STUDY ON INVENTORY OPTIMIZATION AT RAJIV GANDHI CANCER INSTITUTE AND RESEARCH CENTRE, DELHI

Dissertation Submitted to

The IIHMR, DELHI, Delhi

For the partial fulfilment of the award of the degree of

Master of Business Administration (MBA)

In

Hospital and Health Management

By

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Under the Supervision and Guidance of

Dr.Sukesh Bhardwaj

STUDY ON INVENTORY OPTIMIZATION AT RAJIV GANDHI CANCER INSTITUTE AND RESEARCH CENTRE, DELHI

Dissertation Submitted to

TO WHOMSOEVER IT MAY CONCERN

I declare that the dissertation titled, **Study on Inventory Optimization at Rajiv Gandhi Cancer Institute and Research centre, Delhi** is Bonafede's Ede record of my original research work of mine. I declare it has not been performed earlier or submitted to any different institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged.

(Signature)

Name: Prasanna Narayan Tiwari

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CERTIFICATE

This is to certify that Prasanna Narayan Tiwari in partial fulfilment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR , DELHI, Delhi has successfully completed her internship at the Rajiv Gandhi Cancer Institute and Research Centre, Rohini, New Delhi during March 21, 2022 to June 21, 2022.

Place: Head of the Organisation

Date: Name of the Organisation

CERTIFICATE

This is to certify that Prasanna Narayan Tiwari working on the research naming "**Study On Inventory Optimization at Rajiv Gandhi Cancer Institute and Research centre, Delhi"** in partial fulfilment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR , DELHI, Delhi under my guidance and supervision & her approach to the research study has been scientific and analytical.

Faculty Guide	School Dean
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ABSTRACT

Background: For an organisation to be effective and efficient, inventory management is necessary. It is crucial for maintaining inventory levels that must be kept for use in case of production in the future. The aim of inventory management is to strike the right balance between the conflicting economic interests of not holding too much goods.

Aims & objectives: (1) to identify drugs, medical consumables, and surgical instruments used in the hospitals. (2) To forecast the demand of identified items using Seasonal Index and Linear Regression. (3) To calculate the EOQ for identified items.

Methods: This work is based on Quantitative analytical study conducted at RGCIRC for 3 months & secondary consumption Data would be collected directly from Management Information System from the department of Hospital.

Results: On the basis of the analysis of the quarterly demand of 15 listed products in the year 2019, 2020 and 2021, the average expected demand for the year 2022 is analysed to maintain the inventory.

Conclusions: The forecasting method aids the hospital in more accurate forecasting to their demand according to seasonal variation. The economic order cost quantitate allows the hospital to reduce the inventory cost and optimize the order along with the forecasting model

Keywords: EOQ, Inventory Management, Forecasting

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Sincerely,

Prasanna Narayan Tiwari

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Abbreviations

ABBREVIATIONS	FULL FORM
EOQ	Economic Order Quantity
VED	Vital, Essential, Desirable
ABC	Always Better Control
FSN	Fast, Slow, Non-moving
Inj.	Injection
Mg/ml	Milligram/ milliliter
USD	United states dollar
RGCIRC	Rajiv Gandhi Cancer Institute and Research Center

Chapter 1

1.1 Introduction

In order to support effective healthcare delivery, management of inventory, which is at the base of the pharmaceutical supply chain, constitute ordering, getting, keeping, issuing, and again ordering products. The goal is to achieve a balance between "too much and too little" by making decisions at inventory that reduce the overall inventory cost and optimise quality by using limited resources to satisfy actual consumer needs in an effective manner at the exact time and at a reduced cost.

A 1/3 of budget of the hospital is spent on buying supplies & materials, having medications, and 40% of the budget is used for buying and managing stores. This allows for effective inventory management to significantly enhance medical store management.

Optimization of the logistics costs has always been a priority for hospital management. inventory management of pharmacy, however, is a difficult operation, & common issues include high losses, inappropriate use of technology, a lack logistical infrastructure for drug storage, improper checks of drug expiration periods, distribution issues, & illogical drug use. This increases the likelihood of stock outs and overstocks of vital medications, which can lead to resource wastage or blockades, an incline in out-of-pocket costs, & a reduction in the quality of healthcare services.

One important element for effectively using the resources is inventory management. A high service level of supplies of medical equipment is necessary under the unpredictable demand, medical substances account for a considerable portion of the costs, and the management of supplies needs a significant amount of effort to check the levels, track usage, and distribute them. Nevertheless, managing inventories in hospitals is a challenging task due to a number of issues. As a result, it is important to use operations research methodologies to address the administrative problems with the hospital inventory system. Hospitals are searching for alternatives way to stay competitive by reducing the cost to the organization. Economic Order Quantity is the method to efficiently run the inventory. What may be the best order quantity at the lowest price might be helped by an economical order quantity. Essentially, the main use of the study is to suggest an effective forecasting model which helps to reduce inventory stocks using Economic order quantity and ABC analysis. All the In-patient's pharmacy medicines, and surgical items from past 3 years will be analysed.

1.2 Research Question

- To identify an effective forecasting model, which helps to reduce the inventory cost using Economic Order Quantity and ABC Analysis.

1.3 Objectives

- To identify drugs, medical consumables, and surgical instruments used in the hospitals.
- To forecast the demand of identified items using Seasonal Index and Linear Regression.
- To calculate the EOQ for identified items.

Chapter 2

2.1 Literature Review

Title- Medicinal Inventory Management by ABC-VED Analysis in the Pharmacy Store of Veterinary Hospital, Indonesia. **Year**-2018 **Author**- Idda Fitriana, Radein Gaegak Doenny Sataria and Dwi Cahyo Budi Setiawan	The purpose was to examine the annual consumption and expenditure of medical goods using inventory management systems. A total of Rs. 209,342,860.58 was spent on 191 medication items provided in 2016. In the always, better, and control categories, respectively, 14.14, 20.42, and 65.45 percent of drugs were found, accounting for 69.87, 20.42, and 9.71 percent of the pharmacy store's ADE.
Title- The economic analysis (ABC) of drug expenditure in a tertiary care teaching Hospital, B.G. Nagar. **Year**- 2011 **Author**- Naveen AM.R, Santosh Y.L., Sateesh Kumar B.P.	Research revealed that 82.662 percent (2), 11.1525 percent (3), and 6.1864 percent (4) of the items were, respectively, A, B, and C category items. The ABC analysis identifies the medications that need careful supervision in order to maximise financial resources and solve the pharmacy's out-of-stock issues. The higher yearly budget was supported by the cost inflation index.
Title- An inventory management using ABC Analysis & FSN Analysis **Year-** 2020 **Author**- Mr. Roshan Nadkarni and Dr. Asita Ghewari	Due to the inherent uncertainties in supply and demand, which can result in lost sales or holding large stocks, research to achieve optimal inventory replenishment is quite challenging. And in this investigation, they discovered that FSN analysis uses usage rate whereas ABC analysis uses annual consumption value. ABC and FSN are employed in accordance with the significance of materials in manufacturing.

Title- ABC and VED Analysis in Medical Stores Inventory Control **Year**- 2011 **Author**- Lt Col R Gupta, Col KK Gupta (Retd), Brig BR Jain (Retd), Maj Gen RK Garg	According to this study, out of 325 medications, 47 (14.6%) use up 70% of the ADE (Group A), 73 (22.46%) use up 19.99% of the ADE (Group B), and the remaining 205 (63%) use up just 9.99% of the entire budget.
Title- probability economic order quantity model for inventory management of drugs & hospital consumables **Year- 2017** **Author**- P. O. Agaeda and E. H. Oagwuche	They discovered that each medication and hospital supply needed at the Central Pharmacy of the Benue State University Teaching Hospital could be ordered at the optimal economic order quantity and reorder level using the probabilistic EOQ model (BSUTH). That while the Re-order quantity reduces along a rise in cost of ordering, the Economic Order Quantity of each medicine & hospital consumable increases.
TITLE: Inventory using ABC-VEN Matrix in desire referral hospital, Ethiopia **Year**- 2020 **Authors**- Mohammed SAV and Workneah BH	According to a cross-sectional research, out of 1824 medications, 310 (17%), 368 (20.18%), and 1146 (62.83%) were class A, B, and C pharmaceuticals, accounts 69.64%, 19.98%, and 10.38% of yearly United States Dollar drug expenditures. Category A is the highest priority group and requires the greatest attention since it includes expensive but essential or critical drugs. They should always be available and have a little amount of safety stock. Category A pharmaceuticals need rigorous management control, accurate data-driven demand projections, tight budgetary control, a minimum safety stock, staggered purchase orders, frequent stock takes, and wise purchasing,

	stocking, issuance, and inspection practises in order to maintain budgets and availability. Given that Category B comprises necessary and desired medications at a lower cost than Category C, it should be given significant thought. These medications are available for large orders. The category C might receive slack attention. As this category was inexpensive, orders could be placed just once or twice a year, saving on the cost of the purchase and allowing for a fair carrying cost.

2.2 Rationale

The study was performed in order to get the effective forecasting model at the Supply Chain of the Cancer hospital at Rohini, New Delhi which helps to reduce the inventory cost using the Economic Order Quantity and ABC analysis. Firstly, the objectives were to identify the list of drugs, medical consumables and surgical instrumentations used in the hospital and then forecasting the demands of the identifies items using the Seasonal Index and Linear Regression and then calculation of EOQ done for the identified items to get the proper knowledge of inventory management at the department.

Chapter 3

Research Methodology

This work is based on Quantitative analytical study at RGCI Hospital. In which secondary data was collected, directly from Management Information System from the Hospital.

Type of study: Quantitative analytical study
Location of study: conducted at the Rajiv Gandhi Cancer Institute & Research Centre.

Duration of study: A study was conducted from March 21 to June 21, 2022

Study subject: Secondary Data

Sample size: Total Items in Hospital stores: 2358

Category A- 400/2360

Category B- 710/ 2360

Category C- 1250/2360

Sample for analysis – 11 Medicines

4 Medical Consumables

Sampling Technique: The non-probability convenience sampling method was used in the research process.

Sampling Selection:

- Inclusive - In-patient medicines and consumables
- Exclusive - out- patient medical items

Data Collection Method: secondary Data was collected through review of the past records from the files of medical stores & from the hospital Management Information System and formulate to calculate forecasting using excel.

Statistical Method Employed-

- Seasonal Index
- Least Square Regression

Data Analysis – The data of medicines, medical consumables, holding cost, and ordering cost & per unit cost was provided by the hospital.

The first step was to identify monthly indent items from inpatient pharmacy. To find which items needs more attention compared to others, categorizes them into ABC category. Sort out the 2358 items in A, B& C category, then selected the 11 items from A category with high cost & 4 items with regular demand, then insert their historical demands (last 3 years consumption) into an excel sheet to see the trend of particular items. Find out their future demand using seasonal index & least square regression method with formula. After calculated future demand of every quarters, Economic order quantity was calculated using its mentioned formula.

Operational Defination

Inventory- The quantity of goods or the materials.

Inventory Control – Inventory control is a technique for keeping stock at a level where purchase and storage expenses are as low as feasible without compromising supply. As a result, it is essential for keeping the balance between two. If goods like pharmaceuticals are bought in big quantities, a supply may be created quickly and simply.

Methods: -

ABC ANALYSIS- All items have been classified based on its consumption value in the hospital.

(Consumption value = (Unit price of an item) (No. of units consumed per annum)

- A- These items consume 70% of the total inventory cost and are only 10%of the total inventory by quantity.
- B- These items consume 20% of the total inventory cost and are 20%of the total inventory by quantity.
- C- These items consume only 10% of the total inventory cost & 70%of the total inventory by quantity.
- Forecasting Inventory – Inventory forecasting is a technique for estimating inventory levels for the future. Keeping track of sales and demand also makes it easier to manage your purchase orders.

- Seasonal Index- This method is used to find the accurate demand when there is a seasonal fluctuation with the consumption pattern

  To calculate seasonal index

  We take the quarterly sales

  Divide each quarterly sales figure by its yearly average

  Take the average of these index of each quarter to get seasonal index values.

- Least Square Regression –

  $Y = a + bx$

  Y- Dependent variable

  a= Y- intercept (value of Y when X=0)

  b- Slope

  x- Independent variable

  $b = \frac{\text{sum xy} - n^* \text{ x ave y ave}}{\text{Sum x sq.} - n^* \text{ x ave sq.}}$

  a = y ave – b* x ave

In the seasonal index method demand is not constant, because of that this method is used to make seasonal adjustment from the previous year's consumption pattern. This indicates that to get accurate results some seasonal adjustment needed to be done. Each item went through some seasonal adjustment for accurate forecasting. Then a linear regression line was fitted to the demand after the data was plotted. Y- Trend equation is used to calculate the forecast for 13^{th} quarter. Quarter 13 then multiplied by the average seasonal index of 1^{st} quarter.

A. ECONOMIC ORDER QUANTITY-

The optimal order quantity an organization should place in order to reduce its inventory expenses, such as holding costs, shortage costs, and order charges, is known as the economic order quantity (EOQ).

Where:

Economic Order Quantity

$$EOQ = \sqrt{\frac{2 \times D \times S}{H}}$$

S=Setup costs (per order, generally including shipping and handling)

D=Demand rate (quantity sold per year)

H=Holding costs (per year, per unit)

Utilizing the seasonal index technique of predicting, demand was determined. whereas, the hospital provided ordering cost and holding cost .

Chapter 4

Result and Analysis

SECTION 1

The following are the results and interpretation of the study carried, for which out of 2358 items I have taken 15 items which included 11 items are from A category with high cost & 4 items with regular demand in which the quarterly demand of these items were provided by the IPD pharmacy of the past 3 years were analyzed.

	2019				2020				2021			
Item Name	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Herclone-440	40	30	34	38	34	28	24	32	42	30	40	32
Hervycta Plus - 440	22	20	18	19	21	17	15	16	25	19	22	21
Perzeta 420 ml	12	9	12	15	13	6	9	12	15	7	9	13
Keytruda 100 ml/gm.	21	12	6	7	12	9	3	6	27	6	21	24
Uniplatin 50 ml/gm.	4500	2700	3,600	3,150	3780	2790	3,390	4,050	3870	2700	3,510	4,230
Kemocarb 450 ml/gm.	400	300	340	380	330	270	210	320	420	300	380	310
Mitotax 30 ml/gm.	2700	1800	2,160	1,890	2430	1080	1,530	2,340	1980	900	1,260	2,160
Irinot 100 Mg	420	280	330	370	310	260	210	300	410	230	420	330
5-Flucel	13500	9000	11,250	10,800	12600	8100	11,700	12,150	10500	6300	9900	12,400
Asviia 3750 U	34	30	28	48	26	22	14	40	54	34	48	60
Examination Gloves Medium	20160	22500	20,500	20,900	18160	21100	18,000	20,400	21160	21300	21,500	21,400
Blood Glucose Strips (1*100)	30	22	25	23	26	21	24	25	26	22	25	27
Atracurium Inj (NEON)	1800	1000	1,200	1,150	1300	500	900	1,075	1150	650	990	1200
Double Lumen Catheter 16G (B.BRAUN)	1500	1000	1,200	1,100	1400	600	1,050	1,350	1225	550	990	1325
Infusable Pressure Bag 500ML	400	350	370	360	330	220	270	320	310	210	290	330

Table 4.1 depicting the quarter demand of 2019, 2020 and 2021

This table shows the forecasting of 2022 using seasonal index and linear regression

Item Name	SI(Q1)	SI(Q2)	SI(Q3)	SI(Q4)	Q1(2022)	Q2(2022)	Q3(2022)	Q4(2022)
Herclone-440	1.1	0.9	1	1	38	29	32	33
Hervycta Plus - 440	1.1	0.9	1	1	23	18	20	21
Perzeta 420 ml	1.2	0.7	0.9	1.2	13	7	9	12
Keytruda 100 ml/gm.	1.6	0.7	0.8	0.9	21	12	17	23
Uniplatin 50 ml/gm.	1.2	0.8	1	1.1	4310	2882	3613	3985
Kemocarb 450 ml/gm.	1.2	0.9	0.9	1	368	277	308	319
Mitotax 30 ml/gm.	1.3	0.7	0.9	1.2	1819	921	1146	1405
Irinot 100 Mg	1.2	0.8	1	1	362	274	304	315
5-Flucel	1.1	0.7	1	1.1	10804	6783	9557	10367
Asviia 3750 U	1	0.8	0.8	1.4	56	44	51	55
Examination Gloves Medium	1	1.1	1	1.1	20935	22876	21251	22148
Blood Glucose Strips (1*100)	1.1	0.9	1	1	27	21	24	25
Atracurium Inj (NEON)	1.3	0.7	1	1.1	1080	555	755	789
Double Lumen Catheter 16G (B.BRAUN)	1.1	0.9	1	1	1175	576	940	1012
Infusable Pressure Bag 500ML	1.1	0.8	1	1.1	290	212	227	227

Table 4.2 depicting the forecasting of 2022

INTERPRETAION- Seasonal index is the measure of the quarterly consumption compared to the annual average consumption. Here the seasonal index of 2022 is forecasted using least square regression method. The base is of 2019 consumption and then multiplied by seasonal index to find the average consumption in next years.

- There has been increase in demand for Hervycta plus-400, Herclone -400, Asviia 3750 U, Examination Gloves Medium, Uniplatin 50ml/mg, Keytruda 100ml/mg for the year 2021 when compared to 2019 & 2020.
- There has been increase in demand for Perjeta 420mg inj., Kemocrab 450ml/mg, Mitotax 30ml/mg, Irinot 100 mg, 5 -Flucel, Atracurium Inj. (NEON), Double Lumen Catheter 16g (B.BRAUN) , Infusible Pressure Bag 500 ml , for the year 2019 when compared to 2020 & 2021.
- In comparison to 2020, the demand for blood glucose strips has increased in the years 2019 and 2021.
- And the trend was captured & reflected in the forecasted value for the year 2022.

SECTION 2

Utilizing the seasonal index technique of predicting, demand was determined. whereas, the hospital provided ordering cost and holding cost .

Economic Order Quantity for Herclone-440

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	38	50000	3500	5000	**10**
Q2	29	50000	3500	5000	**9**
Q3	32	50000	3500	5000	**10**
Q4	33	50000	3500	5000	**10**

Table 4.3: Economic Order Quantity for Herclone-440

INTERPREATION- The optimal quantity of Herclone-440 ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 10.9, 10, 10.

Economic Order Quantity for Hervycta Plus - 440

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	23	32000	2240	3200	**8**
Q2	18	32000	2240	3200	**7**
Q3	20	32000	2240	3200	**8**
Q4	21	32000	2240	3200	**8**

Table 4.4: Economic Order Quantity for Hervycta Plus - 440

INTERPRETATION- The optimal quantity of Hervycta-440 ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 8, 7, 8, 8.

Economic Order Quantity for Perzeta 420 Ml

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	13	2,50,000	17500	25000	**6**
Q2	7	2,50,000	17500	25000	**4**
Q3	9	2,50,000	17500	25000	**5**
Q4	12	2,50,000	17500	25000	**6**

Table 4.5: Economic Order Quantity for Perjeta 420 ml

INTERPRETATION- The optimal quantity of Perjeta 420 ml ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 6, 4, 5, 6.

Economic Order Quantity for Keytruda 100 ml/mg

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	21	1,70,000	11900	17000	**8**
Q2	12	1,70,000	11900	17000	**6**
Q3	17	1,70,000	11900	17000	**7**
Q4	23	1,70,000	11900	17000	**8**

Table 4.6: Economic Order Quantity Keytruda 100ml/mg

INTERPRETATION- The optimal quantity of Keytruda 100 ml/mg ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 8, 6, 7, 8.

Economic Order Quantity for Uniplatin 50 ml/mg

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	4310	350	25	35	**111**
Q2	2882	350	25	35	**91**
Q3	3613	350	25	35	**102**
Q4	3985	350	25	35	**107**

Table 4.7: Economic Order Quantity for Uniplatin 50 ml/mg

INTERPRETATION- The optimal quantity of Uniplatin 50 ml/mg ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 111, 91, 102, 107.

Economic Order Quantity for Kemocarb 450ml/mg

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	368	2000	140	200	**32**
Q2	277	2000	140	200	**28**
Q3	308	2000	140	200	**30**
Q4	319	2000	140	200	**30**

Table 4.8: Economic Order Quantity for Kemocrab 450 ml/mg

INTERPRETATION- The optimal quantity of Kemocrab 450 ml/mg ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 32, 28, 30, 30.

Economic Order Quantity for Mitotax 30 ml/mg

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	1819	1148	80	115	**72**
Q2	921	1148	80	115	**51**
Q3	1146	1148	80	115	**57**
Q4	1405	1148	80	115	**63**

Table 4.9: Economic Order Quantity for Mitotax 30 ml/mg

INTERPRETATION- The optimal quantity of Mitotax 30ml/mg ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is72, 51, 57, 63.

Economic Order Quantity for Irinot 100 Mg

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	362	1148	80	115	**32**
Q2	274	1148	80	115	**28**
Q3	304	1148	80	115	**29**
Q4	315	1148	80	115	**30**

Table 4.10: Economic Order Quantity for Irinot 100 mg

INTERPRETATION- The optimal quantity of Irinot 100mg ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 32, 28, 29, 30.

Economic Order Quantity For 5-Flucel

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	10804	60	4	6	**176**
Q2	6783	60	4	6	**139**
Q3	9557	60	4	6	**165**
Q4	10367	60	4	6	**172**

Table 4.11: Economic Order Quantity for 5-Flucel

INTERPRETATION- The optimal quantity of 5- Flucel ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 176, 139, 65, 172.

Economic Order Quantity for Asviia 3750 U

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	56	16000	1120	1600	**13**
Q2	44	16000	1120	1600	**11**
Q3	51	16000	1120	1600	**12**
Q4	55	16000	1120	1600	**13**

Table 4.12: Economic Order Quantity for Asviia 3750 U

INTERPRETATION- The optimal quantity of Asviia 3750U ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 13, 11, 12, 13.

Economic Order Quantity for Examination Gloves Medium

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	20935	20	1.4	2	**245**
Q2	22876	20	1.4	2	**256**
Q3	21251	20	1.4	2	**246**
Q4	22148	20	1.4	2	**252**

Table 4.13: Economic Order Quantity for Examination Gloves Medium

INTERPRETATION- The optimal quantity of Examination Gloves Medium ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 245, 256, 246 and 252.

Economic Order Quantity for Blood Glucose Strips (1*100)

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	27	900	63	90	**9**
Q2	21	900	63	90	**8**
Q3	24	900	63	90	**8**
Q4	25	900	63	90	**8**

Table 4.14: Economic Order Quantity for blood glucose strip

INTERPRETATION- The optimal quantity of blood glucose strip ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 9, 8, 8, 8.

Economic Order Quantity for Atracurium Inj (Neon)

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	1080	38	2.7	3.8	**56**
Q2	555	38	2.7	3.8	**40**
Q3	755	38	2.7	3.8	**46**
Q4	789	38	2.7	3.8	**47**

Table 4.15: Economic Order Quantity for Atracurium Inj (NEON)

INTERPRETATION- The optimal quantity of Atracurium Inj (NEON) ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 56, 40, 46, 47.

Economic Order Quantity for Double Lumen Catheter 16g (B.Braun)

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	1175	1600	82	118	**58**
Q2	576	1600	40	58	**41**
Q3	940	1600	66	94	**52**
Q4	1012	1600	71	101	**54**

Table 4.16: Economic Order Quantity for Double Lumen Catheter 16g (B.Braun)

INTERPRETATION- The optimal quantity of Double Lumen Catheter 16g (B.Braun) ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 58, 41, 52, 54.

Economic Order Quantity for Infusable Pressure Bag 500ml

Quarters	Forecasted Demand	Unit Cost (Rs)	Holding Cost (7% Of Unit Cost)	Ordering Cost (10 % Of Unit Cost)	**Eoq**
Q1	290	4500	315	4500	**29**
Q2	212	4500	315	4500	**25**
Q3	227	4500	315	4500	**25**
Q4	227	4500	315	4500	**25**

Table 4.17: Economic Order Quantity for Infusable Pressure Bag 500ml

INTERPRETATION- The optimal quantity of Infusable Pressure Bag 500ml ordered to meet projected demand and minimize associated costs when holding and ordering costs are assumed to be 7 percent and 10 percent of unit cost for each quarter is 29, 25, 25, 25.

Chapter 5

Conclusion

An economic order quantity and a forecasting model were given to them in order to aid in decreasing their stock outs. In order to minimise the problem of hospital product stock out, the economic order quantity optimises the order quantity for each product when an order is placed. The results have demonstrated improvements in forecasting through the provision and recommendation of the inventory control model. This method of forecasting will ensure the optimum items quantity in stock, which would increase profit & reduce inventory holding cost by forecasting according to the seasonal variations.

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