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Management Methods of Av Category Drug Inventories with Abc Combination Analysis (Pareto) And Ven Classification In Pharmaceutical Installations Of Ende Hospital

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Abstract: *Ende Hospital Pharmacy Installation does not yet have a drug supply control system. Purchase planning is done manually based on the historical use of drugs in the last three months and manual checking of which medications will or have been used.In this study, a control design for drug supply in the AV category (A Pareto and V for vital drugs) will be made with ABC analysis and VEN classification, with statistical testing using the Kolmogorov Smirnov method.The results showed that the drug supply control system currently implemented in the pharmaceutical installation at Ende Hospital was not very good, because it had a relatively high purchase cost. They were using the dynamic lot sizing method for AV category drugs, a 4.95% cost savings can be achieved.*

Keywords: *ABC analysis, VEN classification, AV Category Drugs, Dynamic Lot Sizing*

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I. Preliminary

Pharmacy services are an inseparable part of the hospital health system which is oriented towards patient care by providing quality medicine including affordable clinical services for all social levels. The management of pharmaceutical supplies is a managerial function in the Pharmacy Installation as the only pharmaceutical supplies provider including drugs, medical devices, and consumables. Pharmaceutical supplies are often referred to as pharmaceutical logistics. The management of pharmaceutical supplies is essential because inefficiency will harm the hospital, both medically and economically

Pharmacy installation is a revenue center and a supporting service that contributes 50% of total hospital revenue, therefore pharmaceutical supplies must be appropriately managed to increase cost efficiency related to risks caused due to inaccuracy in managing pharmaceutical supplies. Management of drug supplies at home pain associated with the drug logistics management function. Availability is one of the things that must be considered because if there is a shortage or excess amount of medicine it can cause harm to the hospital.

The Ende Hospital Pharmacy Installation manages approximately 352 drug items registered in its database. This raises its problems, especially in drug control, closely related to drug planning and procurement. The drug planning that is being done is still using the consumption method by using the data for the last three months and checking the medicine shelf. Besides, the drugs ordered are also based on instinct / feeling, of course this can result in the drug stocking out or even resulting in an over stock increasing the drug supply value.

This study aims to help build a drug supply control system at Ende Hospital, so that the Pharmacy Installation role as one of the revenue centers can be fulfilled. With this research, it is hoped that it can also help the Hospital Pharmacy Unit to determine the inventory management model to be more effective and efficient.

II. Literature Review

2.1 ABC Analysis and VEN Classification

According to Reddy (2008), ABC analysis is based on Pareto law which states that only a small number of goods have an enormous value while the rest of the other goods which are large in number have only a little value.

Based on ABC analysis, 10% of goods contribute 70% of the value and are called group A, group B is 20% of goods that contribute 20% of the value, and finally group C is 70% of goods that contribute 10% of the value. This shows that controlling a small portion of goods, namely 10% of the total number of goods, will control 70% of the entire inventory value (Reddy, 2008).

The VEN classification is an analysis used to determine drug purchase priorities and determine safe stock levels. Categories of VEN drugs according to Quick (1997):

1. Group V (Vital)

The critical criterion is that this drug is used to save human life, or treat diseases that cause death. Drugs included in this group include life saving medicines, medication for essential health services, and medicines to treat conditions that cause death's most significant causes. For drugs that are included in group V, there should not be a vacuum.

2. Group E (Essential)

The drug's critical criterion is a causally acting drug or a drug work on the disease's source. Vacancies in this group of drugs can be tolerated less than 48 hours.

3. Group N (Non Essential)

The critical criteria for this drug are supporting drugs so that action or treatment is better for comfort or to overcome minor complaints. These medications are used for illnesses that heal independently. Vacancies in this group can be tolerated for more than 48 hours.

To refine the analysis in drug supply control, a combination of ABC analysis and VEN classification is used in a matrix. With this combined method, the value of drug use per the level of clinical need can be seen. The matrix can be constructed as follows:

Table 1.1 ABC / VEN Matrix

	V	E	N
A	AV	AE	AN
B	BV	BE	BN
C	CV	CE	CN

The combination of the VEN and ABC classifications provides a matrix consisting of nine categories. Each group of the above matrix requires different inventory control policies and management.

2.2 Economic Order Quantity (EOQ)

Economic Order Quantity (EOQ) is several inventory items that can be ordered during a period to minimize the cost of the inventory (Sabarguna, 2004). Two types of expenditures considered in the EOQ model are storage costs and ordering costs (Mardiyanto, 2009).

2.3 Safety Stock (SS)

According to Rangkuty (1996), buffer stock is an additional stock held to protect and safeguard the possibility of material shortages (stock out).

The importance of calculating the buffer stock is due to the possibility of late orders which can be caused by traffic jams, floods, or other natural disasters, and an increase in the number of drug use due to increased services, where these things can result in stock out of drugs so that service to patients can be distracted. According to Rangkuty (1996), the amount of investment for buffer stock supplies, especially for expensive medicines (group A), is prioritized for vital and rare drugs.

2.4 Reorder Point (ROP)

According to John and Harding (2001), in drug control with ROP, the decision about when to reorder lies in two factors, namely; first, consideration of immediate reorder rates based on average use and secondly consideration of safety supplies based on degree of uncertainty and level of service demanded.

III. Research Methods

3.1 Research Design

This research is an exploratory research with case studies, because it can answer "how" to a problem or phenomenon in an organization. So that from this research, we can find a way to compile an optimal drug supply control model at Ende Hospital. The analysis used is ABC analysis, VEN analysis then makes a matrix of the two studies and then selects the appropriate inventory control method for drugs that fall into the AV category.

3.2 The Scope Of Research

In principle, this study aims to explore the AV category drug supply management model using the ABC analysis and the VEN category at the Ende Hospital pharmaceutical installation.

3.3 Population and Sample

Researchers determined that the population taken was all types of AV category drugs at Ende Hospital. The sample used in this study was the AV category drugs during 2019.

3.4 Data Analysis Technique

In this study, the data analysis techniques used were as follows:

1. Using ABC analysis.
2. Using the VEN Classification.
3. Determine the pattern or characteristics of drug demand.

4. Select the appropriate supply method for each drug based on the characteristics of drug demand.
5. Calculating the s (reorder point) / ROP and the recommended amount of purchases (Q) according to the method selected based on AV category drugs characteristics and comparing the total investment between the chosen method and the existing conditions in the object of study.

IV. Results And Discussion

4.1 ABC Analysis Results and VEN Classification

Of the 352 drug items, after being calculated using the ABC / Pareto analysis, 70% (64 drugs were included in category A), 20% (89 drugs were included in category B), 10% (199 drugs were included in category C). Then, from the ABC analysis data, drugs that fall into category A will be selected, namely those with a high consumption value.

The 64 drugs included in category A were then analyzed based on their clinical importance by the Pharmacist at Ende Hospital, in this case the Head of the Ende Hospital Pharmacy Unit, to determine which drugs were included in the V (vital) classification. From the results of the analysis of 64 drugs category A, 29 drugs were included in the V classification.These drugs were Human albumin 20% 100 ml, RL infusion, NaCl 0.9% infusion, Bunascan inj, ATS inj 1500 IU, Aqua pro inj 25ml, Human albumin 20% 50ml, Diane Pd-4 dextrin 1.5%, Kutoin injection, Diviti inj, Aminofluid, Widahes 500ml, D5% + NaCl 0.225 infusion, Tetagam inj 250 IU, Petidine inj, Anti Snakehead (ABU), Dextrose 5%, Diane Pd-4 dextwin 2.5%, Induxin, Vitadion 2mg/ml injection, Phyfion 2mg/ml inj, Fentanyl inj, Santocyn inj, D5% + NaCl 0.45 infusion, Ventolin nebu inj, Gitas plus, Norepinephrine inj, Oxytocin inj, and Tranexamic Acid 500 mg inj. From now on referred to as category AV drugs.

4.2 Determination Of Drug Characteristics Based On Data Normality Test With The Kolmologorov-Smirnov Method

In this study, the data normality test was used with the Kolmogorov Smirnov method with the following results:

Table 4.1 Data Normality Test Results with the Kolmogorov-Smirnov method

One-Sample Kolmogorov-Smirnov Test

		Human albumin 20% 100ml	RL infus	NaCL 0,9% infus	Bunascan inj	ATS inj 1500 IU	Aqua pro inj 25ml	Human albumin 20% 50ml
N		52	52	52	52	52	52	52
Normal Parameters[a,b]	Mean	3.69	440.90	502.62	22.79	9.71	406.23	2.65
	Std. Deviation	4.718	693.309	556.779	33.072	11.726	779.546	3.900
Most Extreme Differences	Absolute	.217	.262	.210	.284	.204	.309	.271
	Positive	.212	.228	.210	.284	.192	.309	.271
	Negative	-.217	-.262	-.190	-.245	-.204	-.301	-.248
Test Statistic		.217	.262	.210	.284	.204	.309	.271
Asymp. Sig. (2-tailed)		.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Dianeal Pd-4 dextwin 1,5%	Kutoin injeksi	Diviti inj	Aminofluid	Widahes 500ml	D5% + NaCl 0,225 infus	Tetagam inj 250 IU	Petidine inj	Anti Bisa Ular (ABU)	Dextrose 5%
52	52	52	52	52	52	52	52	52	52
20.77	9.46	2.12	7.54	7.33	36.06	2.65	20.10	.58	40.85
39.568	20.430	3.135	15.336	14.079	74.147	4.396	48.724	1.054	60.730
.300	.322	.327	.315	.340	.313	.304	.352	.400	.295
.270	.279	.327	.315	.340	.281	.304	.352	.400	.295
-.300	-.322	-.250	-.312	-.301	-.313	-.273	-.340	-.292	-.251
.300	.322	.327	.315	.340	.313	.304	.352	.400	.295
.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]

Dianeal Pd-4 dextwin 2,5%	Induxin	Vitadion 2mg/ml injeksi	Phyfion 2mg/ml inj	Fentanil inj	Santocyn inj	D5% + NaCl 0,45 infus	Ventolin nebu inj	Gitas plus	Norepinefrin inj
52	52	52	52	52	52	52	52	52	52
6.92	38.46	17.58	29.06	5.02	48.06	20.88	45.25	29.33	4.79
9.561	52.208	26.836	41.909	6.449	61.940	22.103	43.714	30.759	6.288
.234	.231	.275	.244	.218	.219	.172	.164	.208	.223
.186	.210	.275	.218	.209	.217	.167	.164	.208	.171
-.234	-.231	-.256	-.244	-.218	-.219	-.172	-.150	-.170	-.223
.234	.231	.275	.244	.218	.219	.172	.164	.208	.223
.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.000[c]	.001[c]	.001[c]	.000[c]	.000[c]

Oxitocin inj	Asam Traneksamat 500mg inj
52	52
81.94	52.50
90.670	52.596
.187	.159
.187	.158
-.183	-.159
.187	.159
.000[c]	.002[c]

The results of the data normality test using the One-Sample Kolmogorov-Smirnov Test states that the significance value (Asymp. Sig (2-tailed) of each variable (drug) is <0.05 so it can distribute abnormal data. It can be seen that from the results Normality test and the graph above show that 29 drugs fall into the category of abnormal distribution demand.

4.3 Inventory Policy For Each Drug And Calculation (Reorder Point) ROP And (Amount Of Purchase) Q

The results of the calculation of the purchase of AV category drugs using the real total purchases system and using the Dynamic Lot Sizing method

Table 4.2 Comparison of Purchase Calculations with Total Real Purchases in 2019 vs Dynamic Lot Sizing Method

NO	MEDICINE NAME	REAL PURCHASE TOTAL (Rp)	METHOD DYNAMIC LOT SIZING (RP)	DIFFERENCE (Rp)
1	Human albumin 20% 100 ml	187,609,600	159,468,160	28,141,440
2	RL infusion	183,120,000	183,120,000	
3	NaCL 0.9% infusion	160,250,000	160,250,000	
4	Bunascan inj	88,462,500	84,924,000	3,538,500
5	ATS inj 1500 IU	59,604,545	58,949,550	
6	Aqua pro inj 25 ml	71,500,000	61,776,000	9,724,000
7	Human albumin 20% 50 ml	63,835,200	63,835,200	
8	Dianeal Pd-4 dextwin 1.5%	45,600,000	45,600,000	
9	Kutoin injection	49,335,000	41,112,500	8,222,500
10	Inj Div	26,881,300	26,881,300	
11	Aminofluid	35,094,500	31,585,050	3,509,450
12	Widahes 500 ml	26,614,800	23,953,320	2,661,480
13	D5% + NaCl 0.225 infusion	24,300,000	24,300,000	
14	Tetagam 250 IU inj	26,550,000	26,550,000	
15	Petidine inj	23,377,200	20,455,050	2,922,150
16	Anti Venom Snake (ABU)	15,366,120	15,366,120	
17	Dextrose 5%	17,250,000	15,870,000	1,380,000
18	Dianeal Pd-4 dextwin 2.5%	15,200,000	15,200,000	
19	Induxin	12,196,000	12,196,000	
20	Vitadion 2mg / ml injection	6,380,000	6,380,000	
21	Phyfion 2mg / ml inj	11,550,000	11,550,000	
22	Fentanyl gospel	10,653,600	10,653,600	
23	Santocyn inj	11,097,500	11,097,500	
24	D5% + 0.45 NaCl infusion	9,870,000	9,400,000	470,000
25	Ventolin nebu inj	10,000,000	10,000,000	
26	Gitas plus	9,052,500	9,052,500	
27	Norepinephrine inj	8,314,320	8,314,320	
28	Oxitocin inj	7,348,000	7,348,000	
29	Tranexamic Acid 500mg inj	6,995,000	6,995,000	
				Rp 60,569,520

The table above shows that the difference in total purchases of 29 AV category drugs between the dynamic lot sizing method and the total existing assets in 2019 is Rp 60,566,520. So it can be concluded that using the dynamic lot sizing method for AV category drugs can decrease the total purchase cost compared to the entire previous purchases that do not use the method for purchase planning. The reduction in total purchases of AV category drugs if calculated as a percentage can be seen:

$\frac{60.569.520}{1.223.407.685}$ x 100% = 4.95% which means that there is a savings in the cost of purchasing drugs for the AV category of 4.95% when using the dynamic lot sizing method.

V. Conclusions And Suggestions

5.1 Conclusion

From the results of the research and discussion in this study, the following conclusions were drawn:

1) There are 352 drug items under ABC analysis to determine the drug value based on the Pareto principle. From the results of the analysis, it was found that 70% (64 drugs were included in category A), 20% (89 drugs were included in category B), 10% (199 drugs were included in category C).

2) Of the 64 items of category A drugs, a drug included in category V was selected based on the VEN classification. From the analysis, 29 drugs fall into the V classification.

3) An appropriate control policy for these drugs is dynamic lot sizing. The recommended ROP is based on the Fixed Order Quantity Approach Under the Condition of Uncertainty.

4) It is known that the simulation results of using the dynamic lot sizing method for AV category drugs based on 2019 data, can provide a reduction in the total purchase cost of Rp. 60,566,520 compared to the entire real purchases that do not use the method for planning / purchasing.

5.2 Suggestion

From the results of the above conclusions, the suggestions for this study are as follows:

1) The Pharmacy Installation of Ende Hospital makes an accurate drug planning system based on forecasting and previous real consumption and makes adjustments for the drugs to be ordered.

2) Ende Hospital uses dynamic lot-sizing inventory control method for AV category drugs based on ABC analysis and VEN classification.

3) Ende Hospital created a management information system with an up-to-date database for planning and inventory control to minimize drug procurement delays, which are still manually managed and reduce dependence on specific individuals.

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