Analysis of Cardiovascular Drugs Inventory Control Using ABC-EOQ-ROP-SS Method at Jakarta Islamic Hospital

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INDEXING

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ABSTRACT

Cardiovascular disease was still a global threat and give a major role as the number one cause of death in the world. Patients with CVDs should take the medication regularly so that the availability of these drugs in health facilities must be maintained. And then, Cardiovascular drugs were the highest usage costs during 2019, which is around Rp. 6,924,415,718.20 (22.62%) so that it requires special attention to control the inventory. The object of this research was to determine the implementation of cardiovascular drug inventory control using ABC-EOQ-ROP-SS method to minimize the stock inventory, while maintaining the service level. This research used a non-experimental comparative method with retrospective cardiovascular drug data collection in 2019. Data obtained through the documentation of the Pharmacy Installation section and the logistics section. The data were analyzed to determine the cost efficiency of cardiovascular drugs using the ABC-EOQ-ROP-SS method compared to actual data for drug orders in January-December 2019. The results of ABC-EOQ-ROP-SS methods in controlling cardiovascular drugs can be implemented by the Jakarta Islamic Hospital to minimize stock inventory, while maintaining the service level and can increase the total cost efficiency up to 17,91% of the actual order.

Kata kunci:

Obat Kardiovaskular
Pengendalian
Persediaan;
ABC investasi;
Pemesanan Ekonomis;
Titik Pemesanan Ulang;
Stok Pengaman;

Penyakit kardiovaskuler masih menjadi ancaman global dan berperan besar sebagai penyebab kematian nomor satu di dunia. Penderita CVD diharuskan untuk mengkonsumsi obat secara rutin sehingga ketersediaan obat tersebut di fasilitas kesehatan harus tetap terjaga. Kemudian, obat kardiovaskular merupakan obat dengan biaya pemakaian tertinggi selama tahun 2019, yaitu sekitar Rp. 6.924.415.718,20 (22,62%) sehingga perlu perhatian khusus dalam pengendalian persediaannya. Tujuan penelitian ini adalah untuk mengetahui pelaksanaan pengendalian persediaan obat kardiovaskular dengan metode ABC-EOQ-ROP-SS untuk meminimalkan total biaya persediaan, dengan tetap mempertahankan tingkat pelayanan. Penelitian ini menggunakan metode komparatif non eksperimental dengan pengumpulan data obat kardiovaskular secara retrospektif pada periode Januari - Desember tahun 2019. Data diperoleh melalui dokumentasi bagian Instalasi Farmasi dan bagian logistik. Analisis data dilakukan untuk mengetahui efisiensi biaya obat kardiovaskular dengan metode ABC-EOQ-ROP-SS dibandingkan dengan data aktual pesanan obat tahun 2019. Hasil penelitian menunjukkan bahwa pengendalian obat kardiovaskular dengan metode ABC-EOQ-ROP-SS diketahui dapat dilaksanakan di Rumah Sakit Islam Jakarta untuk meminimalkan stok persediaan, dengan tetap menjaga kinerja pelayanan dan meningkatkan efisiensi biaya sekitar 17,91% dari biaya pemesanan aktual.

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INTRODUCTION

Cardiovascular disease is still a global threat and give a major role as the number one cause of death. In 2015, data from WHO shows that 17.7 million from 39.5 million deaths by CVDs (WHO, 2017). In Indonesia, based on data from Basic Health Research in 2018, at least 15 out of 1000 people or about 2,784,064 individuals suffer from the disease (Risikesdas, 2018). Patients with CVDs should take the medication regularly. Patients with cardiovascular disease who withdraw from medication (aspirin) have an increased risk of

cardiovascular events > 30% (Sundström et al., 2017). Similar to a previous study, patients post myocardial infarction who routinely consumption secondary prevention drugs had significantly better event-free survival, with a 27% reduction in risk of MACE (major adverse cardiovascular events) (Bansilal et al., 2016).

Cardiovascular drugs are vital and essential drugs that must be available in the hospital. The continuous availability of essential drugs within healthcare facilities plays an important role in promoting access and utilization of health services (Kuwawenaruwa, Wyss, Wiedenmayer, Metta, & Tediosi, 2020). Drug availability positively affects patient trust in health care providers (Shan et al., 2016). Trust in health care providers is important; it shapes health service utilization patterns affect treatment compliance (Brennan et al., 2013) and encourages communication with service providers (Al-Mandhary, Al-Zakwani, & Afifi, 2007).

However, hospitals cannot store a large amount of every drug because of limited budget. The hospital budget for drugs is the largest component of hospital expenditure. In many developing countries, the expenditure on hospital medicines can account for about 40 to 50% of total hospital cost (Kemenkes, 2016). With the limited budget, hospital has to maintain the drug availability by enhancing inventory control management. Pharmacy logistic needs to monitor levels of inventory and determine what levels should be maintained, when stock should be replenished, and how large amount should be in order to keep inventory cost as minimum as possible while maintaining high customer service level (Jacobs, F. R., Chase, R. B., & Aquilano, 2011).

From the research on inventory control at local hospitals in Bandung, it can be seen that the hospital has a potential savings of IDR 829,655,791 (56.93%) of the overstock cost of the pharmaceutical unit (Hafnika, F., Farmaciawaty, DA., Adhiutama, A., & Basri, 2016). Another study states the optimal inventory control can save up to 10% in the cost of administering drug supplies. The operational costs of managing drug supply chain at a hospital can reach 40% of the total operating costs, therefore it is very important for a hospital to improve its inventory control system (MWISE, 2010).

Research on cytostatic drug inventory control at Moewardi Hospital, Surakarta, in 2012, controlling cytostatic drugs using the EOQ analysis method is known to increase cost efficiency up to Rp. 224,845,245 or 73% of the total inventory cost of Rp. 306,956,410 (Widodo, 2012). In the Jakarta Islamic Hospital, drug supply control uses the minimum maximum stock level method. Minimum stock for 7 days and maximum for 14 days. However, this minimum and maximum stock causes a lot of inventory in warehouses and pharmacies. The purpose of this research was to determine the implementation and efficiency of controlling cardiovascular drug using the ABC-EOQ-ROP-SS method.

RESEARCH METHOD

This research is a type of quantitative research using comparative non-experimental methods. This study used secondary data of 225 items of cardiovascular drugs during 2019 at the Jakarta Islamic Hospital. Data were analyzed to determine the cost efficiency of cardiovascular drugs using the ABC-EOQ-ROP-SS method. Result of this research was tested using the Paired-Sample t test. This research was done in January – March 2020. At the beginning of the research, all cardiovascular drug items were classified according to the ABC (Always, Better, Control) classification. The ABC classification use the Pareto Principle, which show that a small number of items account for a small rupiah volume and a large

number of items account for a small rupiah volume (Hafnika, F., Farmaciawaty, DA., Adhiutama, A., & Basri, 2016). ABC method classify inventory based on rupiah volume into three categories, which are high rupiah volume (A); moderate rupiah volume (B); low rupiah volume (C). For A items typically only 20% of the total items, but account for nearly 70% of the total usage. B items typically compose about 30% of the total items and about 20% of the total usage. C items account for the remaining 50% of the total items and the remaining 10% of the total costs. Therefore, A items should be inspected and reorder daily, or near daily (Seto, 2004).

Furthermore, the researcher calculated EOQ (Economic Order Quantity) value in category A on the ABC calcification results. EOQ is a formula to determine the number of quantity orders that minimizes ordering costs and carrying costs. EOQ (Economic Order Quantity) uses the assumption of constant demand, constant waiting time, and fixed order costs per order (Waters, 2003). The Economic Order Quantity was calculated using formula:

$$EOQ = \sqrt{\frac{2 DO}{C}}$$

Whereas;

EOQ = Economic order quantity

D = Annual demand

O = Ordering cost (Rp/order)

C = Carrying cost (Rp/unit-year)

After determining the EOQ, the next step is to determine when the purchasing need to reorder. Reorder points (ROP) is the limit of the amount of stock that is still there. What needs to be taken into account is the time it takes between an order to be placed and the goods are received. At that time interval, there must be a guarantee that supplies remain so that they do not interfere with service. ROP can calculate using a formula (Peterson & Kelly, 2004):

$$ROP = (d \times L) + SS$$

Whereas:

ROP = Re-Order Point

d = Average demand per period

L = Lead time

SS = Safety Stock

ROP also considers the importance of safety stock to anticipate uncertain demand / need. Safety stock is a buffer stock that is stored to accommodate an increase in demand or lead time that exceeds the estimated time. Safety stock can be calculated using statistical methods with formulas (Waters, 2003):

$$SS = Z \times sd \times \sqrt{L}$$

Whereas:

SS = Safety Stock

Z = Service level constant

Sd = Standard deviation of demand

L = Lead time

To determine the efficiency obtained from inventory control of cardiovascular drug, the researcher compared the total ordering cost and the total carrying between orders with the EOQ method and the actual orders. We can calculate the cost per unit by using formula:

$$\begin{aligned} TC &= \text{total reorder costs} + \text{total carrying costs} = \\ &= OD/Q + CQ/2 \end{aligned}$$

Whereas:

TC = Total Cost

O = Ordering cost (Rp/order)

D = Annual Demand

C = Carrying Cost (Rp/unit-year)

Q = Quantity Order

RESULT AND DISCUSSION

Analysis of ABC Investment

The results of the ABC classification based on investment value of cardiovascular drugs are shown in the table I. It's shows that the results of ABC classification on 225 items of cardiovascular drugs obtained category A of 23 drug items (10.22%) with an investment value of Rp. 4,839,738,131 (69.89%), category B as many as 38 items of medicine (16.89%) with an investment value of Rp. 1,426,359,595 (20.60%), and category B as many as 164 items of medicine (72.89%) with an investment value of Rp. 658,317 .992 (9,51%).

Table 1. The results of ABC classification on cardiovascular drugs based on the investment value

Category	Item		Cost	
	Amount	Percentage (%)	Amount (IDR)	Percentage (%)
A	23	10,22	4.839.738.131	69,89
B	38	16,89	1.426.359.595	20,60
C	164	72,89	658.317.992	9,51
	225	100	6.924.415.718	100

The results of categories A, B and C are directly proportional to the amount of drug use by cardiovascular patients at the Jakarta Islamic Hospital. This shows that the drug inventory control is less effective and efficient because it is not suitable for drug inventory in general. Based on the inventory control delivered by Seto, that category A represents 20% of drugs in stock and 70% of total sales (Seto, 2004). Meanwhile, category A in the Jakarta Islamic Hospital was only 10.22%. This means that there is an over stock of category A cardiovascular drug.

Analysis of Economic Order Quantity (EOQ)

EOQ calculation is only performed for category A cardiovascular drugs because it is assumed that demand for category A drugs is constant. In determining the optimum order quantity using the EOQ method, it is necessary to calculate the number of annual demands, ordering costs and carrying costs. The annual demand based on data consumption during 2019. Ordering cost include costs required to place an order, including telephone fees and stationary fees, and employee fee. The carrying cost in this research was calculated using the theoretical of Waters, which is 25% of the price unit item of drugs (Waters, 2003).

Table.2 Stationary fess per order

Item	Quantity	Price (Rp)	Total (Rp)
Paper Cost	13	434.500	5.648.500
Computer Tape Cost	6	66.000	396.000
Total Cost/Year			6.044.500
Total Cost/Month			503.708
Cost per Order (1200 order)			420

Table.3 Employee Fees

Employee Fee	Nominal (Rp)
Employee Fee/Month	6.200.000
Employee Fee Order/hour (150 hours/mounth)	41.333
Employee Fee per Order (10 minute/order)	6.889

Based on table.2 interviews, the average time needed to place an order is 6 minutes. Local call rates are IDR 300 per 3 minutes so the cost for 6 minutes of telephone calls is IDR 900. Details of stationary fees for each order can be seen in table 2. Based on the order data in 2019, the average order per month is 1200 order letters. Each order required duplicate paper and computer tape. It takes 1 person on duty to place an order and every month it takes 150 hours of work (6 hours of effective work multiplied by 25 days). It takes 10 minutes for each order to make so employee fee per order was IDR 6.889. Based on the table.3 details of the costs above, the order fee for each order is IDR 8,205.

After the ordering costs and carrying costs are known, the data is entered into the formula. For example, the EOQ calculation for Nitrokaf Retard 2.5 mg BPJS is as follows:

Annual Demand = 540,898 capsules

Carrying Cost = 25% x 1,560 = IDR 390, -

Ordering Cost = IDR 8,209

Then the Economic Order Quantity (EOQ) is:

$EOQ = \sqrt{2DO / C}$

$EOQ = \sqrt{2 \times 540.898 \times 8.209 / 390}$

EOQ = 4,771 capsules

Table.4 The value of EOQ (Economic Order Quantity) and the frequency of ordering each item of cardiovascular drugs category A, compared with the average number of orders and the average order frequency on actual data history

Drug Name	Price/Unit	Annual Demand	EOQ		Order Frequency	
			EOQ	Actual Average Order	By EOQ formula	By Actual Average
Nitrokaf Retard 2,5mg BPJS	1.560,00	540.898	4.771	9.200	113	60
Nitrokaf Retad Forte 5mg BPJS	2.401,99	322.236	2.967	6.000	109	55

Table.4 (continued) The value of EOQ (Economic Order Quantity) and the frequency of ordering each item of cardiovascular drugs category A, compared with the average number of orders and the average order frequency on actual data history

Drug Name	Price/Unit	Annual Demand	EOQ		Order Frequency	
			EOQ	Actual Average Order	By EOQ formula	By Actual Average
Diviti PFS 2.5mg/0.5ml BPJS	237.177,05	1.950	23	56	84	41
Clopidogrel Tab 75mg BPJS	1.403,82	271.639	3.564	7.560	76	38
Adalat Oros Tab 30mg BPJS	3.948,00	93.704	1.248	2.880	75	34
Candesartan Tab 16mg BPJS	943,09	253.142	4.198	6.600	60	39
Bisoprolol Tab 5mg BPJS	840,67	229.848	4.236	5.880	54	24
V-Bloc Tab 6,25mg BPJS	1.500,00	123.192	2.322	3.870	53	34
Candesartan Tab 8mg BPJS	545,00	311.065	6.121	8.640	51	36
Miozidine Tab	3.740,00	36.874	804	1.020	46	37
Candesartan Tab 16mg	7.150,00	15.212	374	480	41	31
Norephineprin Inj BPJS	25.839,00	3.781	98	160	39	22
Vascon Inj	104.500,00	883	24	40	37	16
Candesartan Tab 8mg	4.500,00	19.642	535	570	37	33
Canderin Tab 8mg	7.700,00	11.275	310	360	36	32
Diviti PFS 2.5mg/0.5ml	324.500,00	266	7	14	36	18
Furosemid Inj	3.410,00	23.148	668	875	35	27
Nitrokaf Retard 2,5mg	2.706,00	28.572	833	1.100	34	21
Micardis Tab 80mg	24.534,19	3.068	91	240	34	7
Platogrix Tab 75mg (AJI)	4.400,00	16.983	503	644	34	26
Clopidogrel Tab 75mg	5.536,67	13.471	400	750	34	30
Canderin Tab 16mg	9.900,00	7.308	220	360	33	21
Atofar Tab 20mg	12.100,00	5.829	178	240	33	26

In the table.4, this EOQ value was compared with the actual data on quantity drug orders for the period January to December 2019. For example, the number of economical orders for Nitrokaf Retard BPJS is 4,771 capsules with a frequency of 113 orders in a period of one year. This means that by ordering 4,771 capsules there is an optimal balance between ordering costs and carrying costs so that there is an efficiency between the investment value and the cost of drug supplies that must be

incurred by the hospital. Using the same method, each drug can be determined the EOQ value and the frequency of ordering.

The frequency order of cardiovascular drugs is actually lower than the frequency of order of cardiovascular drugs based on the EOQ method. This can increase carrying costs even though ordering costs can decrease. The difference in the frequency of reality from EOQ shows inefficiency in ordering drug so that it will affect carrying costs. When the frequency order is increased, the cost emphasis occurs on carrying costs and reduces the risk of damage / expiration, even though the ordering costs increase, but there can be considerable cost efficiency (Widodo, 2012).

Analysis of Re-Order Point (ROP) and Safety Stock (SS)

Even though the number of orders is greater than the EOQ, there is still a possibility of a drug vacuum. This is due to the absence of determining the right time to order drugs. So that the EOQ value can be combined with the determination of the re-order point by considering safety stock. Safety stock is needed to prevent vacancies from occurring due to uncertainty in demand, delays in ordering, and delays in transportation when refilling (Heizer, 2015). The Safety Stock value and reorder point show in table 5.

Table 5. Economic Order Quantity (EOQ), Reorder Point (ROP), and Safety Stock (SS) calculation on category A cardiovascular drug

Drug Name	Economic Order Quantity (ROP)	Order Frequency/ Year	Safety Stock (SS)	Re-Order Point (ROP)
Nitrokaf Retard 2,5mg BPJS	4.771	113	255	4.822
Nitrokaf Retad Forte 5mg BPJS	2.967	109	193	2.660
Diviti PFS 2.5mg/0.5ml BPJS	23	84	2	16
Clopidogrel Tab 75mg BPJS	3.564	76	200	2.981
Adalat Oros Tab 30mg BPJS	1.248	75	46	759
Candesartan Tab 16mg BPJS	4.198	60	99	2.066
Bisoprolol Tab 5mg BPJS	4.236	54	96	1.779
V-Bloc Tab 6,25mg BPJS	2.322	53	99	967
Candesartan Tab 8mg BPJS	6.121	51	155	2.663
Miozidine Tab	804	46	38	352
Candesartan Tab 16mg	374	41	20	131
Norephineprin Inj BPJS	98	39	5	36
Vascon Inj	24	37	5	14
Candesartan Tab 8mg	535	37	26	192
Canderin Tab 8mg	310	36	10	96
Diviti PFS 2.5mg/0.5ml	7	36	1	3
Furosemid Inj	668	35	26	206
Nitrokaf Retard 2,5mg	833	34	42	290

Table.5 (Continued) Economic Order Quantity (EOQ), Reorder Point (ROP), and Safety Stock (SS) calculation on category A cardiovascular drug

Drug Name	Economic Order Quantity (ROP)	Order Frequency/ Year	Safety Stock (SS)	Re-Order Point (ROP)
Micardis Tab 80mg	91	34	7	31
Platogrix Tab 75mg (AJI)	503	34	13	150
Clopidogrel Tab 75mg	400	34	71	209
Canderin Tab 16mg	220	33	11	66
Atofar Tab 20mg	178	33	22	67

To calculate safety stock researchers used statistical methods. In calculating the safety stock, the service level that the management wants to achieve must be determined. According to Waters, the service level used is usually 95%, resulting in a Z value = 1.64. From the interviews with the informants, it was found that the lead time of the drugs averaged is 3 days. Based on table 5, each cardiovascular drug item has a varying ROP. Cardiovascular drug orders will only be carried out when stocks reach the ROP point. ROP is a way of procuring drugs by considering lead time, safety stock, and the number of needs. Leadtime is used to estimate an inventory arrives before the inventory runs out, while safety stock is a safety stock to avoid fluctuating demand (Waters, 2003).

This is an example of calculating the Safety Stock of Nitrokaf Retard 2.5 mg BPJS:

Annual Demand = 45,671 capsules

Lead time (l) = 3 days

Service level = 95%

Demand per day = $45,671 / 30 \text{ days} = 1,522 \text{ capsules}$

Standard deviation of demand per day = 90 capsules

Z (95%) = 1.65

Safety Stock = Z × standard deviation of lead-time demand

= $Z\sigma\sqrt{L}$

= $1.65 \times 90 \times \sqrt{3}$

= 255 capsules

So, safety stocks for Nitrokaf Retard 2,5 mg BPJS are 255 capsules.

ROP analysis

Known:

Demand per day = 1,522 capsules

L = 3 days

SS = 255 capsules

So, the calculation is:

ROP = (d x L) + SS

= $(1,522 \times 3) + 255 = 4,822 \text{ capsules}$

So, the Reorder Point (ROP) for Nitrokaf Retard 2.5 mg BPJS is 4,822 capsules

By using the ABC-EOQ-ROP-SS methods is expected to reduce the incidence of cardiovascular drug vacancies. The research that conducted by M. Burhan shows a significant influence the EOQ

and ROP Methods to reduce frequency of drugs vacancy. He compared the number of drug vacancies before and after using the EOQ and ROP methods in drug inventory control, the effects were analyzed using the t-test (Burhan, M. Winarsih, Sri Harijanto, 2019).

Analysis of Total Cost Between EOQ and Actual Order

Table 6. The Result of Total Cost Between EOQ and Actual Order

Drug Name	Ordering Cost	By EOQ		Total Cost	By Actual Order	
		Carrying Cost			Ordering Cost	Carrying Cost
Nitrokaf Retard 2,5mg BPJS	930.671	930.344	1.861.015	482.634	1.793.998	2.276.632
Nitrokaf Retad Forte 5mg BPJS	891.552	890.839	1.782.391	440.873	1.801.495	2.242.367
Diviti PFS 2.5mg/0.5ml BPJS	695.980	681.884	1.377.864	285.849	1.660.239	1.946.088
Clopidogrel Tab 75mg BPJS	625.669	625.402	1.251.071	294.958	1.326.610	1.621.568
Adalat Oros Tab 30mg BPJS	616.359	615.888	1.232.247	267.089	1.421.280	1.688.369
Candesartan Tab 16mg BPJS	495.008	494.884	989.892	314.855	778.045	1.092.900
Bisoprolol Tab 5mg BPJS	445.425	445.136	890.562	320.888	617.895	938.783
V-Bloc Tab 6,25mg BPJS	435.522	435.376	870.899	261.313	725.627	986.940
Candesartan Tab 8mg BPJS	417.176	416.989	834.165	295.548	588.595	884.142
Miozidine Tab	376.491	375.870	752.361	296.763	476.850	773.613
Candesartan Tab 16mg	333.891	334.263	668.154	260.157	429.000	689.157
Norephineprin Inj BPJS	316.717	316.528	633.244	193.989	516.780	710.769
Vascon Inj	302.023	313.500	615.523	181.214	522.500	703.714
Candesartan Tab 8mg	301.385	300.938	602.323	282.879	320.625	603.504
Canderin Tab 8mg	298.569	298.375	596.944	257.101	346.500	603.601
Diviti PFS 2.5mg/0.5ml	311.942	283.938	595.880	155.971	567.875	723.846
Furosemid Inj	284.464	284.735	569.199	217.168	372.969	590.137
Nitrokaf Retard 2,5mg	281.570	281.762	563.332	213.225	372.075	585.300
Micardis Tab 80mg	276.761	279.076	555.837	104.938	736.026	840.964

Table 7. (continued) The Result of Total Cost Between EOQ and Actual Order

Drug Name	Ordering Cost	By EOQ	Total Cost	Ordering Cost	By Actual Order	Total Cost
		Carrying Cost			Carrying Cost	
Platogrix Tab 75mg (AJI)	277.164	276.650	553.814	216.481	354.200	570.681
Clopidogrel Tab 75mg	276.459	276.834	553.292	147.445	519.063	666.508
Canderin Tab 16mg	272.688	272.250	544.938	166.643	445.500	612.143
Atofar Tab 20mg	268.822	269.225	538.047	199.376	363.000	562.376
Total Cost	9.732.308	9.700.685	19.432.993	5.857.357	17.056.745	22.914.102

Table 8. The difference in total cost between an order by economic order and by actual order.

	By EOQ	By Actual Order	Difference	Percentage (%)
Order Cost	9.732.308	5.857.357	3.874.951	39,82
Carrying Cost	9.700.685	17.056.745	-7.356.060	-75,83
Total Cost	19.432.993	22.914.102	-3.481.109	-17,91

In the table.7, We can see that the total reorder costs equal the total carrying costs in. This is always true if we use the economic order quantity. From table 7 it can be seen that ordering using the economic order quantity can save costs around 17.91% of the actual order. The results obtained differ greatly from the efficiency values obtained from Widodo's research which states that using the EOQ analysis method is known to increase the cost efficiency of cytostatic drugs by 73% of the total inventory cost. This is because the price per item of cardiovascular drug is cheaper than the price per item of cytotoxic drug so that the difference in the carrying cost is not too different (Widodo, 2012).

CONCLUSION

The results of ABC-EOQ-ROP-SS methods in controlling cardiovascular drugs can be implemented by the Jakarta Islamic Hospital to minimize stock inventory, while maintaining the service level and can increase the total cost efficiency up to 17,91% of the actual order. The hospital information system can support in fulfilling the data needed in the calculation of the ABC-EOQ-ROP-SS methods. The formula that has been determined must be able to be entered into the hospital information system so that stock travel can be evaluated quickly. Further research is needed for applying this method for all of drugs item in Jakarta Islamic Hospital. In addition, the carrying costs can be more detailed than this research by calculate the electricity costs, storage facility costs, damaged and expired drugs costs, and personnel costs, compared to the total inventory in the end of the year.

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