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THE ROLE OF ANTIBIOTICS DRUG PROCUREMENT PLANNING SYSTEM IN IMPROVING EFFICIENCY USING ABC CRITICAL INDEX METHOD

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Abstract: *Procurement planning of drugs in hospital pharmacy unit is important for the hospital's health service because pharmacy unit is also included in the supporting services and main revenue center. The aim of this research is to analyze the differences value of antibiotic supplies using the ABC critical index method compared to the usual procurement planning at Hospital X.*

This research was an observational research (non-experimental). The design of this research was descriptive evaluative using quantitative and qualitative datas that has been available. Therefore, this research can be included into a retrospective study. There were 190 kind of antibiotic drugs in 2018 and 158 kind of antibiotic drugs in 2019.

This research results no significant difference between the average revenue, the usage value, the investment value, and the ABC critical index value between year of 2018 and 2019. There was difference in the average investment value based on ABC critical index method between 2018 with 2019, as in group A has the highest average investment, while group B has a moderate average investment, and group C has the lowest average investment.

One of the factors that cause planning and procurement of drugs less efficient in 2018 and 2019 was the same planning and procurement system of antibiotic drugs at Hospital X every year. It is important for management team to improve the efficiency of drug planning and procurement by using ABC crital index analysis which can help management team to make decisions related to the planning and procurement of antibiotic drugs at Hospital X.

Keywords: *Efficiency, Drug Planning, Critical Value, and ABC Critical Index Method.*

PRELIMINARY

Health is one of common well-being elements that must be manifested through sustainable development. The community grows very rapidly in this globalization era. It can be seen from the growth of health services, such as hospitals. Scheyer and Friedman (2011) explains that hospitals generally have the greatest regular expenses on procurement of pharmaceutical preparations. According to the World Health Organization (WHO) in 2004, drugs cost in some developed countries ranged between 10-15% of the health budget, while in developing countries drugs cost ranged between 35-66%, and the drugs cost in hospitals in Indonesia is about 39%. National drug policy stated the cost of drugs is a substantial part of all healthcare costs. From various surveys, it can be concluded that the drug costs about 40-50% of total health care operations (Istinganah *et al*. 2006).

A hospital is responsible for ensuring the use of available resources optimally to aim the effectivity and efficiency in cost control. It aims to ensure an adequate supply of items needed so that the items' supply planning can be maintained (Wandalkar *et al*. 2013). Although the cost is great, pharmacy service is a support service as well as a main revenue center. That is because pharmaceutical services contribute 50% of all hospital revenue. Therefore, if

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pharmaceutical supplies are not managed carefully and responsibly, it can be predicted that the hospital revenue will decline. Suciati and Adisasmito (2006) confirmed that more than 90% of health services in hospitals use pharmaceuticals supplies.

From the drugs listed in the formulary of Hospital X, antibiotics were the largest amount of drugs compared with other types of drugs. Also there was no method used in Hospital X specifically for the antibiotics management. Therefore, author was interested to learn about the classification of antibiotics based on critical index ABC analysis. This critical index ABC analysis can help management team to determine the proper planning for each drug groups and which drugs should be prioritized to improve efficiency and reduce costs (Quick *et al*. 2012). By improving the procurement of drugs, pharmacy unit's role as a revenue center in the hospital can be fulfilled (Devnani *et al*. 2010). It can also have an impact on for a better health services provided to the community and for the better satisfaction of patients (Suciati and Adisasmito, 2006). Therefore, to create budget efficiency and reduce the antibiotics' value of inventories in Hospital X, this research on the analysis of antibiotic drugs plan using critical index ABC analysis was conducted.

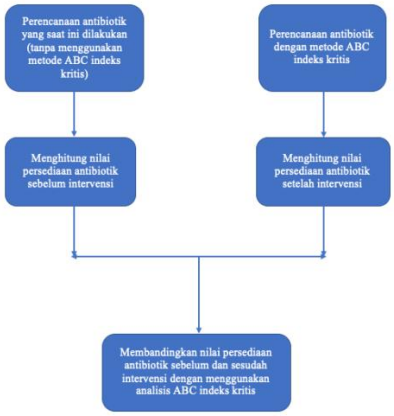
RESEARCH METHODS

This research was conducted at Hospital X. Data retrieval was done in November 2019 until January 2020.

This research was observational research (non-experimental). The research was descriptive evaluative using quantitative and qualitative data that has been provided so that this research can be included in a retrospective study.

The analysis used in this research were value of ABC analysis, ABC investment value analysis, and the critical index ABC analysis. The efficiency will also be calculated by comparing the stock value after critical index ABC analysis with stock value without using critical index ABC analysis. The data used for this research was drugs logistics data consists of the number of drug usage in 2018 and 2019. Data were obtained from Information System Manager and Pharmacy Unit of Hospital X.

Then the data was check for its completeness and processed by Microsoft Excel and SPSS 22.



Picture 1 Research conceptual framework

Hypothesis Development

Based on the description above, the hypothesis obtained in this research include:

1. Different test average value of inventories
   H1: $\mu 2018 \neq \mu 2019$
2. Different test average value of consumption
   H1: $\mu 2018 \neq \mu 2019$
3. Different test average value of investments
   H1: $\mu 2018 \neq \mu 2019$
4. Different test average value of the critical index
   H1: $\mu 2018 \neq \mu 2019$
5. Different test average value of an investment based groups (ANOVA test hypotheses)
   H1: there is at least one group that provides different average real
6. Hypotheses for Chi-Square analysis (to test wether if the groups in 2019 with a critical index ABC method depends on the groups in 2018)

H1: There is an association or relationship between the grouping in 2018 to 2019.

7. Hypotheses for Spearman's correlation test (to test whether there is a relationship between groups in 2018 by 2019). Correlation test to prove the consistency of the grouping in 2018 to 2019 with critical index ABC method.
   H1: There is a correlation between the groups in 2018 to 2019.
8. Hypotheses for the Wilcoxon test (this test is a nonparametric paired test to test whether there are differences in the groups for the same antibiotic drugs from 2018 to 2019)
   H1: The groups in 2018 was significantly different from the groups in 2019.

RESULT

Inventory Control Drugs in Hospital X

Table 1 Comparison of Value Inventory Antibiotics (NPA) against Antibiotics Shopping Value (NBA) in 2018 and 2019

No.	Bulan	NBA (Rp)		NPA (Rp)		Rasio NPA/NBA (%)	
		2018	2019	2018	2019	2018	2019
1.	Januari	234.228.662	278.366.355	65.632.362	92.512.343	28	33
2.	Febuari	224.526.238	395.243.455	73.335.328	67.647.011	33	17
3.	Maret	283.490.006	398.201.237	76.282.178	90.663.576	27	23
4.	April	247.080.346	121.751.882	103.074.915	69.618.240	42	57
5.	Mei	200.283.792	263.107.888	100.123.879	90.798.285	50	35
6.	Juni	181.040.825	250.775.215	83.676.784	85.877.005	46	34
7.	Juli	142.716.137	266.015.118	106.844.575	81.625.001	75	31
8.	Agustus	194.528.728	325.658.910	64.203.637	73.980.852	33	23
9.	September	137.715.078	272.086.667	65.500.064	71.845.184	48	26
10.	Oktober	147.553.633	271.660.290	53.778.109	68.604.626	36	25
11.	November	153.435.008	305.731.779	55.687.996	56.417.344	36	18
12.	Desember	178.767.780	200.989.172	52.992.601	73.334.829	30	36
Total		**2.325.366.233**	**3.349.587.968**	**901.132.482**	**922.924.296**	**39**	**28**

Table 2 Comparison Shopping Value Antibiotics (NBA) against the value of Pharmaceutical Expenditure (NBF) in 2018 and 2019

No.	Bulan	NBA (Rp)		NBF (Rp)		Rasio NPA/NBA (%)	
		2018	2019	2018	2019	2018	2019
1.	Januari	234.228.662	278.366.355	2.177.158.618	2.234.551.097	10.76	12.46
2.	Febuari	224.526.238	395.243.455	2.123.907.457	1.902.729.077	10.57	20.77
3.	Maret	283.490.006	398.201.237	2.371.448.174	1.920.875.990	11.95	20.73
4.	April	247.080.346	121.751.882	2.252.516.778	677.609.065	10.97	17.97
5.	Mei	200.283.792	263.107.888	1.949.449.432	1.490.812.218	10.27	17.65
6.	Juni	181.040.825	250.775.215	1.626.650.276	1.379.412.118	11.13	18.18
7.	Juli	142.716.137	266.015.118	1.414.728.593	1.548.522.133	10.09	17.18
8.	Agustus	194.528.728	325.658.910	1.826.528.059	1.973.650.314	10.65	16.50
9.	September	137.715.078	272.086.667	1.407.908.707	1.760.384.488	9.78	15.46
10.	Oktober	147.553.633	271.660.290	1.448.284.940	1.802.099.010	10.19	15.07
11.	November	153.435.008	305.731.779	1.721.856.431	1.911.255.300	8.91	16.00
12.	Desember	178.767.780	200.989.172	1.772.683.014	1.797.493.600	10.08	11.18
Total		**2.325.366.233**	**3.349.587.968**	**22.093.120.479**	**20.399.394.410**	**10.53**	**16.42**

ABC Analysis

Group of Drugs Based on ABC Usage Analysis

Table 3 The results of the consumption value based on ABC analysis in 2018

Group	Total Usage	Percentage	Number of Drugs	Percentage
A	226 611	68.57%	16	8:42%
B	70 670	21:38%	29	15:26%
C	33 221	10:05%	145	76.32%
amount	**330 502**	**100%**	**190**	**100%**

Table 4 The results of the consumption value based on ABC analysis in 2019

Group	Total Usage	Percentage	Number of Drugs	Percentage
A	123 612	69.62%	19	12:03%
B	35769	20:15%	26	16:46%
C	18 164	10:23%	113	71.52%

amount	177 545	100%	158	100%

Grup of Drugs Based on ABC Investment Value Analysis

Table 5 The results of the investment value based on ABC analysis in 2018

Group	Total Investment	Percentage	number of Drugs	Percentage
A	Rp. 1655605072	69.02%	24	12.63%
B	Rp. 500 035 931	20.85%	35	18:42%
C	Rp. 243 082 543	10:13%	131	68.95%
amount	**Rp. 2398723546**	**100.00%**	**190**	**100.00%**

Table 6 The results of the ABC analysis investment value in 2019

Group	Total Investment	Percentage	number of Drugs	Percentage
A	Rp. 2390461055	68.87%	14	8.86%
B	Rp. 727 960 007	20.97%	30	18.99%
C	Rp. 352 368 251	10:15%	114	72.15%

ABC Critical Index Analysis

Grup of Drugs Based on ABC Critical Index Analysis

Table 7 Results of the analysis of the ABC critical index in 2018

Group	number of Drugs	Percentage	Investment value	Percentage
A	7	3.68%	646381732.8	26.95%
B	64	33.68%	1409733224	58.77%
C	119	62.63%	342608589.2	14:28%
amount	**190**	**100.00%**	**2398723546**	**100.00%**

Table 8 Results of the analysis of the ABC critical index in 2019

Group	number of Drugs	Percentage	Investment value	Percentage
A	6	3.80%	749648773.5	21.60%
B	61	38.61%	2273454910	65.50%
C	91	57.59%	447685629.7	12.90%
amount	**158**	**100.00%**	**3470789313**	**100.00%**

Comparative Analysis of Inventory Value

Table 9 Comparative analysis of the inventories value between group A with ABC critical index analysis with preliminary data (without analysis) in 2018

No.	Antibiotik kelompok A Berdasarkan Analisis ABC Indeks Kritis	Nilai Persediaan	Antibiotik Tidak Berdasarkan Analisis ABC Indeks Kritis	Nilai Persediaan
1.	**TERFACEF 1 GR INJ**	Rp. 62.163.109	**TERFACEF 1 GR INJ**	Rp. 62.163.109
2.	**CEFAT 500 MG CAP / 18**	Rp. 29.385.783	LEVOCIN INF 100 ML	Rp. 58.522.926
3.	CEFOPERAZON 1GR	Rp. 14.089.640	LEVOCIN 500 MG TAB @DOS	Rp. 42.839.041
4.	CEFTRIAXON 1 GR INJ	Rp. 12.410.258	CEFXON 1 GR	Rp. 37.267.904
5.	CEFIXIME CAP 200 MG	Rp. 12.117.492	TAXEGRAM 1 GR INJ	Rp. 29.388.917
6.	CEFIXIME 200 MG CAP O1	Rp. 4.902.624	**CEFAT 500 MG CAP / 18**	Rp. 29.385.783
7.	CEFIXIME 100 MG CAP O1	Rp.2.222.550	CEFILA CAP 100 MG	Rp. 22.970.098
Total		**Rp. 137.291.456**	**Total**	**Rp. 282.537.778**

Table 10 Comparative analysis of the inventories value between group A with ABC critical index analysis with preliminary data (without analysis) in 2019

No.	Antibiotik Berdasarkan Analisis ABC Indeks Kritis	Nilai Persediaan	Antibiotik Tidak Berdasarkan Analisis ABC Indeks Kritis	Nilai Persediaan
1.	**SPORETIK 200 MG CAPS**	Rp. 32.236.245	CEFXON 1 GR	Rp. 56.054.880
2.	**SPORETIK 100 MG CAP@DOS**	Rp. 24.981.724	TERFACEF 1 GR INJ	Rp. 47.175.286
3.	CEFAT 500 MG CAP / 18	Rp. 21.290.142	CEFILA 200 MG CAP	Rp. 36.947.460
4.	CLANEKSI 500 MG KAP/18	Rp. 12.656.160	**SPORETIK 200 MG CAPS**	Rp. 32.236.245
5.	LAPICEF 500 MG CAP	Rp. 12.121.881	CEFILA CAP 100 MG	Rp. 31.430.742
6.	VROXIL 500MG CAP	Rp. 8.705.780	**SPORETIK 100 MG CAP@DOS**	Rp. 24.981.724
Total		Rp. **111.991.932**	**Total**	Rp. **228.826.337**

Hypothesis

Table 11 Result of hypotesis test

No.	Hypotesis Test	α	Result	Conclusion
1.	T-test inventory average	0.173	H1 rejected	No. different
2.	T-test usage average	0.110	H1 rejected	No. different
3.	T-test investment value average	0.091	H1 rejected	No. different
4.	T-test critical index value average	0.170	H1 rejected	No. different
5.	Anova test in 2018	0.000	H1 accepted	Different
6.	Duncan test in 2018	Each grups have a different subset		
7.	Anova test in 2019	0.000	H1 accepted	Different
8.	Duncan test in 2019	Each grups have a different subset		
9.	Anova test in 2018 and 2019	0.000	H1 accepted	Different
10.	Duncan test in 2018 and 2019	Each grups have a different subset		
11.	Chi-Square	0.000	H1 accepted	Significant relationship between 2018 with 2019
12.	Spearman	0.000	H1 diterima	Direct relationship between 2018 with 2019

DISCUSSION

Inventory Control Drugs in Hospital X

There was decrease in the percentage ratio of antibiotics inventory value with antibiotics shopping value at 39% in 2018 to 28% in 2019. The antibiotics inventory value increased from Rp. 901.132.482 in 2018 to Rp. 922.924.296 in 2019. Antibiotics shopping value also increased from Rp. 2.325.366.233 in 2018 to Rp. 3.349.587.968 in 2019. The value of antibiotics supplies and antibiotic shopping this value indicates a less efficient use of funds.

In this research, antibiotic drugs were selected as the unit of analysis because of its shopping value in Hospital X is relatively high compared to overall pharmaceutical expenditure value.

The antibiotics expenditure in 2018 was 10.53% and in 2019 was 16.42% compared to the total value of the overall pharmaceutical expenditure. Successing in controlling the expenditure value of antibiotics means successing in control about one-third of overall pharmaceutical installation's expenditure.

ABC Analysis

The drugs in the hospital were too many that they can be used in ABC control method based on the Pareto principle. According to Paterson (2004), small amount of items play an important role because it has a high value. Reddy (2008) also says that this method can help management team to determine priorities to improve efficiency and reduce costs. This method can make the management team focus on items with higher usage value so that it can be handled more efficiently (Peterson, 2004).

Total antibiotics in 2018 was 190 drugs and total in 2019 was 158. These antibiotic drugs were grouped based on ABC usage analysis, investment value, and the critical index. According to informants, pharmacy unit of Hospital X has not been introduced and carried out the ABC analysis to assist in the planning and procurement of drugs.

Group of Drugs Based on ABC Usage Analysis

From the calculation of ABC usage analysis in 2018, group A with usage amount of 68.57% consists of only 16 drug items is equal to 8.42% of the total drugs. Usage amount of group B is 21.38% of the total usage value and consists of 29 drug items that is equal to 15.26% of the total drugs. While group C with the least usage amount of 10.05% consisted of 145 drug items and is equal to 76.32% of the total drugs.

ABC analysis of the calculation of consumption in 2019 concluded that group A with the usage amount 69.62% of the total consumption and only consist 19 drug items is equal to 12.03% of the total drugs. Group B with usage amount 20.15% of the total number of consumption and consists of 26 drug items that is equal to 16.46% of the total drugs. While group C with the least usage amount 10.23% consisted of 113 drug items is equal to 71.52% of the total drugs.

Therefore, group A with the most usage amount must be ensured about the availability of sufficient stock to avoid stock outs that can impede service to patients in hospitals and caused losses to the hospital.

Grup of Drugs Based on ABC Investment Value Analysis

Calculation of ABC analysis of the investment value in 2018 conclude that group A with a total investment 69.02% of the total investment consisted of only 24 drug items and is equal to 12.63% of the total drugs. Group B with investment value 20.85% of the total investment and consists of 35 drug items that is equal to 18.42% of the total drugs. While group C with the least investment 10.13% of the total investment amount, consists of 131 drug items and is equal to 68.95% of the total drugs.

Calculation of ABC analysis on investment value in 2019 found that group A with a total investment 68.87% of the total investment amount consisted of only 14 drug items is equal to 8.86% of the total drugs. Group B investment value is 20.97% of the total investment amount and consists of 30 items of drugs that equal to 18.99% of the total drug. While group C with least total investment 10.15% of the total investment amount, consists of 114 drug items is equal to 72.15% of the total drugs.

According to Peterson (2004), group A drugs required special attention from the management in control because this group has a great investment value. With the value of investments in group A, it will cause the cost of storage of medicines and hospital extent of loss in case ofthe drugs damage.

ABC analysis can be used in the planning, procurement, to better control because it can perform selective control on each drug group. In addition, the ABC analysis, the cost can be reduced and used more efficiently by prioritizing certain drug groups. Another major advantage of using the ABC analysis is the increased service. With ABC analysis organization can provide supplies to the type, amount, and timing so as to reduce the purchase promptly and inability to meet the demand.

ABC analysis requires periodic evaluation so that changes in prices and consumption may be reconsidered. A review of ABC analysis can be performed each year in conjunction with the revision of the formulary. In addition,

ABC analysis can also lead to a lack of attention on items that have a lower value, when the items are critical in patient care (Reddy, 2008).

ABC Critical Index Analysis

Grup of Drugs Based on ABC Critical Index Analysis

This research used the average of critical index ABC value, investment value, and the critical value. The critical value of drugs obtained through questionnaires distributed to five specialists in Hospital X, involved in the prescribing, who understand the criticality of the drug in the delivery of services to patients.

ABC analysis conducted for the development of medicines in hospitals become critical index ABC analysis. This is done to avoid the lack of attention to important items in patient care, but it has a low value. Analysis ABC critical index includes the amount of usage, the value of the investment, critical dam of the medication on patient care. Therefore, the goods which have a low value but actually critical in patient care will remain aware of its existence. Calhoun and Campbell (1985) explains that the flaws in critical index ABC analysis that there is a possibility of substantial bias for each drug users have the desire of each and was difficult to assess the drug which are numerous.

This research uses an average of the critical value of the number of respondents with different specialties and has a considerable number of patients every day. Respondents are specialists who were assumed most understand the criticality of drug because it is a field of specialization doctors who have the most traffic at the clinic Hospital X.

Calculation of the ABC critical index analysis showed that amounted to 3.68% of the total drug item is a group consisting of seven items of drugs and use an investment of 26.95%. Group B amounted to 33.68%, which consisted of 64 items of drugs with an investment of 58.77%. The remaining portion of 62.63%, consisting of 119 drug items are in group C with an investment of 14.28%.

Calculation of the ABC critical index analysis showed that amounted to 3.80% of the total drug item is a group consisting of 6 items and medicinal uses an investment of 21.60%. Group B amounted to 38.61% which consisted of 61 items of drugs with an investment of 65.50%. The remaining portion of 57.59%, consisting of 91 items of drug is a group C with an investment of 12.90%.

For drugs in group A has a high criticality in providing services to patients in the control and procurement planning process must be considered.

Control will be different for each group. For drug in group A will require very strict control so the control by top level management every day or every week. Data base should be accurate and should be up to date constantly. To ensure the availability of drugs, the hospital can increase the number of suppliers and reduce lead time. As for the drug in group B, can be moderated by middle management control every month and can use based on past use as a basis for planning. For group C, control loose by the user departmen every 3 months, a rough estimate can be used as a basis for planning, as well as the suppliers can be reduced in number.

In addition to combining the amount of usage, the value of investments, and critical index as follows:

1. Drugs with high consumption, high investment value, and high critical value.

Table 9. Drugs with high consumption, high investment value, and high critical value.

No.	Medicine name	
	2018	**2019**
1.	CEFAT 500 MG CAP / 18	CEFAT 500 MG CAP / 18
2.	Cefixime 200 MG CAP O1	CLANEKSI 500 MG KAP / 18
3.	Cefixime CAP 200 MG	SPORETIK 100 MG CAP @ DOS
4.	CEFTRIAXON 1 GR INJ	SPORETIK 200 MG CAPS

There is one item that is the same drug CEFAT 500 MG CAP / 18 contained in the drug group high consumption, high investment value, and high critical value in 2018 and 2019. This antibiotic drugs required strict control because they unavailability of drugs can cause dangerous to the hospital and interfere with the smooth service to patients.

2. Drugs with high consumption, high investment value, and a lower critical value.

Table 10. Drugs with high consumption, high investment value, and a lower critical value.

No.	Medicine name	
	2018	**2019**
1.	VROXIL 500mg CAP	CEFILA 200 MG CAP
2.		CEFILA CAP 100 MG

To remedy this group stock availability is not a necessity for the critical value so low that the drug can be replaced by other drugs. Therefore the use and value of investments is high then these drugs should be provided because it can cause harm to a hospital if stock is not available.

3. Drugs with low consumption, low investment value, and high critical value.

To remedy this group, although its use remains low and cheap price must be provided for the high critical value. Unavailability of drugs can interfere with the smooth running of this group of services to patients.

4. Drugs with low consumption, low investment value, and a lower critical value.

Antibiotics that are included in the low consumption, low investment value, and a lower critical value there are 105 items of drug in 2018, while there were 79 drug items in 2019. To reduce duplication of drugs and improve the efficiency of the planning and control of drugs, the drugs in this group can be reduced particularly drugs that there is no movement because these drugs can be substituted with other drugs. For these drugs need not be provided stock in large quantities, can be done once in a while booking if necessary.

Comparative Analysis of Inventory Value

Total antibiotics group A based on the analysis of the critical index ABC in 2018 as many as seven types of antibiotics. The total value of inventories in 2018 to a group of antibiotic drugs Rp. 137.291.456, When compared based on the largest order value of inventories without using ABC critical index analysis. Only two types of drugs that enter into group A critical index are TERFACEF 1 GR INJ and CEFAT 500 MG CAP / 18, The total value of the inventory Rp. 282.537.778. Difference value of inventories Rp. 145.246.322.

Total antibiotics group A based on the analysis of the critical index ABC in 2019 as many as six different types of antibiotics. The total value of inventories in 2019 Rp. 111.991.932. When compared based on the largest order value of inventories without using ABC critical index analysis. Only two types of antibiotics into the group A critical index are SPORETIK 100 MG CAP @ DOS and SPORETIK 200 MG CAPS. The total value of the inventories Rp. 228.826.337. Difference value of inventories Rp. 116.834.405.

Hypothesis

T-Test for Inventory Average

Based on the results of different test inventory average in 2018 and 2019 (the results of T-test) showed no significant difference between the inventory average in 2018 with 2019. This indicates that the inventory drugs increased in 2018 amounted Rp. 901.132.482 to Rp. 922.924.296 in 2019 was no different, even though the amount of money incurred higher. Amounts of money that increased in 2019 showed that less efficient use of funds.

T-Test

T-test showed no significant difference between the usage average, investment value average, and abc critical index value average in 2018 with 2019.

Different Test for Invenstment Value Average Based on ABC Critical Index Analysis

Different test for investment value average based on ABC critical index analysis using ANOVA test. ANOVA test for differences in the average value of investments between groups A, B, and C. The average difference test in three stages, namely in 2018, 2019 and two years (2018-2019). If the results of ANOVA showed significance, then do a further Duncan test to see the differences in each group.

ANOVA and and Duncan test results indicate at least one group that produces an average value that is significantly different because grouping into A, B, and C on average significantly different. Results A group has an average value of the highest investments, while moderates are group B and the lowest average of group C.

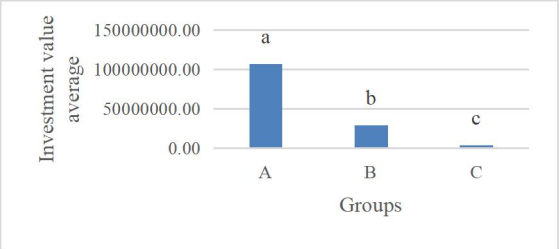


Figure 2 The average value in 2018-2019 investment Duncan test

Relationship Test Between Two Variables Antibiotics in 2018 and 2019

When combined antibiotic drug data from 2018 to 2019, the total types of antibiotics, there are 232. After being separated by the similarity names of drug within two years, there are 116 types of antibiotics that was in the two years 2018 and 2019. That means had 16 types of antibiotics were not always in both years.

The results show the cross-tabulation of the total class of antibiotics which in 2018 entered the group A, only one type of drug that is consistent is the group A in 2019. The rest are 3 types transformed into group B and 1 type in group C in 2019. Total 40 types that enter the group B in 2018, and the results in 2019 domination of drugs still enter the group B with 24 types. While the rest turned into group A as much as 2 drugs and 14 types of drugs enter the group C. 71 types in group C in 2018, the dominance of fixed group C were 58. While the remaining 13 types turns into group B in 2019.

Chi-Square test results indicate a significant relationship between the grouping in 2018 with 2019. The grouping in 2019 depending on the classification system in 2018.

The results of the Spearman correlation value is positive and significant, which means the tendency of the drug when grouped at a particular group in 2018 will be the same as the grouping on 2019. Based on the tests that have been carried out means that the determination of antibiotics in 2019 depends on the determination of antibiotics in 2018 (there is no difference made by the RS X).

CLOSING

Conclusion

Based on this research, can be taken conclusions as follows:

1. The planning and procurement of antibiotic drugs in Hospital X is still not done optimally to achieve effectiveness and efficiency. This is because:
   a. Hospital X formulary unable to fully a role in management logistics of drug. This is happenned because the hospital is still ordering and procuring drugs that are not registered in the formulary.
   b. Doctors are also less involved in making formulary.
   c. There are many variations of drugs with the same drug content. This is because the hospital has added new drug items, before making revisions or improvements to the formulary.
2. T-test results of inventory value average, usage, investment value, and critical index values in 2018 and 2019 show values greater than alpha 5%, then H0 is accepted, which means there is no significant difference between the inventory value average, use, investment value, and critical index value for 2018 with 2019.
3. The investment value average between group A, B, and C antibiotics is significantly different, where in group A has the highest average investment, while group B has a moderate average investment, and group C has an average investment Lowest.
4. Determination of antibiotic drugs in 2019 depends on the determination of antibiotic drugs in 2018 (there was no difference in the planning and procurement of antibiotic drugs by Hospital X).

Managerial Implications

An input for the Hospital X pharmacy unit, among others:

1. To improve the quality of pharmacy services by developing ABC critical index analysis system. Planning and procurement of drugs can be developed and optimized by Pengelosa Sarana Informasi (PSI) through technology information in Hospital X.
2. The integrated system can be used to support the Head of the Pharmacy and Logistics Pharmacy Department, and the Pharmacy Coordinator in the planning and procurement drugs process. ABC critical index analysis can assist managerial to making decisions that related to funding and providing facilities for the procurement of antibiotic drugs at Hospital X.
3. There is no difference in the average obtained from the inventories value in 2018 and 2019. Management must make improvements to the planning and procurement of the drugs system so that it can streamline the funds spent by Hospital X.
4. Inefficient management of funds will be detrimental to the hospital if left unchecked.

Theoretical Implications

The results of the theoretical implications obtained as follows:

1. More research needs to be done on Turn Over Ratio (TOR) and Cost of Goods Sold (COGS).
2. Further research needs to be done on doctor compliance with the use of antibiotics in Hospital X.

Suggestion

Based on these conclusions, the suggestions that can be given by researchers for Hospital X include:

1. It is necessary to revise the formulary of Hospital X because the existing formulary is not the main guide for ordering drugs in the hospital. In revising the formulary, a type of drug must be reviewed before changing or

adding drugs to the formulary to reduce drug duplication. Henceforth needed regular revision or improvement of the drug formulary once a year.

2. Formulary in hospital must to asked the doctor with specialization, not only the management and pharmacists who determine what drugs will be used, as well as those that have been assessed by pharmacists can provide therapeutic benefits for patients.
3. In the planning and procurement of drugs in Hospital X should be given priority. This can be done with ABC usage analysis, investment value, and ABC critical index method. This method will show management to focus more on items that have a critical value and higher use value so that it can be handled more efficiently and the hospital will get greater profits.
4. Evaluation and monitoring of drugs use based on formulary, doctor's adherence to the use of antibiotic drugs, and monitoring that antibiotics that have been ordered must be used by patients on the recommendation of doctors at Hospital X.

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