICINES BY USING ABC AND VED ANALYSIS

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Under the Supervision and Guidance of

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To Whom So Ever It May Concern

This is to certify that Ms. Neha Devi, D/o Mr. Sanjeev Kumar has successfully completed observership program, with effect from March 05, 2026 – June 04, 2026.

During this period, she was posted in Materials Department.

We wish her every success in life.

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CERTIFICATE

This is to certify that dissertation titled “**Inventory classification of medicines by using ABC and VED Analysis**” is a record of the research work undertaken by **Neha devi** in partial fulfilment of the requirements for the award of the degree of MBA (Healthcare Analytics) from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

A handwritten signature in blue ink, appearing to read 'Kumar', written over a horizontal line.

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled **Inventory Classification of medicines by using ABC and VED Analysis.** is the Bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Neha Shukla
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Date: *23-06-2026*

Abstract

Title: Inventory Classification of medicines by using ABC and VED

Analysis.

Author Name: Neha Devi

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Keywords: Inventory, Procurement, Always Better Control, Vital Essentials Desire.

Background: Inventory classification combines ABC Analysis, which ranks items by their financial value and consumption cost, with VED Analysis, which categorizes items by how critically a stockout would disrupt daily operations.

Objective: In a hospital setting, the stakes of inventory management shift from cutting corporate costs to saving human lives.

Methodology: A highly structured retrospective and advanced study is to be done by using ABC and VED analysis techniques.

Results/Findings: When you combine ABC and VED analysis in healthcare, When you combine ABC and VED analysis in healthcare, the goal is to ensure that a doctor never reaches for a life-saving drug or tool only to find the shelf empty, while simultaneously keeping the hospital from wasting its limited budget on the wrong supplies.

Conclusions: This study provides a structured analysis of hospital pharmaceutical inventory by evaluating both total expenditures and clinical criticality. The resulting data gives management a clear framework for assigning oversight duties and applying targeted inventory control techniques.

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Abbreviations

ABC-Always Better Control

VED-Vital, Essential and Desirable

M.R.P-Maximum Retail Price

IPD-In Patient Department

OPD-Out Patient Department

CAP-Capsule

TAB-Tablet

WHO-World Health organization

PO-Purchase order

Chapter 1: Introduction and Background

1.1 Overview

Inventory management is a critical function in hospitals and healthcare organizations because it ensures the continuous availability of medicines, medical supplies, and equipment while controlling costs. Since hospitals maintain many items with varying costs and levels of importance, effective inventory classification techniques are required.

Among the most widely used methods are **ABC** (Always Better Control) Analysis and **VED** (Vital, Essential, Desirable) Analysis. These techniques help healthcare organizations prioritize inventory items based on their annual consumption value and criticality to patient care.

1. ABC Analysis – Classification Based on Consumption Value - **ABC** Analysis is an inventory control technique that categorizes items according to their annual consumption value. It is based on the Pareto Principle (80/20 rule), which states that a small number of items account for a large portion of the total inventory value.

Category A Items: These items constitute approximately 10–20% of the total inventory but account for around 70–80% of the total inventory value. They require strict monitoring and control because of their high cost.

Category B Items: These represent about 20–30% of inventory items and account for 15–25% of the total inventory value. Moderate control measures are required for these items.

Category C Items: These make up 50–70% of inventory items but account for only 5–10% of the inventory value. They require relatively simple control procedures.

2. VED Analysis – Classification Based on Criticality-

Vital (V): Items whose absence can seriously affect patient treatment or hospital functioning. Examples include emergency medicines, oxygen supplies, and life-saving drugs.

Essential (E): Items that are important for regular healthcare services, but whose temporary shortage can be managed for a short period.

Desirable (D): Items whose absence does not immediately affect patient care and can be procured later without major consequences.

3. Combined ABC–VED Analysis – Effective Inventory Control ABC and VED analyses are often combined to create a more comprehensive inventory management system. The combined matrix helps identify items that are both costly and critical, enabling managers to allocate resources more efficiently.

Category I: Includes AV, AE, and BV items (high-cost and/or highly critical items).

These require strict control, frequent monitoring, and priority purchasing.

Category II: Includes BE, CE, BD, and CV items. These require moderate control and periodic review.

Category III: Includes CD items, which are low-cost and less critical. These require minimal management attention.

Tackling the items based on their consumption value and criticality improves the service to the customer as well as controlling the inventor

We can design the stock levels in such a manner that

- Maximum service is provided for Class I category.
- While for Class III category services can be minimum desirable.
- For Class II items service levels can be in between these two levels and average stock holding can be done accordingly.

3. FSN Analysis (Fast-Moving, Slow-Moving, and Non-Moving Analysis)

An inventory classification method called FSN Analysis groups products according to how quickly they are consumed or moved during a given time frame. FSN analysis concentrates on how inventory goods are used, as opposed to ABC analysis, which is more concerned with monetary worth.

1. Fast-Moving (F) Items

Fast-moving items are those that are consumed or issued frequently and have a high turnover rate.

Examples:

- a. Surgical gloves
- b. Syringes
- c. Paracetamol tablets
- d. Saline bottles

Importance:

- Require regular replenishment to avoid stock-outs.
- Need close monitoring because they are used daily in patient care.
- Ensure uninterrupted healthcare services and smooth hospital operations.

2. Slow-Moving (S) Items

Slow-moving items are consumed occasionally and have a moderate turnover rate.

Examples:

- a. Specialized antibiotics
- b. Certain diagnostic reagents
- c. Rarely prescribed medicines

Importance:

- Require periodic review of stock levels.
- Excessive stocking may lead to increased holding costs.
- Proper monitoring helps maintain an optimal inventory level.

3. Non-Moving (N) Items

Non-moving items are those that have not been issued or consumed for a long period.

Examples:

- a. Expired medicines
- b. Obsolete medical equipment parts
- c. Rarely used drugs

Importance:

- Occupy valuable storage space.
- Increase carrying and maintenance costs.

1.2 Research Question

Is the current inventory management system of the hospital sufficient to meet the demand?

1.2 Research Objectives

To classify medicines in the hospital medical store using ABC and VED analysis to improve inventory control, optimize resource utilization, and ensure the continuous availability of essential medicines.

To categorize medicines according to their annual consumption value using ABC analysis.

- To classify medicines based on their criticality using VED analysis.
- To develop an ABC–VED matrix for inventory prioritization.
- To evaluate the effectiveness of ABC and VED analysis as inventory control techniques in hospital pharmacy management.
- To suggest measures for improving inventory control and optimizing medicine availability in the hospital.

1.3 Hypothesis and Theoretical Grounding

A hypothesis is a tentative statement that can be tested through research. For the study
Inventory Classification of Medicines Using ABC and VED Analysis.

- **Null Hypothesis**

There is no significant relationship between inventory classification using ABC and VED analysis and the effectiveness of medicine inventory management in the hospital medical store.

- **Alternative Hypothesis**

Inventory classification using ABC and VED analysis significantly improves the effectiveness of medicine inventory management by optimizing inventory control, reducing costs, and ensuring the availability of essential medicines.

2. Theoretical Grounding

The theoretical foundation of this study is based on inventory management principles, the Pareto Principle, and criticality-based inventory control methods used in healthcare organizations.

A. Inventory Management Theory

Inventory Management Theory emphasizes maintaining the right quantity of inventory at the right time and place while minimizing costs. In hospitals, effective inventory management is essential because medicines directly affect patient care and safety.

Relevance to the Study:

- a. Helps prevent medicine shortages and overstocking.
- b. Reduces inventory carrying costs.
- c. Improves utilization of hospital resources.

B. Pareto Principle (80/20 Rule) – Basis of ABC Analysis

ABC Analysis is based on the Pareto Principle developed by Vilfredo Pareto.

Around **10–20%** of medicines

Category A account for nearly **70–80%** of total inventory

Category B medicines account for moderate expenditure.

Category C medicines account for a small percentage of expenditure.

C. ABC–VED Matrix Theory

The ABC–VED Matrix combines cost-based classification (ABC) and criticality-based classification (VED) to create a comprehensive inventory control system.

The matrix groups medicines into:

Category I: High-priority medicines requiring strict control.

Category II: Medium-priority medicines requiring moderate control.

Category III: Low-priority medicines requiring routine control.

Relevance to the Study -

- Facilitates effective inventory prioritization.
- Balances financial considerations with clinical importance.
- Improves decision-making in hospital pharmacy management.

Chapter 2: Review of Literature

Table 2.1 Literature Review on inventory classification by using

Authors	Year	Study Location	Sample Size	Sampling Techniques	Salient Features
Gupta et al.	2007	Tertiary Care Hospital, India	421 drug items	Retrospective inventory analysis	Applied ABC and VED analysis for pharma industry. Strict control over AV category medicines to reduce costs.

Authors	Year	Study Location	Sample Size	Sampling Techniques	Salient Features
Devnani et al.	2010	Rural teaching Hospital	346 medicine items	Retrospective	Demonstrated the usefulness of combining ABC and VED analysis for prioritizing inventory control.

Pund	2013	Govt. Medical Hospital, India	498 Pharmaceutical items.	Cross sectional inventory analysis	Evaluated Drug consumption by using ABC and VED analysis
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Authors	Year	Study Location	Sample Size	Sampling Techniques	Salient Features
Singh et al.	2016	Public sector Hospital, India	612 Drug formulations	Descriptive Analytical study	Demonstrated that ABC and VED is an effective tool for inventory control

Authors	Year	Study Location	Sample Size	Sampling Techniques	Salient Features
Mishra et al.	2018	Multispecialty Hospital, India	740 medicine	Retrospective study	Recommended integrated inventory control systems to improve medicine availability and reduce waste
Sharma et al.	2022	Tertiary care	685 Pharmaceutical Products	Retrospective	ABC and VED remains a reliable inventory , empathizes

		Hospital, India			the periodic review of AV and AE category medicines
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Authors	Year	Study Location	Sample Size	Sampling Techniques	Salient Features
Kumar et Al	2020	Secondary Care Hospital	580 medicine items	Cross sectional study	Enhanced decisions have been made in procurement and stock management

Chapter 3: Methodology

3.1 Study Design The study will be conducted using descriptive and analytical cross-sectional study design. The research will involve collection and analysis of inventory-related data from the hospital supply chain or medical store department. ABC and VED analyses will be applied to inventory records for evaluating inventory control efficiency

3.2 Setting The study will be conducted in the Supply Chain Management / Medical Store Department of a tertiary care hospital. The selected hospital maintains a large inventory of medicines, surgical consumables, emergency supplies, and medical equipment required for patient care and hospital operations.

3.3 Study Population, Inclusion, and Exclusion Criteria To maintain data integrity, the study population may include – medicines, surgical consumables, medical supplies and emergency drugs.

* **Inclusion Criteria:** Inventory items available in the hospital during the study period. Staff involved in inventory management processes.

* **Exclusion Criteria:** Incomplete inventory records. Expired or obsolete items are not currently in use.

Study tools: How long will the following tools be used during the study:

1. Hospital inventory registers
2. Stock issue and consumption records
3. Procurement records

3.4 Sample Size and Sampling Technique The sample size will consist of selected inventory items available in the hospital during the study period.

For example: Approximately 200–500 inventory items may be included depending on hospital size and data availability. For Sampling techniques inventory items will be selected on the basis of –

- Availability of records
- Frequency of use
- Relevance in hospital operations
-

3.4 Data Processing Flow The workflow for data extraction, ingestion, and interpretation is structured sequentially:

1. **Data Collection:** Data is Collected from the Hospital Pharmacy of year 2015-2016. Information such as item name, quantity, unit costs and stock availability obtained from stock registers.
2. **Compilation and Organization of data:** Data is collected and arranged listed along with its annual consumption quantity and unit pricing
3. **Calculation of Annual data:** Annual consumption value of each item is calculated as-
$$\text{Annual Consumption} = \text{Annual consumption Quantity} * \text{Unit cost}$$

- **ABC Analysis of Inventory Items:** Based on annual consumption value, medicines are ranked and are classified into 3 categories –

A Category - Contributing 70-80 % of total inventory.

B Category- Contributing 15- 20% of total inventory.

C Category – Contributing 5- 10 % of total inventory.

- **VED Analysis of Inventory Items:** Each medicine was categorized according to its criticality –

VITAL -Life saving medicines fall into this category

ESSENTIAL-Important medicines required for routine treatment can be managed temporarily.

DESIRABLE - Medicine with lower criticality and whose temporary non availability

3.8 Preparation of ABC- VED Matrix – Combination of ABC AND VED create an ABC-VED matrix. Inventory can be grouped into categories such as AV, AE, AD, BV, BD, CV, CE and CD.

Chapter 4: Results and Discussions

Study Area – Apollo Hospital, Delhi

Study Type – Retrospective

METHODS AND DATA

1. ABC Analysis The medications were then divided into A, B, and C categories based on the percentage of total cost consumed: 70%, 20%, and 10%. Pareto analysis, named for the Italian economist Vilfredo Pareto in the 19th century, is another name for ABC analysis. The first 10% of the goods, which make up about 70% of the total value (cost), are divided into three categories by the study. The remaining 70% are C products, which make up a small percentage of the total value, and the final 20% are category B items, which account for an additional 20% of the cumulative value.

The analysis is conducted using the logical processes listed below:

1. Make a list of everything you've bought or used, then enter the cost per unit.
2. Enter the amounts consumed over a specified time frame.
3. Calculate the value of consumption
4. Calculate the percentage of total value represented by each item.
5. Rearrange the list. Rank items in descending order by total value, starting at the top with highest value.
6. Calculate the cumulative percentage of the total value for each item at the top; add the percentage to that of the item below in the list
7. Choose to cut points for A, B and C categories.
8. Present the result graphically. Plot the percentage of total cumulative value on the Y-axis and the item number in X-axis.

2. Analysis of VED

All of the above items were categorized into vital (V), essential (E), and desired (D) categories in order to conduct a VED criticality analysis. The V category includes goods that were absolutely necessary for the patients' lives and those that had to be on hand at all times. VED analysis is a priority-setting approach where medications are categorized based on how they affect health. Vital items are those that are absolutely necessary for operations and do not allow for any time for correction; that is, they cannot be purchased off the shelf if they are unavailable. Work can be completed for a few days without essential goods, which are relatively less important. The remaining items are referred to as desirable objects. A panel of clinicians classified drugs as Vital (V), Essential (E) and Desirable (D).

3. ABC-VED MATRIX

The ABC and VED analyses were cross-tabulated to create the ABC-VED matrix. Three categories (I, II, and III) were identified from the resulting combination. Items from the AV, AE, AD, BV, and CV subcategories made up Category I. The BE, CE, and BD subcategories constituted category II and Category III was made up of the remaining CD subcategory items. The first letter in these subcategories represents its position in the ABC analysis, while the second letter represents its position in the VED analysis.

Controlling the inventory and providing better customer service are two benefits of handling the items according to their criticality and consumption value.

The stock levels can be created in a way that

- Class I categories receive the highest level of service.
- In contrast, services in the Class III category may be at least desired.
- Service levels for Class II items may fall within these two ranges, and average stock holding may be carried out appropriately.

DISCUSSIONS

Data Collection tool –

ABC Analysis, VED analysis, ABC-VED matrix

Data collection Techniques –

The hospital pharmacy provided secondary statistics on pharmaceuticals over a five-month period. Only medications given to patients by the hospital were included in the report; medications for sales counter, surgical, and dressing supplies were not.

ABC CLASSIFICATION OF MEDICINES

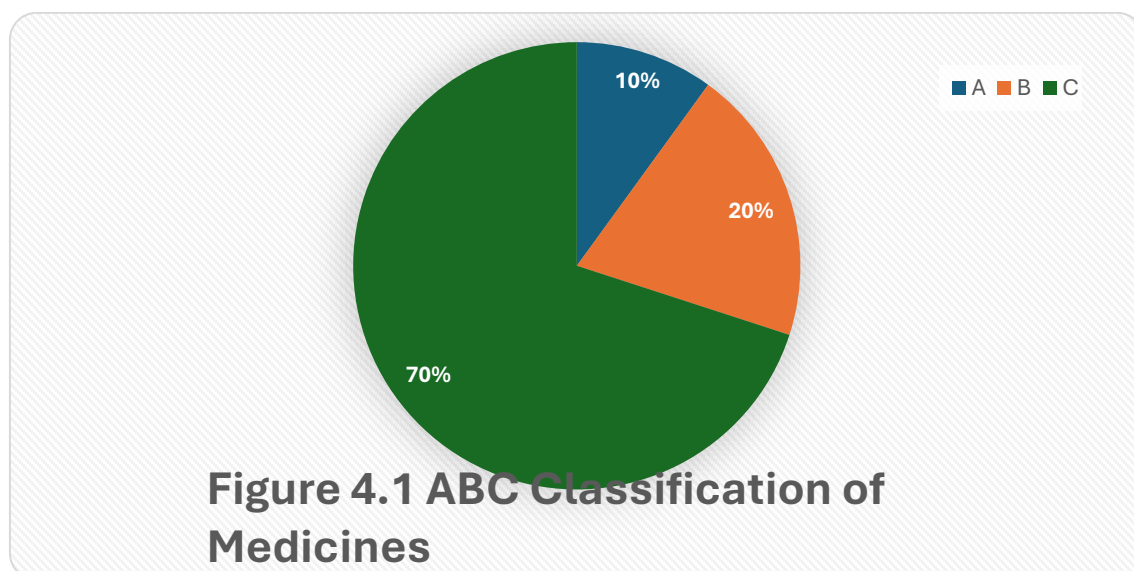


Figure 4.1 ABC Classification of Medicines

Figure 4.1

Category	Number of Medicines	Percentage
A	12	10.00%
B	24	20.00%
C	84	70.00%

Interpretation of ABC Classification of Medicines:

3.4.1 Figure 4.1 shows the ABC classification of medicines based on their consumption/value. The analysis indicates that Category C medicines make up the highest proportion, accounting for 70% (84 medicines) of the total inventory. These medicines are low-cost but high in number, requiring simple control measures. Category B medicines represent 20% (24 medicines), which need moderate monitoring and management. On the other hand, Category A medicines are the least in number, with only 10% (12 medicines), but they are usually the most valuable and require strict supervision and effective inventory control.

1. Interpretation of VED Classification of Medicines:

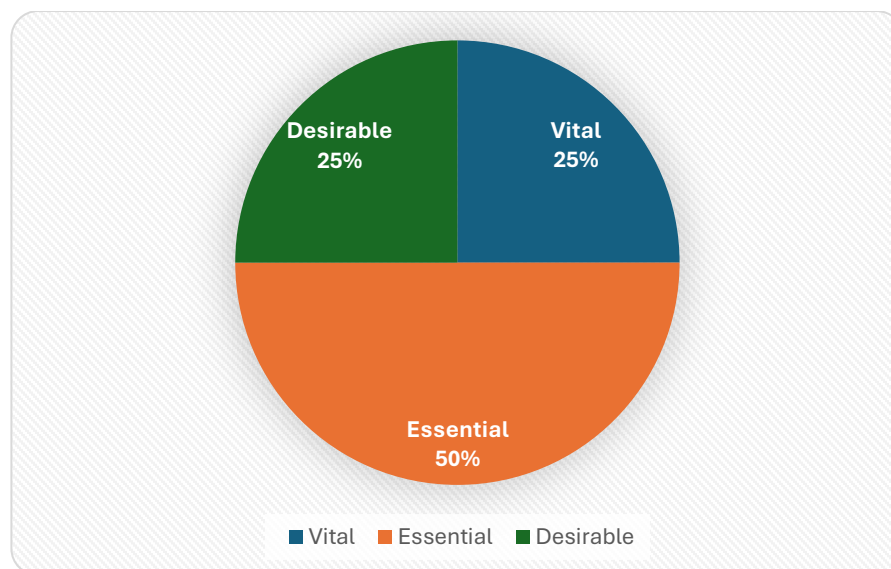


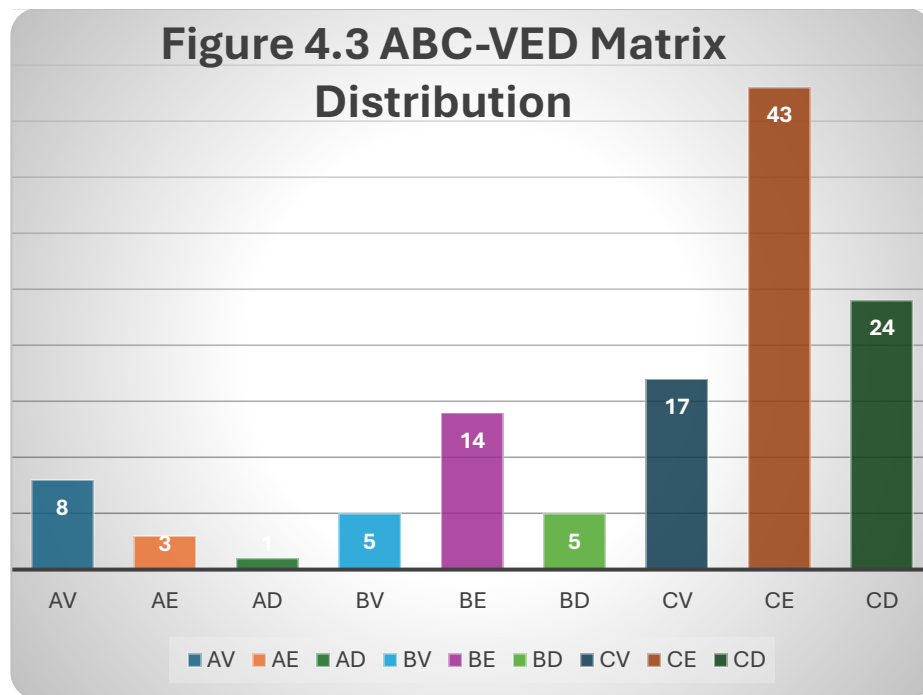
Figure 4.2 VED Classification of Medicines

Interpretation of VED Classification of Medicines:

Figure 4.2 shows the VED classification of medicines based on their importance in hospital inventory. The analysis reveals that Essential medicines form the largest group, accounting for 50% (60 medicines) of the total stock. These medicines are important for regular patient care and should always be available. Vital medicines account for 25% (30 medicines) and are the most critical, as their shortage can directly affect patient treatment and safety. Similarly, Desirable medicines also make up 25% (30 medicines), which are less critical and can be managed with lower priority. This

classification helps the hospital to focus more on important medicines and maintain proper stock availability.

2. Interpretation of ABC-VED Matrix Distribution



What is ABC-VED Matrix?

ABC-VED Matrix is a method used in hospitals to classify medicines by combining:

- ABC Analysis (based on cost/value)
- A = High-cost medicines (need strict control)
- B = Medium-cost medicines (need moderate control)
- C = Low-cost medicines (need simple control)
- VED Analysis (based on criticality/importance)
- V = Vital medicines (lifesaving, must always be available)
- E = Essential medicines (important for regular treatment)
- D = Desirable medicines (less critical, can be delayed)

1. AV (A + Vital) – 8 medicines (6.67%)

- A = High cost
- V = Vital (lifesaving)

These are expensive and very important medicines. They need strict control because stock-out be dangerous.

Examples: Insulin Injection, Adrenaline Injection, Dopamine Injection.

Meaning: High cost + lifesaving.

2. AE (A + Essential) – 3 medicines (2.5%)

- A = High cost
- E = Essential

These medicines are costly and needed regularly for treatment.

Examples: Meropenem, Piperacillin-Tazobactam, Human Albumin.

Meaning: High cost + important.

3. AD (A + Desirable) – 1 medicine (0.83%)

- A = High cost
- D = Desirable

3. Integration of ABC Control Strategies –

Interpretation of Inventory Control Categories

Figure 4.4 shows the distribution of medicines into three inventory control categories:

Category I, Category II, and Category III. The graph helps in understanding which group of medicines requires more attention in inventory management.

- Category II has the highest share, accounting for 52% of the total medicines. This means more than half of the medicines fall into this group, so they need regular monitoring and proper stock management. These medicines are generally important for routine hospital treatment.
- Category I represents 28% of medicines. These are the most important and high-priority medicines, which require strict supervision and continuous availability because they are often costly or critical for patient care.
- Category III makes up 20% of the medicines. This is the smallest group and includes medicines that are less critical and can be managed with lower priority.

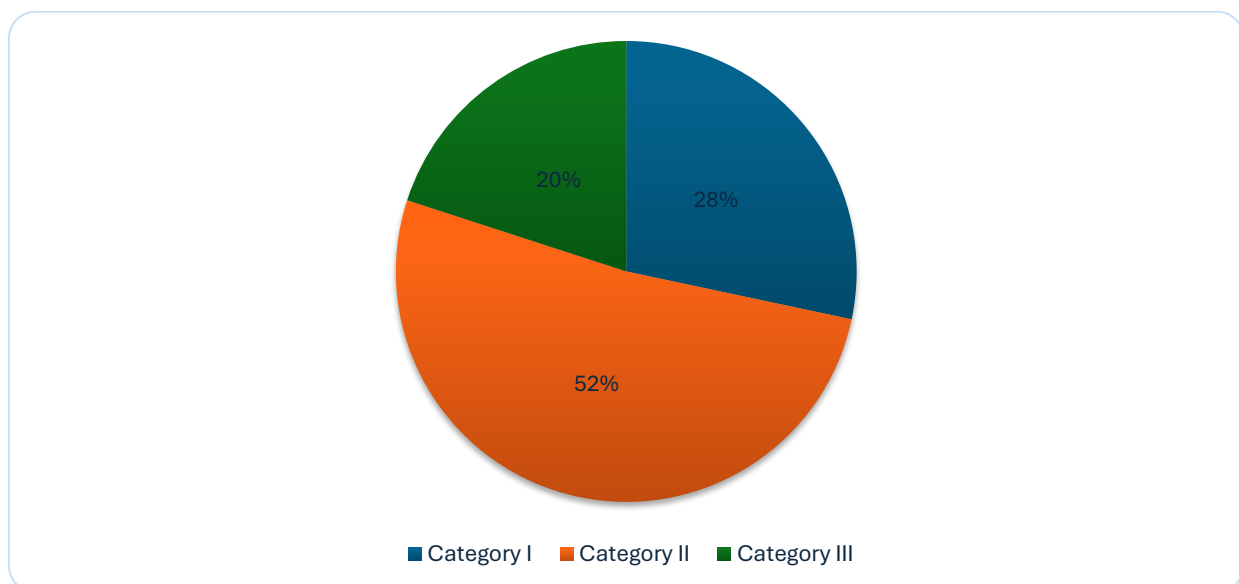


Figure 4.4 Inventory Control Categories

Chapter 5: Recommendations

The following recommendations are suggested to improve inventory management practices in hospital pharmacies:

5.1 Implement ABC and VED analysis on a regular basis.

The hospital should conduct ABC and VED analysis periodically, preferably every six months or annually, to ensure that inventory classifications remain accurate and relevant. Medicine consumption patterns and treatment requirements may change over time; therefore, regular review will help management make informed decisions regarding procurement, stock levels, and budget allocation.

5.2 Maintain strict control over Category A medicines.

Since Category A medicines account for the highest inventory expenditure despite being fewer in number, they should be closely monitored. Hospitals should establish approval procedures, maintain accurate stock records, and conduct frequent stock verification to avoid overstocking, pilferage, wastage, and unnecessary financial burden.

5.3 Give highest priority to Category I items in the ABC–VED matrix.

Category I medicines include items that are either highly critical, expensive, or both. These medicines require continuous supervision, frequent stock monitoring, and timely replenishment. Hospital management should develop special inventory policies for these medicines to ensure patient safety and operational efficiency.

5.4 Adopt computerized inventory management systems.

The use of inventory management software can improve accuracy in stock monitoring, consumption tracking, and procurement planning. Automated systems can generate alerts for low stock levels, approaching expiry dates, and reorder requirements, thereby reducing manual errors and improving inventory control.

5.5 Conduct regular stock audits and physical verification.

Periodic stock audits should be carried out to compare physical stock with inventory records. This practice helps identify discrepancies, prevent losses, improve accountability, and ensure that inventory data remains accurate for decision-making purposes.

5.6 Monitor medicine expiry dates effectively.

Hospitals should implement a First-Expiry-First-Out (FEFO) system to minimize wastage caused by expired medicines. Regular review of near-expiry items can help ensure timely utilization, redistribution, or replacement before they become unusable.

5.7 Provide training to pharmacy and inventory staff.

Continuous training programs should be organized to improve staff knowledge regarding inventory control techniques, stock management practices, and the application of ABC and VED analysis. Well-trained personnel can contribute significantly to efficient inventory management and better resource utilization.

5.8 Focus on reducing non-moving and excess inventory.

Slow-moving and non-moving medicines should be reviewed regularly to identify unnecessary stock accumulation. Reducing excess inventory can free up storage space, lower carrying costs, and prevent financial losses due to expiration.

Chapter 6 – Conclusion

6.1 The study demonstrated that ABC and VED analysis are highly effective inventory control techniques for hospital pharmacy management.

By classifying medicines according to their annual consumption value (ABC Analysis) and their criticality to patient care (VED Analysis), the hospital can identify which medicines require the highest level of attention and control. This systematic approach helps improve decision-making and ensures better utilization of available resources.

6.2 VED analysis highlighted the importance of maintaining uninterrupted availability of critical medicines.

Vital medicines are essential for saving lives and managing emergencies. The study emphasized that stock-outs of such medicines can directly affect patient treatment and hospital operations. Therefore, maintaining adequate stock levels of vital and essential medicines should remain a top priority for hospital management.

6.3 The combined ABC–VED matrix provided a more comprehensive inventory management framework.

By integrating both cost and criticality factors, the matrix helped categorize medicines into different priority groups. This enabled hospital administrators to focus greater attention on medicines that are both costly and clinically important while applying simpler control measures to less critical items.

6.4 Category I medicines require the highest level of managerial attention and control.

These medicines include items that are either expensive, highly critical, or both. Continuous monitoring, frequent stock verification, and priority procurement should be adopted for these medicines to ensure uninterrupted patient care and efficient inventory utilization.

6.5 Category II medicines require moderate monitoring and periodic review.

Since this category represented the largest proportion of medicines in the study, proper stock management and regular assessment are necessary to maintain optimal inventory levels while avoiding excess storage costs.

6.6 Category III medicines can be managed using simpler inventory control procedures.

These medicines are generally low-cost and less critical to immediate patient care. Therefore, hospitals can reduce management effort and resources for these items without negatively affecting healthcare service delivery.

6.7 The implementation of ABC and VED analysis contributes to cost reduction and improved financial efficiency.

By identifying priority medicines and optimizing procurement practices, hospitals can reduce unnecessary inventory carrying costs, minimize wastage, and make better use of their limited financial resources.

Overall, the study concludes that ABC and VED analysis should be adopted as a regular inventory management practice in hospital pharmacies.

Their combined application not only ensures the continuous availability of essential medicines but also strengthens operational efficiency, improves resource utilization, reduces wastage, and ultimately contributes to better patient care outcomes and hospital performance.

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