

Inventory Control Analysis of Patent Medicine Using Activity Based Costing and Economic Order Quantity Method

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Abstract

Pharmacy X is located on Jendral Sudirman Street, Duri Barat Village, Mandau District, Bengkalis Regency, Riau Province, Indonesia. Due to the lack of grouping for medications and a mechanism for calculating the frequency of reorders, this pharmacy struggled to manage its supply of medications. This study aims to identify patent medicine type A using Activity-Based Costing (ABC) Analysis, as well as the optimal number of medicine orders using the Economic Order Quantity (EOQ) Method and reordering. Data is gathered through observation and interviews with medicine supplier companies, lead time, storage costs, ordering costs, and sales data. The ABC grouping analysis of patent medicine type A yielded 31 types of medicine, according to the findings. The use of EOQ proved to be more optimal, with a dispute of Rp. 582. 498,373, as did the use of Reorder Point, with an average of when the drug stayed 1 unit the company had to reorder. Pharmacy X is expected to consider using EOQ to perform minimum ordering on prioritized drugs in an effort to reduce excessive inventory costs.

Keywords

Activity Based Costing, EOQ, Inventory, Lead Time and Reorder Point.

1. Introduction

Pharmacy X is located on Jl. Jendral Sudirman, Duri Barat Village, Mandau District, Bengkalis Regency, Riau. It is one of the most frequently visited pharmacies in Duri due to its central location. So far, Pharmacy X's drug inventory control consists solely of checking the stock of each drug. Orders are only placed when the drug supply is depleted. There is no drug grouping and no special calculation to determine the number of reorders.

According to the findings of interviews with pharmacy owners, the most common problems are drug shortages and drug excess, with the latter resulting from the fact that consumers rarely purchase drugs, but pharmacies maintain excessive quantities of these drugs. There were numerous expired patent drugs in 2021, with the pharmacy suffering the most losses due to expired drugs in January, totaling Rp. 6,561,000. Due to expired patent drugs, Pharmacy X incurred a loss of Rp. 15,752,500 in 2021.

To determine whether inventory control is effective, three questions must be answered: what to control, how much to order, and when to reorder. The ABC method can then be used to determine which drugs are the most important to control, the Economic Order Quantity (EOQ) method to determine how many drugs to order, and the Reorder Point (ROP) method to determine when the drugs will be delivered and reordered (Abbas et al. 2021).

1.1 Objectives

The purpose of this study, based on the problem stated above, is to classify the group of patent drugs type A based on the ABC method, which is a group of patented drugs that provide high-cost benefits for Pharmacy X. Its purpose is to determine the optimal number of drug orders using the EOQ method and to determine when to reorder using the EOQ method. ROP at Pharmacy X and provide Pharmacy X with recommendations or suggestions for dealing with inventory control issues in Type A Patent Drugs.

2. Literature Review

A. Inventory Control

Inventory control is the effort by a company's logistics management to control inventory in the face of inescapable costs. It is because it has inventory and includes these costs, which are storage costs, ordering costs, and shortage costs. All of these costs have unique characteristics that must be comprehended by the business, particularly those in charge of the logistics sector (Prastyorini 2020).

B. ABC method

The ABC method classifies a group of materials in descending order according to how much it costs to use each material for a given amount of time (price per unit of material multiplied by the volume of use of the material during a certain period). One year is the most typical duration (Gaspersz 2006). The group is classified into (Rikomah 2017):

1. Group A

Group A is a drug that consumes 70% of the budget while using no more than 20% of the medicine. Drugs in the class A group are extremely dangerous, and they must be strictly controlled and monitored on a continuous basis.

2. Group B

Group B takes up a 20% budget with a drug amount of around 10-80%. Group B drugs are subject to less stringent supply restrictions than group A drugs. However, reports on their use and the remainder of the drug are still required, so that inventory management can always be managed.

3. Group C

Group C consumes 10% of the budget, with medicine accounting for 10-15%. More medicinal goods in Class C, but no impact on warehouse and financial activities because they are less expensive and use less energy.

C. Forecasting

Forecasting is a tool or method for predicting or estimating a future value by paying close attention to relevant data or information, both past and present. Forecasting is almost always performed by everyone, whether they work for the government, a business, or are simply concerned about the weather, the inflation rate, political issues, or the exchange rate of a country's currency (Maricar 2019).

D. EOQ (Economic Order Quantity) Method

EOQ is one of the most commonly employed inventory control techniques. Knowing the assumptions of the known quantity of demand, constant waiting time or lead time, lack of quantity discounts, variable costs only ordering costs and holding costs, and complete avoidance of out-of-stock situations makes it a simple technique to implement (Dyatmika & Krisnadewara 2017). Following is the formula for calculating the EOQ:

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

Where Q is the number of Order Quantities, and DS/H is holding cost of each unit product.

Using the above formula, we can also determine the number of orders (P) during a specific time period, namely by the formula (Heizer and Render 2011):

$$P = \frac{D}{Q}$$

Where D is the product demand and Q is the economic order quantities. The total annual inventory cost (TIC) is calculated by adding up the total ordering cost (TS) and the total holding cost (TH), is (Efendi et al., 2019):

TIC = Ordering fee + Storage fee

$$TIC = S + H \frac{DQ}{2}$$

Where TIC is Total inventory cost (total inventory cost), S is storage costs.

E. Safety Stock

Safety stock refers to an inventory that protects or maintains the possibility of a product shortage. For instance, when the use of goods exceeds the original estimate or there are delays in receiving the ordered goods. The calculation formula for safety stock is (Ryando and Susanti 2019):

$$SS = Z \cdot xstd$$

Where:

Z = factor of safety used by the company

SS = Safety stock

std = Standard deviation of demand

In this case, the safety factor in question is the possibility that the company will use stockout. For example, a company uses a 5% probability of running out of stock, then by using a normal frequency distribution table with a value of 0.05 = 1.65 (Heizer and Render2011).

F. Reorder Point (ROP)

The reorder point is the time or point at which a similar order must be held so that the arrival or receipt of the ordered material coincides with the moment when the safety stock inventory reaches zero (Ryando and Susanti2019).

The ROP equation is as follows:(Efendi et al.2019):

$$ROP = (dx L) + SS$$

Where:

ROP = Reorder Point

d = daily demand

L = lead time (waiting time)

SS = safety stock (safety stock/buffer stock)

G. Total Company Cost

Calculation of the total cost of inventory or Total Inventory Cost (TIC) in the Company with the following formula(R et al. 2019):

Factory TIC = (frequency of orders x cost of one order) + (use of raw materials for one year x holding costs)

TICper = holding fee + ordering fee

$$TICper = (D \times H) + (nx S)$$

Where:

TICper = Company Inventory Cost

D = Average use of raw materials per year

S = Ordering Fee

H = Storage Cost

n = Number of orders per year

3. Methods

PT. X was the subject of this investigation. The goal of data collection was to allow someone to answer the research questions, test hypotheses, and evaluate the results. This study required both primary and secondary data, particularly:

a. Primary data

This primary data was collected through direct observation of Pharmacy X. Primary data is a type of research data obtained from company interviews to gather information or data for further data processing. The information gleaned from the interviews included the names of companies that supplied patented drugs to Pharmacy X.

b. Secondary data

This secondary data was gathered from already-existing sources, specifically internal company data. Among the information obtained were:

- 1) Company profile
- 2) Booking fee
- 3) *Lead time*
- 4) Storage fee
- 5) Company sales data.

3.1. ABC Analysis Method

ABC analysis identifies, by grouping the types of drugs whose use or high prices necessitate the greatest expenditures or budgets. The ABC analysis is conducted as follows:

1. Calculating the revenue value of each patented drug during 2021
2. Calculating the total revenue from all patent drug inventories in 2021
3. Calculating the percentage of income generated by each patented drug
4. Sorting patent drugs by percentage of their income value, from largest to smallest
5. Calculating the total percentage value of patent drug revenue

6. Group A patented drugs have a revenue value of 70% of total drug revenue, Group B patented drugs have a revenue value of 20% of total drug revenue, and Group C patented drugs have a revenue value of 10% of total drug revenue.

3.2. Forecasting (Forecast)

After group A patent drugs were obtained, the forecasting method was applied to forecast demand in 2022. Forecasting is carried out in the following way:

1. Identify request data patterns
2. Forecasting using the QM application for Windows version 5.0
3. Forecasting accuracy measurement
4. Determine the method with the least amount of error

3.3. Economic Order Quantity (EOQ) Method

After determining the demand, the Economic Order Quantity (EOQ) method was used. Utilizing this method, the amount of each inventory order was determined to reduce ordering and storage costs while increasing the efficiency of the overall inventory cost. Additionally, this technique can establish how frequently each group A patented drugs are ordered in a given year.

The steps for calculating the Economic Order Quantity on patented drugs are as follows:

1. Calculate the demand or need for drugs over a one-year period, beginning in January 2021 and ending in December 2021. (forecast).
2. Lead Time or the waiting time required from the time the order is placed until the drug arrives at the pharmacy, as determined by interviews with the pharmacy owner.
3. Order Cost or the cost each time you make an order, which includes phone and stationery costs, is Rp. 1.500,00, as determined by interviews with Pharmacy owners.
4. Storage fee
5. Finally, perform the EOQ Method calculation.

3.4. Reorder Points (ROP)

Before calculating the ROP, the safety stock or safety stock must be determined. The ROP calculation is performed after determining the safety stock. The term "reorder point" refers to the inventory level at which an order must be placed. The company determines the necessary reorder point to avoid running out of stock (stockout) or having excess stock when the amount of inventory in stock starts to steadily decline (over stock).

The steps involved in calculating Reorder Point for patented drugs are as follows:

1. Look for safety stock or calculate safety stock. The company uses a probability of 5% of stockouts, then by using the normal frequency distribution table, the obtained value of $Z_{0.05} = 1.65$ (Heizer and Render, 2011).
2. Lastly, conduct the ROP calculation.

4. Data Collection

Pharmacy X information was collected through interviews and direct observations. The generated data included company profiles, the names of drug suppliers to Pharmacy X, as well as order and sales information for 2021. The retrieved data for this study are:

4.1. X Duri Pharmacy Profile

Pharmacy X is located on Jl. Jendral Sudirman, Duri Barat Village, Mandau District, Bengkalis Regency, Riau. It is one of the most frequented pharmacies in Duri due to its central location.

4.2. X Pharmacy Suppliers

This pharmacy receives drugs from 10 different suppliers, including PT. Amtar Mitra I-3 Sembada, PT. Kebayoran Farma, PT. Indo Farma Global Medica, PT. Harapan Raya Mandiri, PT. Bina Sanprima, PT. Anugrah Arigon Medica, PT. Global Medica Pekanbaru, PT. Kimia Farma, PT. Mensa Bina Sukses, and PT. pentavalent. Orders for drugs are decided to make when the supplier comes to the pharmacy, which occurs at the beginning of every month.

4.3. Ordering Costs

The cost of ordering is known as a result of interviews with pharmacies, where the costs incurred to place an order are included in a single message. The reservation fee is Rp. 1.500,00.-

4.4. Lead Time

The leadtime of each order is the interval or grace period between the time an order is placed and the time it arrives at the pharmacy. Each drug requires a two-day lead time. The following is Table 1 which provides the holding cost details.

Table 1. Holding Costs at Pharmacy X

No	Medicine Name	Selling Price (Rp)	Holding Cost (Rp)
1	Ventolin Inhaler	140000	233,333
2	Diane	190000	316,667
3	Nexium 40 Mg	200000	333,333
4	Lipitor 10 Mg	290000	483,333
5	Pariet 10 Mg	260000	433,333
6	Sucralfat suspensi 500 mg/5 ml 100 ml	20000	33,333
7	Inpepsa Sirup 100 ml	95000	158,333
8	Depakene Sirup	226000	376,667
9	Mexon	12000	20,000
10	Lodia 2 Mg	20000	33,333
11	Histigo 6 Mg	20000	33,333
12	Gramamine 50 Mg	25000	41,667
13	Lapibal 500 Mg	40000	66,667
14	Imodium	120000	200,000
15	Myonal	110000	183,333
16	Pregabalin 75 Mg	65000	108,333
17	Alofar 100 Mg	10000	16,667
18	Rhinofed	45000	75,000
19	Tarivid Otic Sol	100000	166,667
20	Akilen (Ear Drop)	60000	100,000
21	Fg Troces	16000	26,667
22	Kandistatin Drops	65000	108,333
23	Fitaquin Cream	75000	125,000
24	Dobrizol	30000	50,000
25	Burnazin Cream	90000	150,000
26	Concor 2,5 Mg	73000	121,667
27	Mucopect 15 Mg/5ml	82000	136,667
28	Lerzin Drops 15 ml	40000	66,667
29	Lameson 8 Mg	80000	133,333
30	Phenytoin 100 Mg Capsule	70000	116,667
31	Ryvel Sirup	60000	100,000

Table 2 below provides information on the total sales of dispensary X in 2021. The information has included the price of each unit product.

Table 2. Sales Data at Pharmacy X in 2021

No	Medicine Name	Selling Price	Total	No	Medicine Name	Selling Price	Total
1	Alegi	27000	128 strips	58	Lasal Sirup	48000	25 bottles
2	Acifar 400 Mg	10000	70 strips	59	Licostan	15000	165 strips
3	Akita Tablet	7000	227 strips	60	Melanox 2% Cream 15g	45000	50 tubes
4	Alermax	3000	140 strips	61	Miratrim	10000	62 strips
5	Akilen (Ear Drop)	60000	78 bottles	62	Molexflu	8000	333 strips
6	Alletrol (Eye Drop)	21000	56 bottles	63	Nifural Sirup	74000	38 bottles
7	Alofar 100 Mg	10000	525 strips	64	Norpid 10 Mg	20000	55 strips
8	Alofar 300 Mg	15000	110 strips	65	Omegestic	5000	152 strips
9	Bidaxtam	14000	154 strips	66	Omestan	5000	64 strips
10	Borraginol N Oint	105000	28 tubes	67	Oxicobal	3000	63 strips
11	Burnazin Cream	90000	47 tubes	68	Pamol 125 Mg Supos	20000	75 sups
12	Buscopan Tablet	5000	88 strips	69	Pariet 10 Mg	260000	48 strips
13	Captopril 50 Mg	5000	93 strips	70	Phenytoin 100 Mg Capsule	70000	55 bottles
14	Cerini	55000	55 strips	71	Planotab	4000	98 strips
15	Danasone	3000	233 strips	72	Polofar Plus	3000	485 strips
16	Decubal Cream 40 g	65000	25 tubes	73	Pratifar 40 Mg	6500	70 strips
17	Depakene Sirup	226000	34 bottles	74	Primadex Tablet	6000	68 strips
18	Dobrizol	30000	147 strips	75	Pregabalin 75 Mg	65000	82 strips
19	Hormico 200 Mg	7000	47 strips	76	Pronicy	4000	562 strips
20	Grafamic	6000	138 strips	77	Proxona	3000	67 strips
21	Hufadine	10000	141 strips	78	Ranivel 75mg/5 ml Sirup 60 ml	70000	46 bottles
22	Imodium	120000	48 strips	79	Quantidex	5000	84 strips
23	Kandistatin Drops	65000	70 strips	80	Retaphyl Sr 300 mg	15000	152 strips
24	Lipitor 10 Mg	290000	44 strips	81	Rhemafar 4 Mg	5000	300 strips
25	Lodia 2 Mg	20000	370 strips	82	Rhinofed	45000	110 strips
26	Histigo 6 Mg	20000	346 strips	83	Groferton 30 mg	6000	149 strips

27	Inpepsa Sirup 100 ml	95000	97 bottles	84	Ryvel Sirup	60000	59 strips
28	Lameson 8 Mg	80000	49 strips	85	Sagestam Cream	18000	82 tubes
29	Lerzin Drops 15 ml	40000	101bottle	86	Samquinor	16000	76 strips
30	Mertigo 6 Mg	50000	61 strips	87	Sanprima	12000	63 strips
31	Mexon	12000	632 strips	88	Seremig	10000	70 strips
32	Mixalgin	10000	253 strips	89	Soldextam	4000	110 strips
33	Molacord 0,5 Mg	13000	124 strips	90	Sistenol Kaplet	28000	63 bottles
34	Molafate Sirup	33000	49 bottles	91	Solinfec	11000	276 strips
35	Molasic	7000	99 strips	92	Spasminal	10000	168 strips
36	Mucopect 15 Mg/5ml	82000	50 bottles	93	Sucralfat suspensi 500 mg/5 ml 100 ml	20000	490 bottles
37	Muzoral (Ketoconazole) 200 mg	4000	128 strips	94	Supertetra	9000	102 strips
38	Myonal	110000	50 strips	95	Tarivid Otic Sol	100000	48 bottles
39	Nebacetin Powder 5gr	25000	99 bottles	96	Tera F	6000	98 strips
40	Neuralgin	10000	120 strips	97	Teosal	3000	506 strips
41	Nexitra 500 Mg	3000	72 strips	98	Tifestan Forte	4000	71 strips
42	Nexium 40 Mg	200000	74 strips	99	Trinordiol 28 Mg	24000	82 strips
43	Norvom	3000	84 strips	100	Valsartan 80 Mg	38000	81 strips
44	Novaxicam	1500	235 strips	101	Ventolin Inhaler	140000	283bottle
45	Farsifen 400 Mg	15000	94 strips	102	Vesperum	4000	77 strips
46	Farizol	4000	151 strips	103	Fitaquin Cream	75000	59 tubes
47	Farmoten 25 Mg	4000	153 strips	104	Concor 2,5 Mg	73000	57 strips
48	Fg Troces	16000	292 strips	105	Cortidex	5000	116 strips
49	Cludepatic 500 Mg	5000	209 strips	106	Dexteem Plus	4000	112 strips
50	Glocovance 500 Mg/5Mg	8000	132 strips	107	Diane	190000	96 packs
51	Inflason	4000	213 strips	108	Rivoltar 50 Mg	5000	503 strips
52	Interdoxin 100 Mg	40000	41 strips	109	Gramamine 50 Mg	25000	258 strips
53	Kalmethasone 0,5 Mg	2000	52 strips	110	Claneksi Forte 125 Mg 60 MI	70000	42 bottles
54	Katitra 500 Mg	8000	50 strips	111	Etadexta	3000	66 strips

55	Klorfeson Cream	10000	89 tubes	112	Etaven 400 Mg	4000	81 strips
56	Klordema Lotion 30 MI	100000	35 bottles	113	Estalex 50 Mg	10000	72 strips
57	Lapibal 500 Mg	40000	161 strips				

5. Results and Discussion

Pharmacy X has conducted drug planning based on the results of interviews. Pharmacy X placed orders with suppliers for an average of 20 strips/tablets, 10 bottles/syrup, 5 tubes/ointment, and 5 suppositories of Pamol 125 mg. However, Pharmacy X frequently over-ordered when the drug's stock was still abundantly available, causing many drugs to accumulate and expire.

Pharmacy X sold a wide range of medications. The supplies studied in this study were drugs, particularly patent drugs. According to the results of the document processing, there were 113 different types of patent drugs. The ABC analysis of patented drugs based on investment value for the period January 2021-December 2021 is as follows here in Table 3.

Table 3. Results of Grouping Patent Drugs Based on ABC Method

Group	Drug Type	Percentage (%)	Income (Rp)	Percentage of Income (%)
A	31	31.940%	241,561,000	70%
B	30	29.778%	70,813,000	20%
C	52	38.282%	35,535,500	10%
Total	113	100%	347,909,500	100%

The table above shows the results of the ABC analysis. The ABC analysis of investment value revealed that group A had 31 types of drugs or 31.940% of all patented drugs, absorbing 70% of investment, while group B had 30 types of drugs or 29.778% of all patented drugs, absorbing 20% of investment. While group C contains up to 52 different types of drugs, accounting for 38.282% of all patented drugs, drug items only absorb 10% of investment.

The EOQ was calculated by taking the number of sales in a period, ordering costs, and holding costs. The ABC analysis was used to calculate the sales amount. The cost of ordering Pharmacy X was Rp. 1,500.00 per phone call. Holding costs are the expenses incurred when inventory is held or carried for an extended period of time. Appendix 1 lists the Pharmacy X storage costs. The calculation of the EOQ for Group A Patented Drugs yielded the following results, which can be seen in Table 4.

Table 4. The Calculation of EOQ of Group A Patent Drugs

No	Medicine name	Total Drug Sales	Drug Ordering Fee (Rp)	Storage Fee Per-Drug (Rp)	Order before using EOQ (Times)	EOQ	Reorder with EOQ (Times)
1	Ventolin Inhaler	276,083	1500	233,333	27	59,579	4,634
2	Diane	71,832	1500	316,667	13	26,087	2,754
3	Nexium 40 Mg	91,118	1500	333,333	12	28,637	3,182
4	Lipitor 10 Mg	41,457	1500	483,333	12	16,041	2,584
5	Pariet 10 Mg	24,000	1500	433,333	12	12,890	1,862
6	Sucralfate suspension 500 mg/5 ml 100 ml	478,308	1500	33,333	37	207,480	2,305
7	Inpepsa Syrup 100 ml	97,564	1500	158,333	14	42,995	2,269
8	Depakene Syrup	40,951	1500	376,667	12	18,060	2,268
9	Mexon	605,117	1500	20,000	38	301,277	2,009
10	Lodia 2 Mg	372,917	1500	33,333	31	183,202	2,036
11	Histigo 6 Mg	351,672	1500	33,333	23	177,907	1,977
12	Gramamine 50 Mg	254,411	1500	41,667	18	135,342	1,880

13	Lapibal 500 Mg	164,526	1500	66.667	14	86.044	1,912
14	Imodium	49,715	1500	200,000	12	27.308	1,821
15	Myonal	79,153	1500	183,333	12	35,989	2,199
16	Pregabalin 75 Mg	85.553	1500	108,333	12	48,674	1,758
17	Alofar 100 Mg	517,189	1500	16.667	38	305,110	1,695
18	Rhinofed	87,846	1500	75,000	12	59,278	1,482
19	Tarivid Otic Sol	71,019	1500	166.667	12	35,754	1,986
20	Akilen (Ear Drops)	83,001	1500	100,000	12	49,900	1,663
21	Fg Troces	290.445	1500	26.667	20	180,761	1,607
22	Candistatin Drops	63.342	1500	108,333	13	41,882	1,512
23	Fitaquin Cream	31.308	1500	125,000	13	27,412	1.142
24	Dobrizol	175,924	1500	50,000	14	102,740	1,712
25	Burnazine Cream	20,315	1500	150,000	13	20,157	1.008
26	Concor 2.5 Mg	53,220	1500	121,667	12	36,225	1,469
27	Mucopect 15 mg/5ml	37,916	1500	136.667	112	28,850	1.314
28	Lerzin Drops 15 ml	104.829	1500	66.667	14	68,682	1.526
29	Lameson 8 Mg	44,080	1500	133.333	12	31,493	1,400
30	Phenytoin 100 mg Capsule	52.482	1500	116.667	12	36,736	1,429
31	Ryvel Syrup	35,334	1500	100,000	12	32.558	1.085

According to the calculation above, before using the EOQ of the drug with the most orders in 2021, Mucopect 15mg/5ml was 112 times, and after using the EOQ, the order was only made 1 time with the number of orders being 28,850 bottles. Before and after the implementation of the EOQ method, a substantial number of orders for patented drugs were placed. This demonstrates its efficacy, as using EOQ can reduce the number of reorders of type A patent drugs in a year. Ordering efficiently can reduce excess storage costs.

To calculate the ROP, the safety stock/buffer stock must first be calculated. So far, Pharmacy X's safety stock or buffer stock is only estimated; there is no special calculation to determine the buffer stock. The average lead time for drugs, according to interviews, is 2 days. Table 5 following the ROP calculations for patented drugs from Group A:

Table 5. Calculation of ROP for Group A Patent Drugs

No	Medicine name	Number of Requests	D	L	SS(Strips/Box/Bottle/Tubes)	dx L	ROP
1	Ventolin Inhaler	59.579	0.163	2	0.292	0.326	0.618
2	Diane	26.087	0.071	2	0.998	0.143	1,141
3	Nexium 40 Mg	28,637	0.078	2	0.707	0.157	0.864
4	Lipitor 10 Mg	16,041	0.044	2	0.081	0.088	0.169
5	Pariet 10 Mg	12,890	0.035	2	0.000	0.071	0.071
6	Sucralfate suspension 500 mg/5 ml 100 ml	207,480	0.568	2	0.076	1.137	1,213
7	Inpepsa Syrup 100 ml	42,995	0.118	2	0.262	0.236	0.498
8	Depakene Syrup	18.060	0.049	2	0.401	0.099	0.500
9	Mexon	301,277	0.825	2	0.579	1,651	2,230
10	Lodia 2 Mg	183,202	0.502	2	0.307	1.004	1.311
11	Histigo 6 Mg	177,907	0.487	2	0.062	0.975	1.037
12	Gramamine 50 Mg	135,342	0.371	2	0.117	0.742	0.859
13	Lapibal 500 Mg	86.044	0.236	2	0.146	0.471	0.617
14	Imodium	27.308	0.075	2	0.508	0.150	0.658
15	Myonal	35,989	0.099	2	1,208	0.197	1,405
16	Pregabalin 75 Mg	48,674	0.133	2	0.253	0.267	0.519
17	Alofar 100 Mg	305,110	0.836	2	4,455	1,672	6,127
18	Rhinofed	59,278	0.162	2	0.915	0.325	1,240
19	Tarivid Otic Sol	35,754	0.098	2	0.626	0.196	0.822

20	Akilen (Ear Drops)	49,900	0.137	2	0.478	0.273	0.751
21	Fg Troces	180,761	0.495	2	0.318	0.990	1.309
22	Candistatin Drops	41,882	0.115	2	0.420	0.229	0.650
23	Fitaquin Cream	27,412	0.075	2	1.144	0.150	1,294
24	Dobrizol	102,740	0.281	2	0.569	0.563	1.132
25	Burnazine Cream	20,157	0.055	2	1,102	0.110	1,213
26	Concor 2.5 Mg	36,225	0.099	2	2,331	0.198	2,530
27	Mucopect 15 mg/5ml	28,850	0.079	2	0.499	0.158	0.657
28	Lerzin Drops 15 ml	68,682	0.188	2	1.164	0.376	1.541
29	Lameson 8 Mg	31,493	0.086	2	0.233	0.173	0.406
30	Phenytoin 100 mg Capsule	36,736	0.101	2	0.104	0.201	0.305
31	Ryvel Syrup	32,558	0.089	2	0.978	0.178	1,156

This quantity is the optimal point for reordering in order to avoid stock shortages caused by stock-outs and stock shortages due to increased demand. By calculating the ROP and storing safety stock, the pharmacy can improve service quality and avoid losses caused by backorders.

After calculating the EOQ and ROP, the TIC (Total Inventory Cost) is calculated using EOQ, while TICp below is The Existing Total Inventory Cost of the Pharmacy. Both Cost comparison is calculated to determine the before and after Total Inventory Cost (TIC) at the pharmacy. The calculation of the TIC and TICp for group A patent drugs appears in Table 6 below:

Table 6. Calculation of TIC and TICPer of Patent Drugs Group A

No	Medicine name	Number of Needs	Average Drug Needs/year	Ordering Cost (Rp)	Storage Cost (Rp)	EOQ (units)	TIC (Rp)	Many Orders Yearly (times)	TICp (Rp)
1	Ventolin Inhaler	276.083	23,583	1500	233.333	59.579	13901,720	27	46002,770
2	Diane	71,832	8,000	1500	316,667	26.087	8260.779	13	22033,336
3	Nexium 40 Mg	91,118	6,167	1500	333.333	28,637	9545,570	12	20055,554
4	Lipitor 10 Mg	41,457	3,667	1500	483.333	16,041	7753,232	12	19772,221
5	Pariet 10 Mg	24,000	4,000	1500	433.333	12,890	5585,694	12	19733,332
6	Sucralfate suspension 500 mg/5 ml 100 ml	478,308	40,833	1500	33,333	207,480	6915,947	37	56861,098
7	Inpepsa Syrup 100 ml	97.564	8,083	1500	158,333	42,995	6807.555	14	22279,858
8	Depakene Syrup	40,951	2,833	1500	376,667	18,060	6802.549	12	19067,223
9	Mexon	605,117	52,667	1500	20,000	301,277	6025,531	38	58053,333
10	Lodia 2 Mg	372,917	30,833	1500	33,333	183,202	6106,663	31	47527,768
11	Histigo 6 Mg	351,672	28.833	1500	33,333	177,907	5930,164	23	35461.102
12	Gramamine 50 Mg	254,411	21,500	1500	41,667	135,342	5639,293	18	27895.841
13	Lapibal 500 Mg	164,526	13,417	1500	66.667	86.044	5736,320	14	21894,449
14	Imodium	49,715	4,000	1500	200,000	27.308	5461.593	12	18800,000
15	Myonal	79,153	4,167	1500	183,333	35,989	6598,035	12	18763.888
16	Pregabalin 75 Mg	85.553	6,833	1500	108,333	48,674	5273,010	12	18740,276
17	Alofar 100 Mg	517,189	43,750	1500	16.667	305,110	5085,270	38	57729,181
18	Rhinofed	87,846	9,167	1500	75,000	59,278	4445,824	12	18687,500
19	Tarivid Otic Sol	71,019	4,000	1500	166.667	35,754	5958,991	12	18666.668
20	Akilen (Ear Drops)	83,001	6,500	1500	100,000	49,900	4990,020	12	18650,000

21	Fg Troces	290.445	24,333	1500	26.667	180,761	4820,362	20	30648.897
22	Candistatin Drops	63.342	5,833	1500	108,333	41,882	4537,189	13	20131,943
23	Fitaquin Cream	31.308	4,917	1500	125,000	27,412	3426,441	13	20114,583
24	Dobrizol	175,924	12,250	1500	50,000	102,740	5136,984	14	21612,500
25	Burnazine Cream	2729,600	3,917	1500	150,000	20,157	204637,240	13	20087,500
26	Concor 2.5 Mg	53,220	4,750	1500	121,667	36,225	4407,420	12	18577,918
27	Mucopect 15 mg/5ml	37,916	4,167	1500	136.667	28,850	3942,791	112	168569,446
28	Lerzin Drops 15 ml	104.829	8,417	1500	66.667	68,682	4578,854	14	21561,114
29	Lameson 8 Mg	44,080	4.083	1500	133.333	31,493	4199.042	12	18544.443
30	Phenytoin 100 mg Capsule	52.482	4,583	1500	116.667	36,736	4285.878	12	18534.724
31	Ryvel Syrup	35,334	4,917	1500	100,000	32.558	3255,795	12	18491,667
							380,051,757		963,550,130

Based on the calculation of TIC and TICPer, the difference of Rp. 582,498,373 indicates that the use of EOQ is more effective.

6. Conclusion

The following conclusions can be drawn from the results of processing and analysis performed:

1. By using the ABC method, it has been revealed that the patented drugs that must be prioritized are 31 types of drugs in which the drug has a very high investment value of Rp. 241,561,000 of the total Rp. 347,909,500. Consequently, its inventory needs to be controlled under strict supervision.
2. According to the EOQ calculation, the Ventolin Inhaler can be ordered up to 59,579 bottles with an ordering frequency of 4,634 times. The summary results of the EOQ calculation can be found in Appendix 1. Based on the EOQ calculations for 31 type A patent drugs, an average of 80 pieces of the maximum quantity of drugs can be ordered, with a frequency of two orders per month. When using the EOQ method, ordering patent drugs is more efficient, as demonstrated by reducing the number of drug orders to reduce excess inventory costs. According to the EOQ, the cost of inventory is Rp.380,051,757. According to Pharmacy X, the real cost of inventory is Rp.963,550,130. It means that using the EOQ Method saves Rp. 582,498,373.

The ROP calculation shows that the Ventolin Inhaler drug must be reordered when the stock is 0.618 bottle or less than 1 bottle; the results of the ROP calculation recapitulation can be found in Appendix 2. And, if, according to the overall ROP calculation, the average order is one drug, and each drug stock remains one piece, the pharmacy must place another order with the amount of inventory determined by the EOQ method.

3. Recommendations or proposals for controlling the inventory of type A Patent Drugs based on research findings, for example, this Ventolin Inhaler Brand Patent Drug can be reordered when the drug is left with 1 bottle with a total order of 60 bottles, and it is recommended to order the drug 5 times in a year. Appendix 3 contains recommendations for other Type A patent drugs. All of the drugs in Table 4.43 are group A drugs, because group A is the most beneficial to the pharmacy. As a result, controlling the supply of this class of drugs should be prioritized. To avoid drug shortages, pharmacies are expected to check drugs at least three times per week, and pharmacies are expected to prioritize drugs ordered during the previous period, so they do not expire.

The following recommendations can be made in light of this study:

1. Based on the findings of the study, the authors recommend that Pharmacy X consider using the ABC analysis method to identify prioritized patent drugs and the EOQ method to implement a minimum order policy for prioritized drugs to reduce excessive inventory costs. Further researchers can investigate the most recent inventory control strategies to minimize errors in the previous EOQ method.

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