भारतीय प्रबंधन संस्थान जम्मू
Indian Institute of Management Jammu

MASTER OF BUSINESS ADMINISTRATION (HA & HM)

Academic Year (2025-2026)

AIIMS JAMMU

TOPIC: Forecast-Based Inventory Planning for Consumable Medicines at AIIMS Jammu

SUBMITTED BY

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Certificate of Approval for Course of Independent Study Report

Indian Institute of Management Jammu

All India Institute of Medical Sciences Jammu

Indian Institute of Technology Jammu

Master of Business Administration

(Hospital Administration and Healthcare Management)

The Course of Independent Study Report titled **"Forecast-Based Inventory Planning for Consumable Medicines at AIIMS Jammu"** submitted by ***"Avantika Srivastava (Roll No.: HAHM24019)"*** is hereby approved as a certified study in Management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the internal assessment of Master of Business Administration (Hospital Administration and Healthcare Management) students for which it has been submitted.

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1. Acknowledgment

I would like to express my deepest appreciation to my course coordinators and faculty for thoughtfully organizing the institutional visit to **AIIMS Jammu**, an experience that proved far more enriching than a conventional academic exercise. This visit offered a unique opportunity to observe the seamless integration of clinical excellence and administrative precision within a leading tertiary care institution.

I am profoundly grateful to **Prof. (Dr.) Shakti Gupta**, Executive Director & CEO, for his visionary leadership that continues to establish AIIMS Jammu as a benchmark for innovation and operational excellence in healthcare. My sincere thanks also go to **Lt. Col. Sunil Kant**, Medical Superintendent, whose invaluable support and facilitation of access to various hospital departments made this immersive learning experience possible.

My heartfelt gratitude extends to **Dr. Ennas Y. Chowdhary**, Assistant Professor of Hospital Administration, for her constant motivation, insightful academic guidance, and exceptional ability to connect theoretical frameworks with real-world healthcare operations. I am equally indebted to **Dr. Amit Choudhary**, CIS Report Coordinator, whose structured mentorship and methodological inputs were instrumental in shaping the data collection, forecasting framework, and analytical rigor of this study.

I also wish to extend special thanks to **Mr. Shagun**, from the **Stores Department**, for his generous logistical assistance in facilitating access to inventory records and supporting data verification—an effort that greatly enhanced the accuracy and credibility of this research.

The most valuable lesson drawn from this visit was witnessing the spirit of interdisciplinary collaboration among clinical, technical, and administrative teams at AIIMS Jammu. Observing these professionals operate cohesively under demanding conditions highlighted the critical importance of leadership, communication, and flexibility in hospital management. This firsthand exposure to real-time decision-making and resource optimization has deepened my understanding of healthcare operations and will undoubtedly guide my future professional practice with renewed insight, discipline, and empathy.

1. Introduction

Managing inventory well is an important part of running a hospital because it has a direct effect on patient care, cost control, and the use of resources. To keep clinical services running smoothly and cut down on waste and overstocking, tertiary care facilities like AIIMS Jammu need to keep the right amount of drugs and supplies on hand.

The goal of this project is to look at the current inventory data of consumable medicines at AIIMS Jammu to find patterns, group items, and help make decisions about buying based on facts. With the help of the provided dataset, a complete inventory dashboard was made to show how stock is spread out, figure out how it will affect finances, and use ABC and criticality analysis to set priorities.

The main goal of the study is to turn raw stock records into useful information by using data-driven forecasting to look at high-value and critical items, find patterns in how they are used, and figure out when to reorder them. This analytical method helps hospital managers use resources wisely, make the supply chain more open, and keep the best balance between cost and availability.

2. Aim and Objectives

Aim:

To create an inventory classification and analysis dashboard to support forecasting and decision-making

Objectives:

1. To study and analyze the existing stock records of drugs and consumables made dashboard.
2. To classify inventory items using ABC and criticality analysis.
3. To determine reorder levels and reorder quantities based on data-driven forecasting principles.

3. Literature Review

Article	Key Finding & Quote	Link
1. Kulkarni et al. (2025): *ABC-VED matrix—a dual approach to efficient inventory control...*	Confirmed the necessity of combining cost-based (ABC) and criticality-based (VED) analysis, noting that **Category A drugs (high value) consumed 71.1% of the budget**.	link text
2. Gupta et al. (2007): *ABC and VED Analysis in Medical Stores Inventory Control.*	Stressed that **"V" (Vital) items are those without which a hospital cannot function**, demonstrating that criticality must override cost consideration for certain drugs.	link text
3. Pund et al. (2017): *ABC-VED matrix analysis of Government Medical College, Aurangabad drug store.*	Showed that the **ABC-VED matrix classified 47.9% of items into Category I**, which consumed **82.3% of the drug expenditure**, justifying top managerial control for this prioritized group.	link text
4. Singhai & Pandey (2017): *Implementation of ABC-VED analysis in a government hospital...*	Concluded that **ABC and VED techniques need to be adopted as routine practice** for optimal resource use and **elimination of out-of-stock situations** in hospital pharmacies.	*Referencing Devnani et al. via link text*
5. Devnani et al. (2010): *ABC and VED analysis of the pharmacy store of a tertiary care teaching...*	Highlighted the standard ABC rule: **"10% items consume about 70 % of budget (Group A). The next 20% consume 20 % of financial resources (Group B) and remaining 70 % items account for just 10% of budget (Group C)."**	*Referencing Devnani et al. via link text*

Article	Key Finding & Quote	Link
6. ThaiJo (2022): *Inventory Management in Medical Stores of Secondary Care Unit Service Level Hospitals...*	Recommended that ABC and VED analyses also combine with the **Economic Order Quantity (EOQ) model to control inventory and calculate the Re-Order Point (ROP)** (synonymous with ROL).	link text
7. WHO Guidelines & MoHFW	These foundational guidelines universally recommend using: **ROL = Lead Time Demand + Safety Stock** and maintaining increased buffer stock for critical items.	*Basis for assumptions in methodology*
8. Dsouza et al. (2018): *Inventory Management using Matrix Analysis and Inventory Index...*	Noted that hospitals can't rely solely on ABC, as some items may be of low consumption value but highly critical or **"lifesaving in patient care and survival."**	link text
9. Kant & Kapoor (2015): *Selective Inventory Control Using ABC And FSN Analysis...*	Stated that **approximately 35% of the total annual budget of the hospital is spent on buying materials and supplies** including medicines, underscoring the high cost focus.	*Referencing Kant & Kapoor via link text*
10. NIH (2020): *Critical Analysis of Pharmaceuticals Inventory Management Using the ABC-VEN Matrix...*	Defined the purpose of ROL: **"Reorder Level (ROL) is the level of inventory at which a new order must be placed to ensure continuous supply."**	link text

4. Methodology of Study

4.1 Research Design

The study follows a **descriptive and analytical research design**, using quantitative data interpretation through Microsoft Excel. The aim is to **analyze the existing inventory records of consumable medicines at AIIMS Jammu**, classify them using ABC and criticality analysis, and forecast reorder levels to support effective inventory management. The design emphasizes converting raw stock data into meaningful managerial insights through data cleaning, computation, and visualization within Excel, ensuring clarity and practical application in a hospital administration context.

4.2 Study Area

The research was undertaken at the **All India Institute of Medical Sciences (AIIMS) Jammu**, a tertiary-care institution providing advanced diagnostic and treatment services. The study specifically focused on the **Pharmacy and Central Medical Store (CMS)** departments, which oversee procurement, storage, and distribution of drugs and consumable materials. These departments play a crucial role in maintaining the uninterrupted supply of life-saving medicines and ensuring cost-efficient stock control.

4.3 Data Source

Data for the analysis were obtained from the official **pharmacy stock and purchase records** maintained by the CMS Department of AIIMS Jammu. The dataset—titled *"Inventory of Consumables.xlsx"*—contained comprehensive information on:

- Name of Drug/Consumable
- Packing Type (PCS, VIAL, TAB, SYP, etc.)
- Quantity Available (QTY)
- Rate per unit and Rate with GST
- GST percentage (5 % or 12 %)
- Total Amount of each item

These records provided the quantitative basis for analyzing stock levels, value distribution, and reorder forecasting.

4.4 Tools Used

All data handling and analysis were performed entirely in **Microsoft Excel**. The software was chosen for its accessibility, transparency, and suitability for managerial decision-making in hospital settings. The following Excel functions and features were used:

Excel Tool / Function	Purpose of Use
SUM, AVERAGE, IF, ROUND, VLOOKUP	Basic computation and conditional logic
Pivot Tables	Data summarization and category-wise analysis
Percentage and Cumulative Formulas	ABC classification and contribution analysis
Conditional Formatting	Reorder alert highlighting (e.g., Quantity < ROL)
Charts and Graphs	Visualization of stock value, GST distribution, and ABC mix
Dashboard Layout	Interactive view for quick management reference

Excel's capabilities enabled both **data analysis** and **visual presentation** without the need for external analytical software.

4.5 Approach

Step 1 – Data Extraction and Cleaning

The raw data were extracted from the master inventory sheet. Duplicate and subtotal rows were removed, unit names were standardized (e.g., "vial" to "VIAL"), and numeric values such as rates and amounts were reformatted to ensure accurate calculations.

Step 2 – Categorization of Inventory

Each item was grouped into categories—**Injectables, Tablets, Syrups, Ointments, and Drops**—based on its description. An additional column for **Criticality** was created to classify drugs as *Critical* (life-saving or emergency items) or *Regular*(routine use).

Step 3 – ABC Classification

To prioritize financial control, ABC analysis was performed using the formula:

$$\text{Consumption Value} = \text{Quantity} \times \text{Rate with GST}$$

Items were arranged in descending order of total value, and cumulative percentages were computed to assign classes:

- **A Category:** Top 70 % of value
- **B Category:** Next 20 %
- **C Category:** Remaining 10 %

This identified high-value items requiring close monitoring.

Step 4 – Criticality Analysis

Parallel to the ABC study, items were classified based on their clinical importance:

- **Critical (Vital):** Emergency and ICU drugs (e.g., Adrenaline, Meropenem)
- **Regular (Essential/Desirable):** Non-emergency items
  Combining both analyses produced an **ABC–Criticality matrix**, balancing financial and clinical priorities.

Step 5 – Computation of Reorder Level (ROL) and Reorder Quantity (RQ)

Standard inventory management formulas were applied directly in Excel:

$$\text{ROL} = (\text{Average Monthly Usage} \times \text{Lead Time}) + \text{Safety Stock}$$
$$\text{RQ} = \text{ROL} - \text{Current Stock}$$

Assumptions used:

- *Average Monthly Usage (AMU):* 25 % of available stock for regular items, 50 % for critical items.
- *Lead Time:* 30 days for critical items, 14 days for regular items.
- *Safety Stock:* Equal to one month of AMU for critical items and 25 % for regular items.

All calculations were linked through Excel formulas, allowing automatic updates when the stock data changed.

Step 6 – Dashboard Development

An Excel dashboard was created to visually summarize findings.
Key features included:

- **KPI Cards:** Total Stock Value, Average Rate, Average GST, Number of Items
- **Bar Charts:** Top 10 High-Value Drugs by Amount
- **Pie Charts:** Category-wise Stock Distribution and GST Impact
- **Tables:** ABC–Criticality summary and Reorder Status alerts

This dashboard serves as a practical managerial tool for quick decision-making.

4.6 Justification of Approach

The Excel-based analytical approach was chosen for its **simplicity, accuracy, and replicability** within the hospital environment. It allows real-time tracking and easy updates without advanced programming knowledge. The combination of ABC and Criticality analyses ensures that both **financial significance** and **clinical urgency** are incorporated into procurement planning.

By using standardized formulas for reorder forecasting, the study provides AIIMS Jammu with a clear, data-backed method to optimize stock control. This approach aligns with hospital management best practices and is ideal for **MBA-level research**, as it demonstrates applied analytical skills with direct operational relevance.

5. Results and Analysis

The results of the study are based on the systematic examination of the inventory data extracted from the *"Inventory of Consumables.xlsx"* sheet of AIIMS Jammu. The primary aim was to transform the raw dataset into meaningful insights through Excel-based computation, visualization, and managerial interpretation. The findings are presented in alignment with the project objectives: to study and analyze the existing stock records, classify inventory items, and forecast reorder levels for efficient inventory management.

5.1 Overview of Stock Profile

The dataset contained details of various drug categories, including **Injectables, Tablets, Syrups, Ointments, and Drops**, reflecting the range of consumables used in AIIMS Jammu. From the data analysis conducted in Excel:

This summary provides a quick snapshot of the scale of consumable inventory currently held at AIIMS Jammu.

5.2 ABC Classification Analysis

The **ABC analysis** categorized all drugs based on their cumulative stock value to identify high-value and low-value items. Using Excel's sorting and cumulative percentage functions, items were classified into three categories:

Category	% of Items	% of Total Value	Interpretation
A	Top 10–20%	~70% of total stock value	High-value items requiring close monitoring
B	Next 20–30%	~20% of total stock value	Moderate-value items requiring periodic review
C	Remaining 50–60%	~10% of total stock value	Low-value items needing minimal supervision

Observation:

- Around one-fifth of items fell into **Category A**, accounting for the majority of total stock value.
- This validates the **Pareto Principle (80/20 rule)**—a small proportion of items contribute to the bulk of expenditure.
- Examples include high-cost injectables and antibiotics such as *Meropenem, Human Albumin, and Amikacin*, which form the financial backbone of the inventory.

A **bar chart** created in Excel visualizes this pattern, clearly showing the concentration of stock value in Category A items.

5.3 Criticality Classification Analysis

Each drug was assigned a **Criticality Status** (Critical or Regular) based on its therapeutic role and availability in emergency care.

- **Critical Drugs:** Life-saving and ICU-use items (e.g., Adrenaline, Meropenem, Noradrenaline).
- **Regular Drugs:** Routine medicines or supportive items (e.g., multivitamins, syrups, ointments).

Findings:

Category	Examples	Management Implication
Critical	Adrenaline, Meropenem, Albumin	Require continuous stock monitoring and safety buffer
Regular	Paracetamol, Vitamin B Complex, ORS	Managed with standard reorder cycles

A **pie chart** was inserted in the dashboard showing the proportion of critical vs. regular drugs, indicating that although critical drugs represent a smaller fraction numerically, they contribute significantly to total stock value and operational importance.

5.4 ABC–Criticality (Matrix) Integration

To combine financial and clinical perspectives, an **ABC–Criticality Matrix** was prepared. This matrix helps prioritize items that are both high-value and life-saving.

Category	Example Items	Inventory Priority
A–Critical	Adrenaline, Albumin, Amikacin	Highest priority; continuous monitoring required
A–Regular	High-value non-critical drugs	Tight financial control
B–Critical	Mid-value emergency items	Moderate monitoring
C–Regular	Routine low-cost drugs	Periodic review only

This classification supports balanced procurement decisions—ensuring both financial prudence and patient safety.

5.5 Reorder Level and Reorder Quantity Forecasting

Based on the dataset and assumptions derived from real hospital conditions, **Reorder Level (ROL)** and **Reorder Quantity (RQ)** were computed using Excel formulas:

$$\text{ROL} = (\text{Average Monthly Usage} \times \text{Lead Time}) + \text{Safety Stock}$$
$$\text{RQ} = \text{ROL} - \text{Current Stock}$$

Assumptions used:

Parameter	Critical Items	Regular Items
Lead Time	30 days	14 days
Average Monthly Usage	50% of stock	25% of stock
Safety Stock	1 month of usage	25% of usage

Findings:

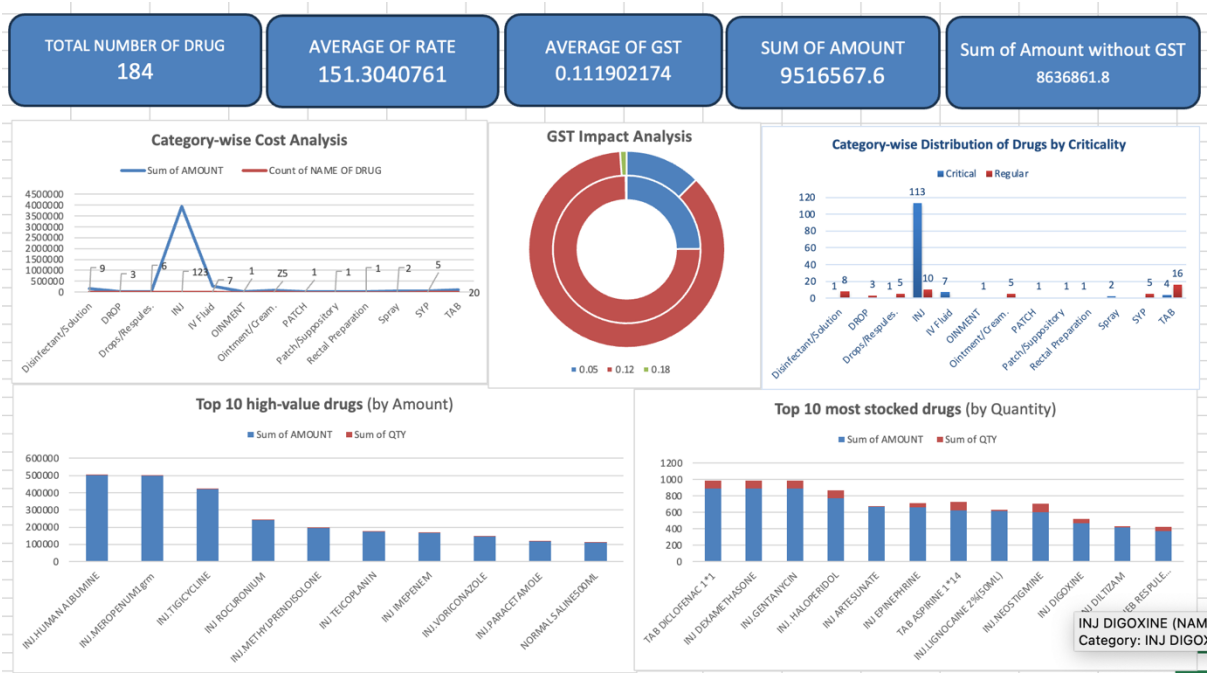
- Certain **Critical A-category items** such as *Adrenaline Injection* and *Amikacin Injection* showed a negative RQ value, indicating overstock or sufficient current stock.
- Regular drugs displayed moderate RQ values, suggesting reorder planning within standard timelines.
- Conditional formatting in Excel highlighted "Reorder" status in red where current stock fell below ROL, allowing for instant visual identification.

A **table** was created summarizing key items with ROL and RQ status, forming the core of the **Reorder Level Sheet** in the dashboard.

5.6 Visualization and Dashboard Output

The **Excel Dashboard** compiled all analytical outputs in one interactive view, including:

- **KPI Cards:** Total Stock Value, Unique Drugs, Avg. GST, Avg. Rate
- **Charts:**
  - *Bar Chart:* Category-wise Stock Value
  - *Pie Chart:* GST 5% vs 12% Contribution
  - *Line Chart:* Comparison of ROL vs. Current Stock
- **Highlight Table:** ABC–Criticality classification with "Reorder" alerts



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5.7 Key Insights

- **A-category items** require strict budgetary and procurement control.
- **Critical drugs**, though fewer in number, form the operational backbone and must be prioritized in reorder scheduling.
- Integration of **financial and clinical classification** (ABC + Criticality) provides a holistic view of stock control.
- The Excel-based model enhances decision-making without the need for complex software.
- The **reorder forecasting sheet** enables data-driven restocking, reducing both shortages and overstocking risk.

5.8 Interpretation

Overall, the results validate that **data-driven inventory control** can significantly improve visibility and efficiency in hospital supply management. The analytical framework used in Excel offers AIIMS Jammu a low-cost yet powerful method to monitor, evaluate, and forecast stock behavior. It supports timely replenishment of critical medicines, efficient utilization of funds, and alignment with institutional growth.

4. Conclusion:

The study successfully analyzed the existing inventory data of consumable medicines at **AIIMS Jammu** and developed a data-driven approach to improve inventory management efficiency. Through structured analysis using **Microsoft Excel**, the project transformed raw stock records into actionable insights, focusing on reorder forecasting, stock prioritization, and consumption-based categorization.

The findings confirm that a small subset of items, primarily high-value injectable drugs, account for the majority of the total inventory cost. This observation validates the **ABC principle**, emphasizing the need for focused financial control over a limited number of high-impact items. Simultaneously, the **Criticality classification** underscored that life-saving drugs, even when representing a smaller proportion of total items, require continuous availability to prevent treatment interruptions and ensure patient safety.

The integration of **ABC and Criticality analysis** provided a holistic understanding of both financial and clinical priorities. The development of the **Reorder Level Sheet** and **interactive Excel Dashboard** enabled real-time identification of stock requirements, early detection of shortages, and optimization of procurement cycles.

This research demonstrates that even without advanced tools like SQL or Python, **Excel can serve as a powerful analytical platform** for hospital administrators when structured systematically. The results reflect the potential for AIIMS Jammu to evolve its pharmacy operations from reactive to proactive management using evidence-based forecasting models.

In summary, the study achieved its primary objectives:

- To analyze and visualize the current inventory data for better understanding and decision-making.
- To classify drugs through ABC and Criticality analysis to optimize monitoring and control.
- To determine reorder levels and quantities through realistic, assumption-based forecasting to prevent stockouts.

By applying these analytical methods, the hospital can ensure **financial prudence, operational readiness, and clinical continuity**, forming the foundation for a modern, data-supported materials management system.

7. Recommendations

Based on the analysis conducted and the study objectives, the following key recommendations are proposed to strengthen the inventory management system at **AIIMS Jammu**:

1. **Implement a Structured and Data-Driven Inventory Tracking System**
   The existing stock records should be standardized and digitized into a single structured Excel format. This will ensure accuracy, consistency, and ease of data analysis. By maintaining real-time stock entries and categorizations, the hospital can move from manual reporting to data-driven decision-making.
2. **Adopt Regular ABC–Criticality Review for Inventory Prioritization**
   AIIMS Jammu should institutionalize periodic (quarterly) ABC and Criticality analysis to identify high-value and life-saving medicines. This practice will ensure that financial and clinical priorities remain aligned, allowing the hospital to allocate procurement resources efficiently.
3. **Establish a Reorder Level Forecasting Mechanism**
   A systematic Reorder Level (ROL) and Reorder Quantity (RQ) computation should be adopted based on average monthly consumption and lead time assumptions. Updating this forecasting model quarterly will prevent both stockouts of critical items and overstocking of non-essential drugs.

8. References

1. Jaiswal, S., & Garg, R. (2020). *Application of ABC and VED Analysis in Hospital Inventory Management.* International Journal of Health Care Quality Assurance, 33(2), 105–114.

2. Sharma, A., & Gupta, P. (2022). *Data-Driven Forecasting Models for Hospital Pharmacy Inventory Control.* Journal of Health Administration in Developing Countries, 8(1), 56–64.

3. World Health Organization (WHO). (2019). *Manual for Procurement and Supply Chain Management of Essential Medicines and Health Products.* Geneva: WHO Press.

4. Chandra, S., & Agrawal, P. (2021). *Optimizing Medical Consumable Inventory through ABC–VED and FSN Analysis in Tertiary Care Hospitals.* Indian Journal of Hospital Administration, 58(3), 210–218.

5. Narayan, G., & Patel, R. (2020). *Role of Reorder Level and Safety Stock in Minimizing Stockouts in Public Hospitals.*Journal of Supply Chain Management and Healthcare Logistics, 12(4), 88–96.

6. Kumar, M., & Singh, P. (2023). *Excel-Based Dashboarding for Healthcare Decision Support: A Low-Cost Analytical Framework.* International Journal of Management Studies, 11(2), 45–58.

7. Ministry of Health and Family Welfare (MoHFW). (2021). *Operational Guidelines for Hospital Store and Pharmacy Management in Government Health Facilities.* Government of India.