

A study on optimizing inventory by application of ABC analysis, Forecasting and Economic order quantity at Sankara Eye Hospital, Coimbatore

**By: Smit Shah
Management Trainee
Sankara Eye Hospital, Coimbatore**

Introduction

- Inventory management and control is one of the most important aspect in an effective organization.
- It is vital for any organization to control the flow of goods and materials. The primary goal of inventory management is to avoid holding too much stock and avoid stock outs
- Economic order quantity (EOQ) is a proven model to optimize stock quantities and minimize associated costs
- The purpose of this study is to implement an effective forecasting model to facilitate optimum inventory control using ABC analysis and Economic order quantity

Objectives and Rationale

Objectives

- To identify drugs and medical consumables for applying economic order quantity
- To forecast the demand for the identified items
- To calculate the economic order quantity for identified items

Rationale

- At Sankara Eye Hospital, Coimbatore a 'minimum-maximum' inventory control model is used which highlights the range of quantities to be maintained at a given point of time
- The range is currently forecasted using simple average method
- The seasonal index method of forecasting along with economic order quantity will take into consideration trends and seasonal variation in demand and enable the organisation to maintain optimum level of inventory

Methodology

Research Question

- What is the current inventory control model utilized at Sankara Eye Hospital, Coimbatore?
- How will the application of economic order quantity inventory control model affect the current status of inventory?

Study Design

- Quantitative descriptive study conducted on a retrospective basis

Sample size calculation

- Total items in hospital stores: 560
 - Item Category A = 3/560
 - Item Category B = 4/560
 - Item Category C = 553/560
- Sample for analysis: 8 medicines
 - 5 medical consumables

- **Sampling method**

Non-probability convenience sampling

- **Data collection method**

Secondary consumption data for last 2 years was collected from Management Information System of Sankara Eye Hospital, Coimbatore.

Statistical methods employed

- Seasonal Index method
- Linear Regression

- **Inclusion criteria:** In patient medicines and consumables
- **Exclusion criteria:** Intraocular lens
- **Limitations:** Ordering cost (S) was not available, hence it was calculated on unit cost

Seasonal Index method of forecasting

- A seasonal index is a measure of how a season through some cycle compares with the average season of that cycle. By de-seasonalizing data, we're removing seasonal fluctuations, or patterns in the data, to predict or approximate future data values
- The seasonal index of each value is calculated by dividing the period amount by the average of all periods. This creates a relationship between the period amount and the average that reflects how much a period is higher or lower than the average
- For this study each quarter consumption average was divided by yearly consumption average to obtain seasonal index. Least square regression was then applied to forecast the value for next quarters

Economic Order Quantity (EOQ)

- Economic order quantity (EOQ) is the ideal order quantity an organisation should purchase to minimize inventory costs such as holding costs and ordering costs.
- It is calculated by using the following formula:

$$Q = \frac{\sqrt{2DS}}{H}$$

Where,

Q = economic order quantity

D = demand

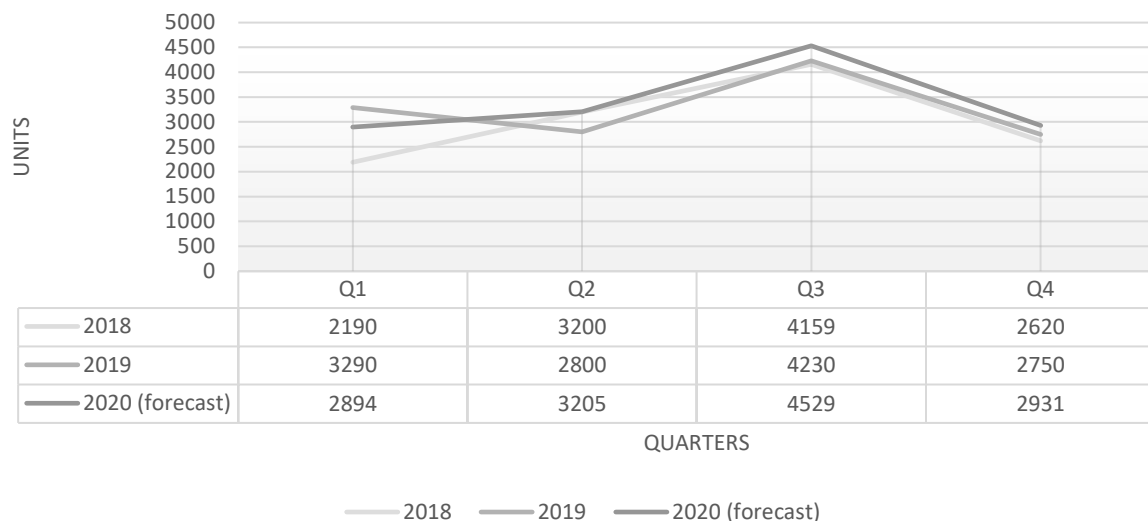
S = ordering cost

H = holding cost

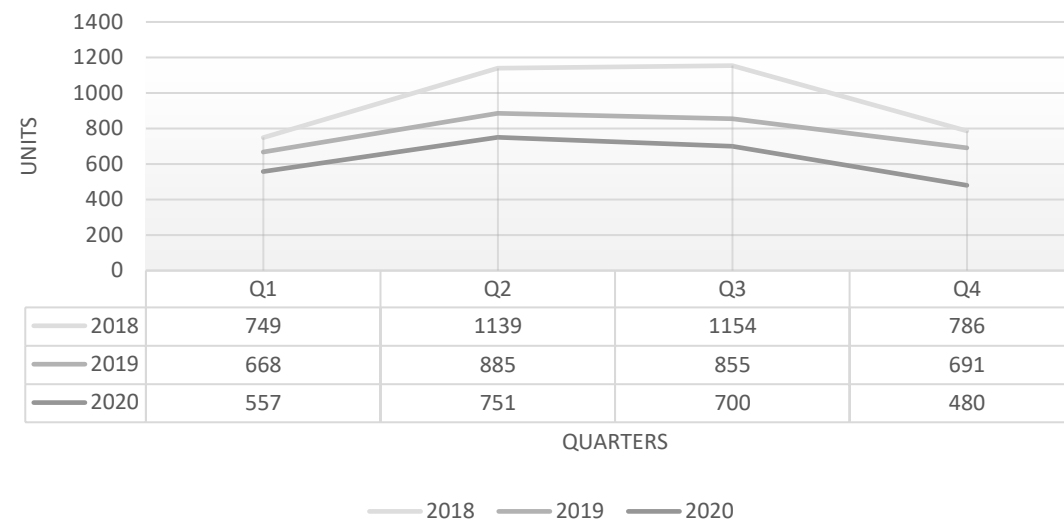
- **Demand (D) was calculated by using seasonal index method of forecasting. Whereas, ordering cost (S) was calculated as 20% of unit cost and holding cost (H) was calculated as 24% of unit cost annually**

Results (forecast for the year 2020)

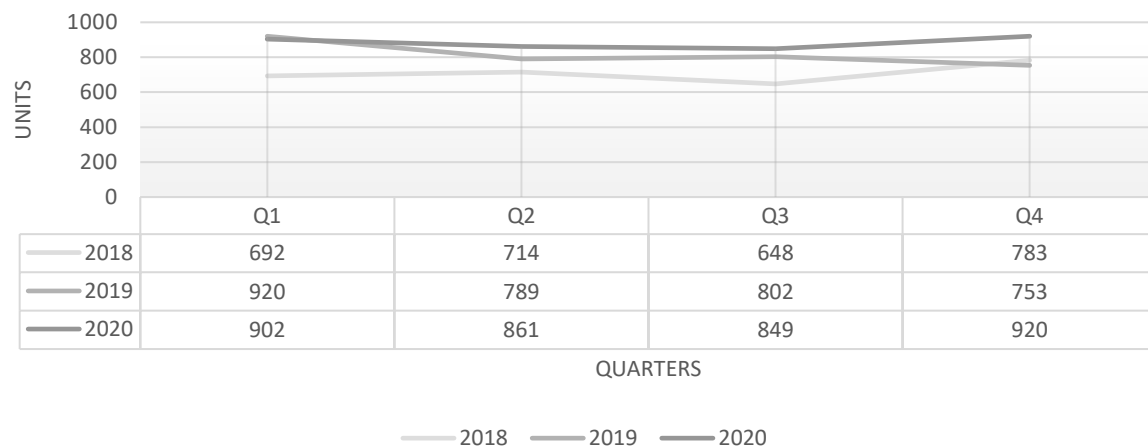
Actamid



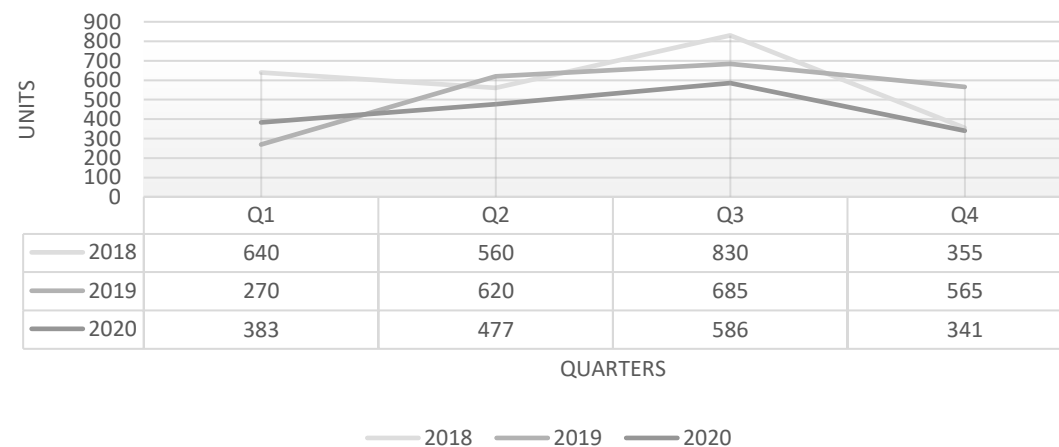
Tropicacyl Plus



Exocin 5ML

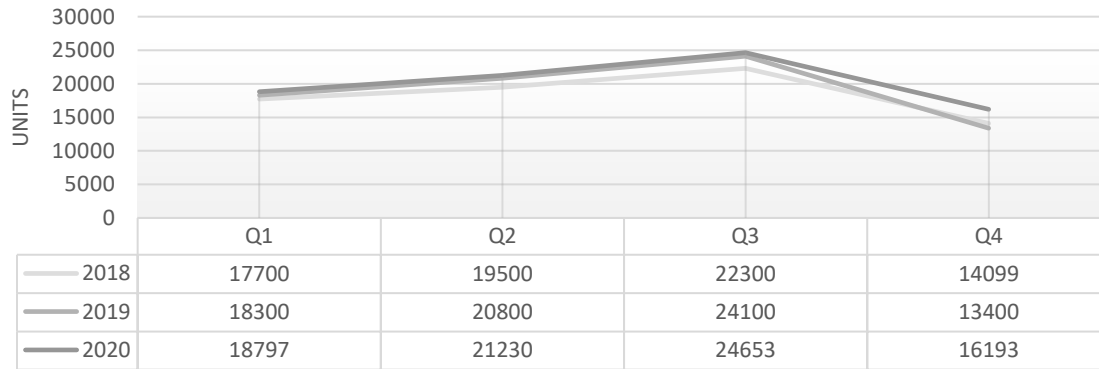


Chymoral Forte Tab



Results (forecast for the year 2020)

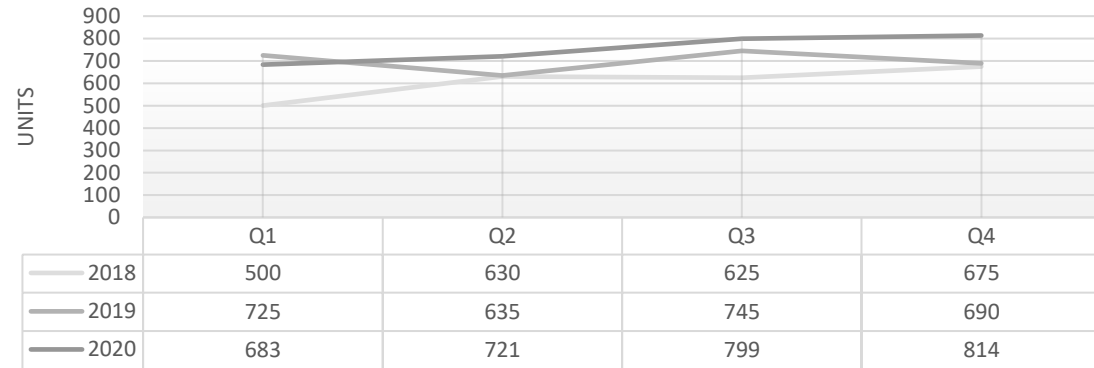
Glucometer Strips



QUARTERS

— 2018 — 2019 — 2020

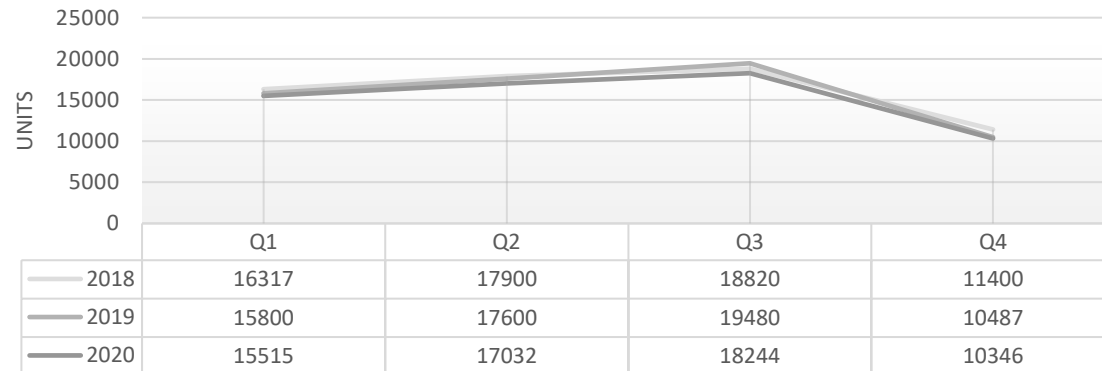
Cohevisc



QUARTERS

— 2018 — 2019 — 2020

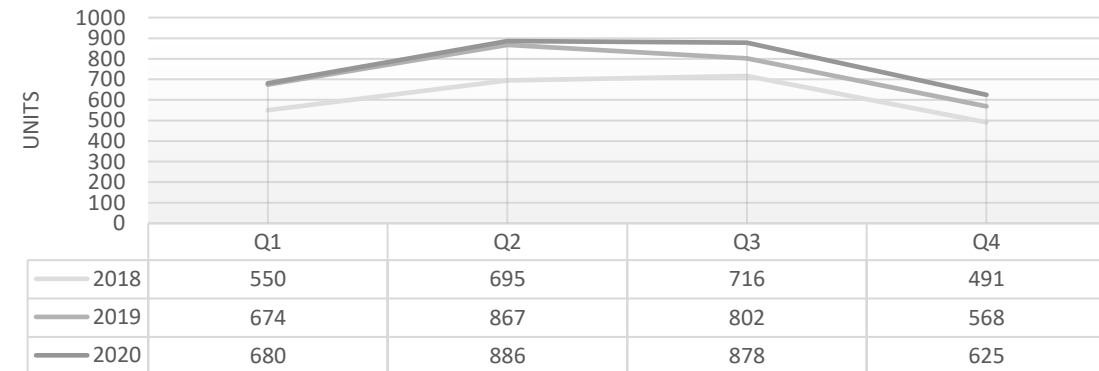
Lancet (OR) Medipoint



QUARTERS

— 2018 — 2019 — 2020

Vigamox 5ML

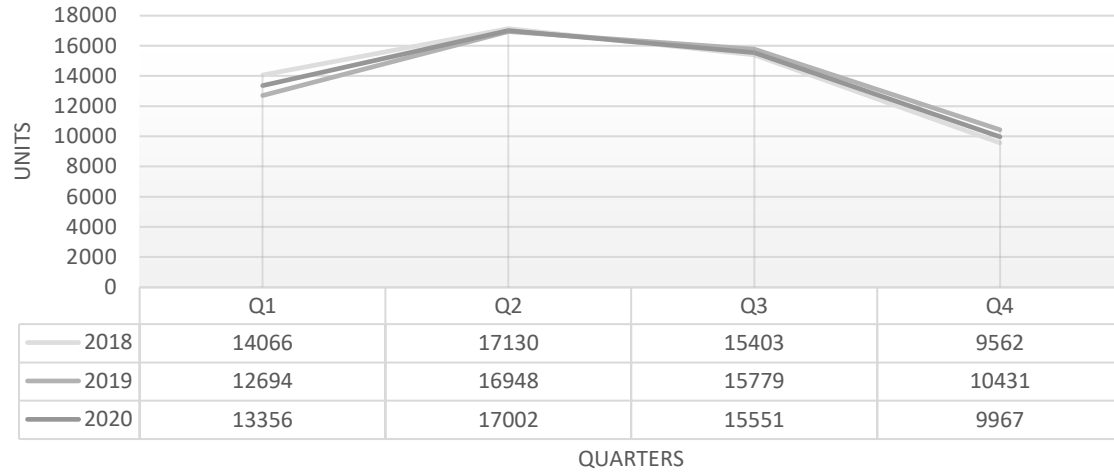


QUARTERS

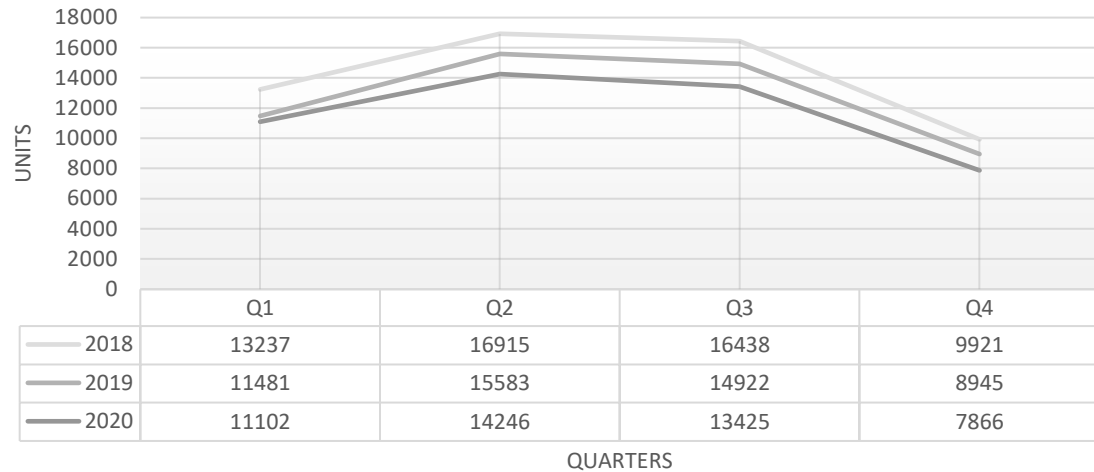
— 2018 — 2019 — 2020

Results (forecast for the year 2020)

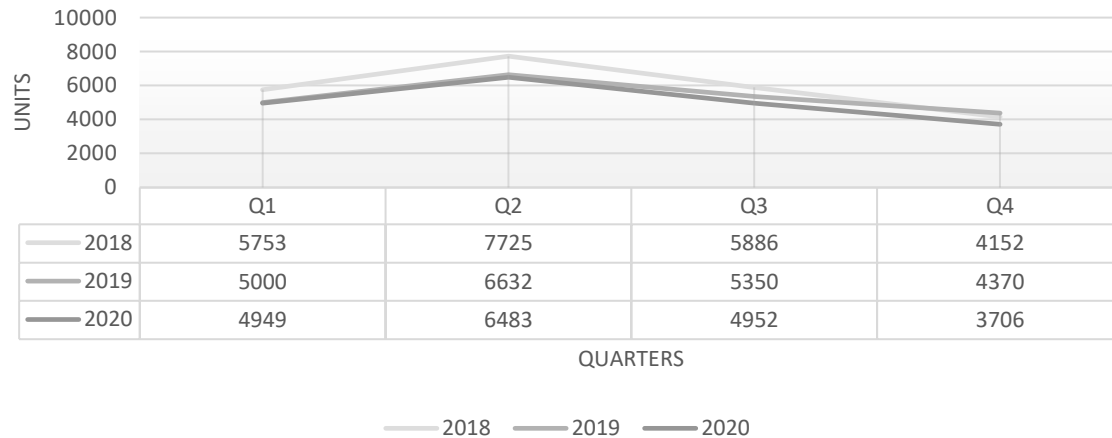
2CC Syringe



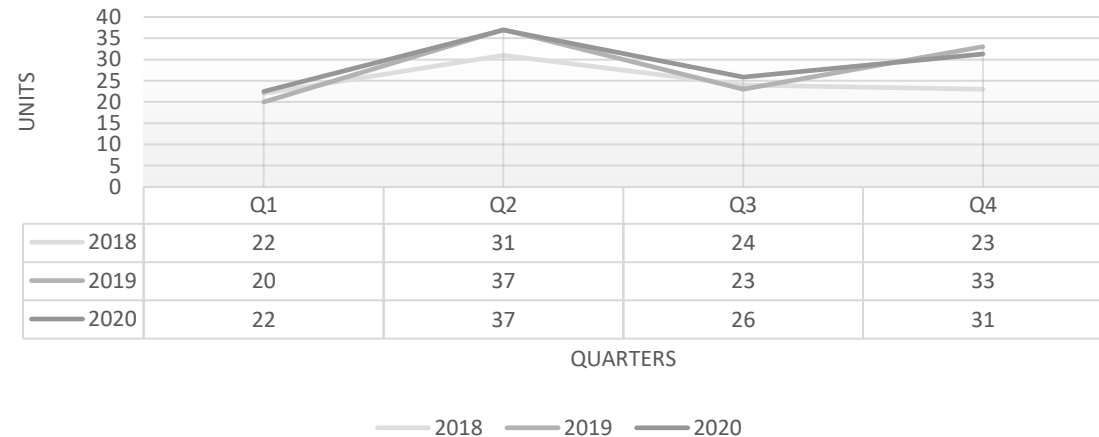
5CC Syringe



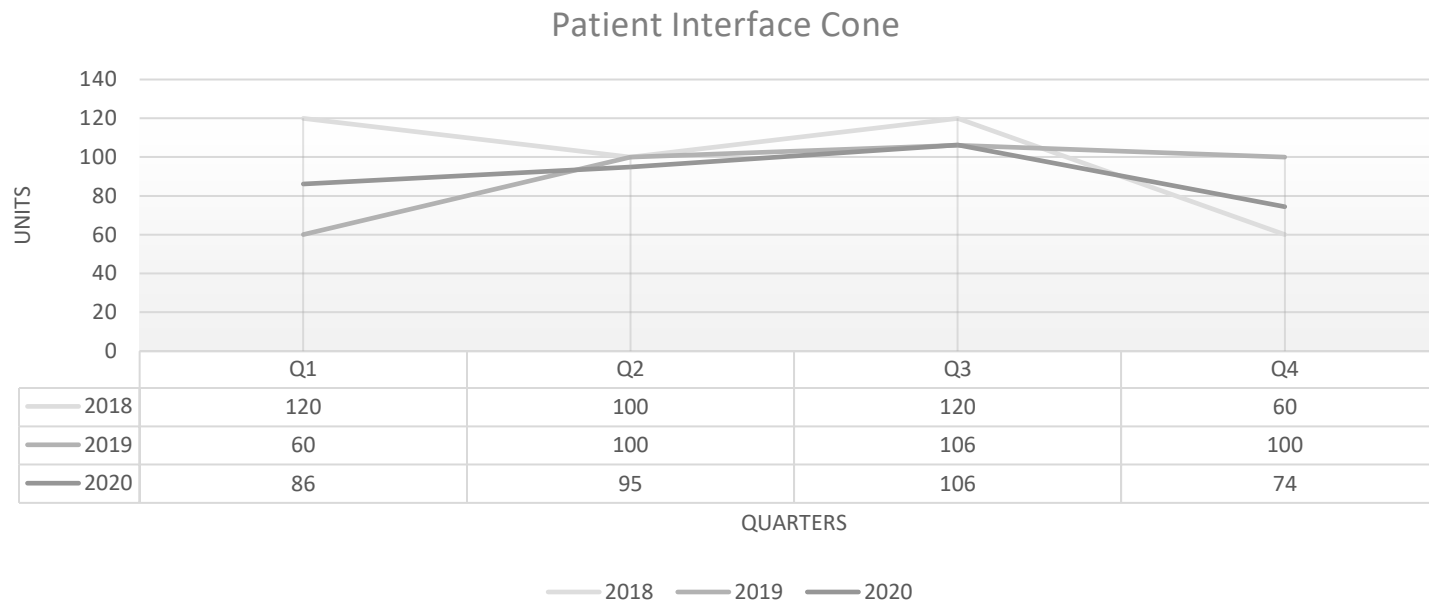
Appavisc PFS 3ML



Ribolink 1MG



Results (forecast for the year 2020)



Economic Order Quantity

Economic order quantity for Actamid

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	2894	2.83	6	20	139
Q2	3205	2.83	6	20	146
Q3	4529	2.83	6	20	174
Q4	2931	2.83	6	20	140

Economic order quantity for Tropicacyl Plus

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	557	34.54	6	20	61
Q2	751	34.54	6	20	71
Q3	700	34.54	6	20	68
Q4	480	34.54	6	20	57

Economic order quantity for Exocin 5ML

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	902	41.29	6	20	78
Q2	861	41.29	6	20	76
Q3	849	41.29	6	20	75
Q4	920	41.29	6	20	78

Economic order quantity for Chymoral Forte Tab

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	383	12.93	6	20	51
Q2	477	12.93	6	20	56
Q3	586	12.93	6	20	63
Q4	341	12.93	6	20	48

Economic Order Quantity

Economic order quantity for Glucometer Strips

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	18797	7.14	6	20	354
Q2	21230	7.14	6	20	376
Q3	24653	7.14	6	20	405
Q4	16193	7.14	6	20	329

Economic order quantity for Cohevisc

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	683	290	6	20	67
Q2	721	290	6	20	69
Q3	799	290	6	20	73
Q4	814	290	6	20	74

Economic order quantity for Lancet (OR) Medipoint

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	15515	1.46	6	20	322
Q2	17032	1.46	6	20	337
Q3	18244	1.46	6	20	349
Q4	10346	1.46	6	20	263

Economic order quantity for Vigamox 5ML

Quart ers	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	680	188.62	6	20	67
Q2	886	188.62	6	20	77
Q3	878	188.62	6	20	77
Q4	625	188.62	6	20	65

Economic Order Quantity

Economic order quantity for 2CC Syringe

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	13356	1.86	6	20	298
Q2	17002	1.86	6	20	337
Q3	15551	1.86	6	20	332
Q4	9967	1.86	6	20	258

Economic order quantity for 5CC Syringe

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	11102	2.38	6	20	272
Q2	14246	2.38	6	20	308
Q3	13425	2.38	6	20	299
Q4	7866	2.38	6	20	229

Economic order quantity for Appavisc PFS 3ML

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	4949	42.86	6	20	182
Q2	6483	42.86	6	20	208
Q3	4952	42.86	6	20	182
Q4	3706	42.86	6	20	157

Economic order quantity for Ribolink 1MG

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	22	3626.55	6	20	12
Q2	37	3626.55	6	20	16
Q3	26	3626.55	6	20	13
Q4	31	3626.55	6	20	14

Economic Order Quantity

Economic order quantity for Patient Interface Cone

Quarters	Forecasted demand	Unit cost (Rs)	Holding cost (% of unit cost)	Ordering cost (% of unit cost)	Economic order quantity
Q1	120	7533.03	6	20	28
Q2	100	7533.03	6	20	26
Q3	120	7533.03	6	20	28
Q4	60	7533.03	6	20	20

Conclusion

- The current model of forecasting utilised at Sankara Eye Hospital, Coimbatore considers simple average consumption. It does not capture trends and seasonal variation in consumption pattern. This might lead to stock outs or over-stocking which may result in loss of sales or increased carrying costs. The proposed model of seasonal index forecasting will capture trend and seasonal variation in demand and enable the organization to forecast demand efficiently
- Economic order quantity would help the organization to take decisions on optimum quantity to be ordered for a commodity. This would further contribute towards minimizing associated costs
- The results have shown a more comprehensive method of forecasting. However, quantification of holistic associated ordering costs would yield a more accurate result for economic order quantity