Drug Procurement Analysis of the Ten Biggest Diseases at the Barru District Public Health Center Using the ABC Method

Gemy Nastity Handayany*, Syahrul Basri

Faculty of Medicine and Health Sciences, UIN Alauddin Makassar, South of Sulawesi, Indonesia

Abstract

BACKGROUND: Management of pharmaceutical preparations at the public health center aims to ensure the availability of drugs whenever needed, in sufficient quantities and guaranteed quality, to support quality services at the public health center so that pharmaceutical services can take place effectively and efficiently.

AIM: This study aims to determine the ABC value of medicines at the Barru District public health center based on use, investment, and critical index value in 2020 and to determine, in which medicines are a priority in the procurement of pharmaceutical preparations.

METHODS: In this study, an analysis of pharmaceutical preparations from the ten biggest diseases at the Barru District public health center was conducted using the activity-based costing (ABC) method. This is a quantitative research with a descriptive observational study design to obtain an overview of drug procurement. Data collection was carried out by reviewing documents with purposive sampling technique on quantitative retrospective data in the form of the number of medicines, budgets, and medicines use data that listed on LP-LPO of public health center.

RESULTS: The results showed that the analysis of the critical index value of pharmaceutical preparations at the Barru District public health center resulted in an average percentage of preparations that were included in the ACIV group as much as 16.42%, the BCIV group as much as 16.23% and the CCIV group as much as 67.35%.

CONCLUSION: There are five pharmaceutical preparations that are a priority for the procurement of pharmaceutical preparations at the Barru District public health center with an investment value of Rp. 322,838,650.00 (this represents 18.09% of the total investment).

Introduction

Medicine is an item that is needed by sick people. The importance of drugs in health services has great consequences in the drug budget. Given the importance of budget management and drug procurement in public health center, drug management must be carried out effectively and efficiently so that it can provide the maximum benefit for patients [1].

Good drug management ensures that drugs are always available whenever needed, in sufficient quantities and guaranteed quality, to support quality services at public health center. The drugs needed are drugs that are medically necessary in accordance with the state of the local disease pattern, it has been scientifically proven that these drugs are useful and safe to use in the public health center concerned [2].

To achieve optimal performance, it is necessary to harmonize the duties and functions of the administration of government affairs in the health sector by the Health Office in the district/city. One of the tasks of the district/city Health Office is to report and present health data and information in the district/city area, one of which is the largest disease data in the district/city. The largest disease data collection aims to determine the pattern of diseases that exist in the community every year so that it can be a reference for the formulation and implementation of policies related to public health at the district/city level [3].

In 2020, there are ten biggest diseases in the Barru District public Health Center, namely, hypertension in the first place with a percentage of 28.10%, then in the second rank is acute respiratory infections (ARI) with a percentage of 17.82%, followed by gastritis in the third rank with a percentage of 15, 85%, in fourth place is diabetes mellitus with a percentage of 12.02%, then in fifth place is dermatitis with a percentage of 8.31%, in the sixth rank is common cold with a percentage of 5.12%, followed by rheumatism in the seventh rank with a percentage of 4.70%, then in the eighth rank is myalgia with a percentage of 3.32% ranked ninth is diarrhea with a percentage of 2.58%, and in the last rank is cephalgia with a percentage of 2.15% [4].

At present, the planning and procurement of drugs at the public health center are carried out centrally by pharmacists in the pharmacy warehouse of the District Health Office. In pharmacy warehouses, pharmacists are required to be able to manage drugs well so that the drug procurement process at the public health center can

run effectively and efficiently. In general, the drug supply consists of various types of drugs that are very large in number. Various kinds of drugs have different priority levels, so to find out which drugs need to be prioritized, activity-based costing (ABC) analysis can be used.

ABC analysis is a method of classifying inventory items according to the investment value in a company/institution. Group A items typically range from 15% to 20% of all inventory items and cover between 75% and 80% of the total annual investment value. Class B items typically range from 20% to 30% of all inventory items and account for 20% of the total annual investment value. Class C items usually make up 50% of all inventory items and account for 5–10% of the total annual investment value. ABC analysis tends to measure the significance of each inventory item in terms of value and when ABC analysis is applied to inventory situations, it can show the importance of the item and the level of control placed on the item [5].

In pharmaceutical management, drug grouping through the ABC method is one of the scientific methods used for the application of policies relevant to drug planning and procurement in health care centers [6]. At present, the planning and procurement of drugs in the pharmacy warehouse of the Health Office of Barru District are still using the consumption method. The consumption method is a method of planning and procuring drugs by looking at data on drug use in the previous period. The consumption method is easier to implement, but the application of this method cannot ensure the use of drugs that come out at the pharmacy installation so that the state of the drug stock cannot be predicted. Therefore, ABC analysis can be used as an analytical method for planning and procuring drugs in pharmacy warehouses, especially for drugs that have the most use so that the use of the budget can be controlled optimally.

Barru District has 12 public health center spread across various areas. Each public health center treats various diseases suffered by the community in its working area. Based on the data for the ten biggest diseases, the pattern of the disease can be determined. The ten biggest diseases listed of with the highest percentage in the Barru District Public Health Center in 2020 consist of Hypertension, ARI, gastritis, diabetes mellitus, dermatitis, common cold, rheumatism, myalgia, diarrhea, and cephalgia.

Methods

Study design

This is a quantitative study with a descriptive observational study design that aims to provide an in-depth description of drug procurement at the Barru District public health center in 2020 using the ABC method. This research was conducted at the Pharmacy Installation of the Barru District Health Office consisting of 12 public health center. This study uses a retrospective research approach, where observations begin at one point before the start of the study so that all observational data are past data obtained from authentic sources [7].

Data collection

Data collection was carried out by conducting a document review using purposive sampling technique on quantitative retrospective data in the form of the number of drugs, budgets, and data on the use of drugs at the Barru District public health center listed in LP-LPO (Statements Use of Drug-Demand) in 2020 [8].

The collection of research subjects was based on inclusion and exclusion criteria, namely, the inclusion criteria of the research subjects were medicines that were available at the Barru District Health Center in 2020. Exclusion criteria for research subjects were medicines which were aid drugs/dropping/grants and medicines whose price is unknown.

Research instruments

Researchers conducted a document review of the research subject. The instruments used in this study were the LP-LPO of the Barru District public health center in 2020, the Pharmacy Warehouse Drug List as of December 31, 2020, clinical practice guidelines for doctors in primary health care facilities, edition I of 2017 as a guide to find out the types of drugs prescribed for the ten biggest diseases at the public health center, Computer Programs, and Calculators.

ABC analysis of value in use

All medicines used are counted in 1 year; then, the medicines are sorted based on the number of uses from the highest usage to the least usage. From this sequence, they are classified into several groups, namely, ANP, BNP, and CNP based on the cumulative percentages of 80%, 15%, and 5%. Then, the classified drugs were given a score of 3 for the ANP group, a score of 2 for the BNP group, and a score of 1 for the CNP group. The following is the formula for determining the percentage of drug use value:

$$\%NP = \frac{P}{\sum P} \times 100\%$$

Information:

%NP: Percentage of value in use

P: Number of drug use in a year

ΣP: Total number of puskesmas drug use

After the value of drug use is known, data collection on the value of drug use is carried out from

the ten largest diseases at the puskesmas based on the clinical practice guidebook for doctors in the primary health care facilities [9].

ABC analysis of investment value

The investment value of all medicines is calculated in 1 year by multiplying the number of uses by the unit price of each drug, then the medicines are sorted based on their investment value from the highest to the lowest investment value. From this sequence, they are classified into several groups, namely, ANI, BNI, and CNI based on the cumulative percentages of 80%, 15%, and 5%. Then, the classified drugs were given a score of 3 for the ANI group, a score of 2 for the BNI group, and a score of 1 for the CNI group. The following is the formula for determining the percentage of drug investment value:

$$NI = P \times H$$

Information:

NI   : Percentage of investment value

P   : Number of drug use in a year

H   : Unit price of medicine

$$\%NI = \frac{I}{\sum I} \times 100\%$$

Information:

%NI: Percentage of investment value

I: Total value of drug investment in a year

ΣP: Total investment value of all puskesmas drugs

After the investment value of drugs is known; then, a data collection of the investment value of drugs from the ten largest diseases in the puskesmas is carried out based on the clinical practice guidebook for doctors in the primary health care facilities [9].

ABC analysis of critical index value

All medicines have a critical index value calculated by adding up the value in use score (SNP) with the investment value score (SNI) for each drug; then, the medicines are sorted based on the highest critical index value to the lowest critical index value. The use value and investment value of Group A gets a score of 3, Group B gets a score of 2, and Group C gets a score of 1. Hence, the range of scores obtained is 2–6. Drugs are then classified into several groups, namely, ANK, BINK, and CINK based on the range of scores obtained. The following is the formula for determining the critical index value:

$$NIK = S_{NP} + S_{NI}$$

Information:

NIK: Critical Index Value

S_{NP}: Score of drug use value

S_{NI}: Score of drug investment value

The formula for determining the range of scores for the critical index value group:

Score range = (Highest Score-Lowest Score)/ (Number of Groups)

Hence, the range of scores obtained is:

Score range = (6–2)/3 =1.33

From these calculations, drugs with a score range of 2–3.33 belong to the CNIK group, drugs with a score range of 3.34–4.66 to the BNIK group and drugs with a score range of 4.67–6 to enter the ANIK group.

After the critical index value of the drug is known; then, data on the critical index value of the drug from the ten largest diseases in the puskesmas are carried out based on the clinical practice guidebook for doctors in the primary health care facilities [9].

Conformity analysis of drug demand and procurement

All medicines are calculated in total demand and supply in a year. The percentage of suitability of demand and supply of drugs at the Puskesmas is carried out using the formula:

$$\%KPO = \frac{A}{M} \times 100\%$$

Information:

%KPO: Percentage of suitability of demand – drug procurement

A: Number of drug procurement in a year

M: Number of drug requests in a year

The demand and procurement data were then analyzed and tested for significance with SPSS 26.0 for windows using the paired-samples t-test analysis method. Demand and procurement data are also analyzed descriptively to determine their suitability. Data are said to be appropriate if it meets ±10% of the comparisons made. Furthermore, the data are presented in the form of tables and figures [10].

Results

This research based on Pareto ABC was carried out at the Barru District Health Center in 2020 by utilizing Pareto law in its analysis. The ABC critical index method is done by combining 2 Pareto, namely, Pareto ABC value in use and Pareto ABC investment value. This method is a method that can be used to describe the state of management of pharmaceutical

Table 1: Grouping of pharmaceutical preparations based on value in use in 2020

Public Health Center	Group	Number of preparation items	Percentage of number of items per group	Number of use per group	Percentage of number of use per group
Bojo Baru	A_{NP}	25	14.79	281.210	78.91
	B_{NP}	20	11.83	56.300	15.80
	C_{NP}	124	73.37	18.859	5.29
	Total	169	100.00	356.369	100.00
Doi-Doi	A_{NP}	19	12.03	97.630	79.17
	B_{NP}	18	11.39	12.360	10.02
	C_{NP}	121	76.58	13.332	10.81
	Total	158	100	123.322	100.00
Lisu	A_{NP}	22	14.01	248.680	78.89
	B_{NP}	22	14.01	50.680	16.08
	C_{NP}	113	71.97	15.881	5.04
	Total	157	100.00	315.241	100.00
Madello	A_{NP}	17	10.97	249.640	79.55
	B_{NP}	17	10.97	47.670	15.19
	C_{NP}	121	78.06	16.506	5.26
	Total	155	100.00	313.816	100.00
Mangkoso	A_{NP}	18	11.18	494.600	79.92
	B_{NP}	22	13.66	91.343	14.76
	C_{NP}	121	75.16	32.898	5.32
	Total	161	100.00	618.841	100.00
Padongko	A_{NP}	23	13.22	482.030	79.91
	B_{NP}	27	15.52	89.641	14.86
	C_{NP}	124	71.26	31.574	5.23
	Total	174	100.00	603.245	100.00
Palakka	A_{NP}	24	16.78	243.920	79.47
	B_{NP}	18	12.59	46.429	15.13
	C_{NP}	101	70.63	16.572	5.40
	Total	143	100.00	306.921	100.00
Palanro	A_{NP}	22	13.50	333.990	79.62
	B_{NP}	23	14.11	64.100	15.28
	C_{NP}	118	72.39	21.371	5.09
	Total	163	100	419.461	100.00
Pancana	A_{NP}	20	13.42	302.840	79.86
	B_{NP}	23	15.44	56.800	14.98
	C_{NP}	106	71.14	19.562	5.16
	Total	149	100.00	379.202	100.00
Pekkae	A_{NP}	21	14.19	615.600	78.95
	B_{NP}	25	16.89	124.180	15.93
	C_{NP}	102	68.92	39.928	5.12
	Total	148	100	779.708	100.00
Pujananting	A_{NP}	23	13.53	186.100	78.81
	B_{NP}	23	13.53	38.638	16.36
	C_{NP}	124	72.94	11.414	4.83
	Total	170	100	236.152	100.00
Ralla	A_{NP}	21	13.82	546.910	79.76
	B_{NP}	20	13.16	105.400	15.37
	C_{NP}	111	73.03	33.359	4.87
	Total	152	100	685.669	100.00

Table 2: Grouping of pharmaceutical preparations based on investment value in 2020

Public Health Center	Group	Number of preparation items	Percentage of number of items per group	Number of investment per group	Percentage of number of investment per group
Bojo Baru	A_{NI}	42	24.85	Rp. 106.173.298.20	79.98
	B_{NI}	43	25.44	Rp. 19.931.838.38	15.01
	C_{NI}	84	49.70	Rp. 6.644.624.02	5.01
	Total	169	100.00	Rp. 132.749.760.60	100.00
Doi-Doi	A_{NI}	27	17.09	Rp. 43.967.479.10	79.37
	B_{NI}	40	25.32	Rp. 8.552.093.55	15.44
	C_{NI}	91	57.59	Rp. 2.876.685.34	5.19
	Total	158	100	Rp. 55.396.257.99	100.00
Lisu	A_{NI}	33	21.02	Rp. 108.580.728.00	79.39
	B_{NI}	38	24.20	Rp. 21.327.835.00	15.59
	C_{NI}	86	54.78	Rp. 6.853.035.18	5.01
	Total	157	100	Rp. 136.761.598.18	100.00
Madello	A_{NI}	22	14.19	Rp. 84.474.010.00	79.91
	B_{NI}	36	23.23	Rp. 15.874.011.55	15.02
	C_{NI}	97	62.58	Rp. 5.364.393.00	5.07
	Total	155	100	Rp. 105.712.414.55	100.00
Mangkoso	A_{NI}	33	20.50	Rp. 145.115.266.00	79.46
	B_{NI}	41	25.47	Rp. 28.216.083.00	15.45
	C_{NI}	87	54.04	Rp. 9.290.085.91	5.09
	Total	161	100	Rp. 182.621.434.91	100.00
Padongko	A_{NI}	44	25.29	Rp. 194.354.091.00	79.48
	B_{NI}	46	26.44	Rp. 37.837.506.00	15.47
	C_{NI}	84	48.28	Rp. 12.326.341.45	5.04
	Total	174	100	Rp. 244.517.938.45	100.00
Palakka	A_{NI}	33	23.08	Rp. 113.119.214.00	79.99
	B_{NI}	38	26.57	Rp. 20.983.817.00	14.84
	C_{NI}	72	50.35	Rp. 7.318.053.93	5.17
	Total	143	100	Rp. 141.421.084.93	100.00
Palanro	A_{NI}	37	22.70	Rp. 109.280.497.10	79.65
	B_{NI}	39	23.93	Rp. 20.785.838.70	15.15
	C_{NI}	87	53.37	Rp. 7.136.397.74	5.20
	Total	163	100	Rp. 137.202.733.54	100.00
Pancana	A_{NI}	37	24.83	Rp. 105.718.598.00	79.70
	B_{NI}	37	24.83	Rp. 20.135.277.00	15.18
	C_{NI}	75	50.34	Rp. 6.798.763.24	5.13
	Total	149	100	Rp. 132.652.638.24	100.00
Pekkae	A_{NI}	37	25.00	Rp. 187.762.471.00	79.42
	B_{NI}	37	25.00	Rp. 36.564.993.10	15.47
	C_{NI}	74	50.00	Rp. 12.095.556.00	5.12
	Total	148	100	Rp. 236.423.020.10	100.00
Pujananting	A_{NI}	44	25.88	Rp. 61.106.132.00	79.45
	B_{NI}	38	22.35	Rp. 11.907.602.80	15.48
	C_{NI}	88	51.76	Rp. 3.895.088.46	5.06
	Total	170	100	Rp. 76.908.823.26	100.00
Ralla	A_{NI}	36	23.68	Rp. 160.439.428.00	79.68
	B_{NI}	36	23.68	Rp. 30.841.505.90	15.32
	C_{NI}	80	52.63	Rp. 10.070.851.55	5.00
	Total	152	100	Rp. 201.351.785.45	100.00

preparations that are effective and efficient. This analysis aims to determine the critical index value of pharmaceutical preparations at the Barru District Health Center in 2020 (Tables 1-5).

Discussion

Availability of drugs in treatment is a sensitive and needs to be timely for its implementation [11]. Therefore, the availability of medicines is important to be maintained and planned properly. One analysis that is widely used is the ABC analysis [12], [13], [14]. ABC analysis can be useful to assist procurement-related activities such as determining sourcing to ensure products are priced more, procurement is consistent with public health priorities, and assessing how often orders are overall [15].

Critical index value analysis is calculated by combining two analytical values, namely, value in use

and value of investment [16]. Each analysis contributes to 50% of the value of the analysis. In general, most pharmaceutical preparations are in Group C and the least are preparations in Group A. Based on the data that has been obtained, the inventory that is a priority in procurement at the public health center is the inventory item that is included in the ANIK and BNIK groups, while the inventory items that are included in the CNIK group need to be controlled in the procurement in the following

Table 3: Number of items and percentage of pharmacy inventory of Barru district health center in 2020 based on critical index value

Public Health Center	Group						Number of Pharmaceutical Preparation Items
	A_{NIK}		B_{NIK}		C_{NIK}		
	Quantity	%	Quantity	%	Quantity	%	
Bojo Baru	28	16.57	33	19.53	108	63.91	169
Doi-Doi	22	13.92	23	14.56	113	71.52	158
Lisu	25	15.92	26	16.56	106	67.52	157
Madello	19	12.26	19	12.26	117	75.48	155
Mangkoso	25	15.53	21	13.04	115	71.43	161
Padongko	27	15.52	36	20.69	111	63.79	174
Palakka	27	18.88	27	18.88	89	62.24	143
Palanro	27	16.56	24	14.72	112	68.71	163
Pancana	24	16.11	28	18.79	97	65.10	149
Pekkae	31	20.95	19	12.84	98	66.22	148
Pujananting	29	17.06	29	17.06	112	65.88	170
Ralla	27	17.76	24	15.79	101	66.45	152

Table 4: Analysis of the conformity of demand-procurement of pharmaceutical preparations at the Barru district health center

Public Health Center	Number of preparation items	Total Number of Requests	Total Procurement	Percentage of Conformity
Bojo baru	169	900764	434722	48.26
Palanro	158	629761	522755	83.01
Mangkoso	157	897848	616050	68.61
Madello	155	361047	331326	91.77
Ralla	161	1021887	773192	75.66
Lisu	174	305418	353730	115.82
Pekkae	143	726022	667152	91.89
Pancana	163	397750	381254	95.85
Padongko	149	1214192	734126	60.46
Palakka	148	315196	337993	107.23
Doi-doi	170	206488	149160	72.24
Pujananting	152	391326	311786	79.67
Total		7.367.699	5.613.246	76.19

year. This is because the CNIK group is a group with low use of preparations, so it is necessary to control the management to avoid the accumulation of the number of preparations at the public health center and prevent the wastage of preparations due to expiration [1], [17]. For Group C preparations that have little or no level of use, it should not be held in the following year or when the public health center needs these preparations, the procurement can be done on a cito basis. Meanwhile, the procurement of preparations for Group A is carried out routinely but in small quantities to minimize ordering and storage costs, but still needs to be monitored to avoid vacancies at the public health center.

Table 5: Analysis for drug demand and procurement at the Barru district public health center

Public Health Center	t	df	Sig. (2-tailed)
Bojo baru	3.529	168	0.001
Doi-doi	1.504	157	0.135
Lisu	−0.990	156	0.324
Madello	0.640	155	0.523
Mangkoso	2.439	160	0.016
Padongko	1.827	173	0.069
Palakka	−0.595	142	0.553
Palanro	1.157	162	0.249
Pancana	0.354	148	0.724
Pekkae	0.888	147	0.376
Pujananting	1.749	169	0.082
Ralla	2.540	151	0.012

Level of significant: 5% (0.05).

Based on the analysis of critical index values, not all types of preparation items for therapeutic management of the ten biggest diseases in Barru District are included in the ANIK group. This can be influenced by various factors in the public health center such as the number of cases and the number of preparation items. Therapeutic preparations included in the CNIK group should be strictly controlled. This is done to avoid the possibility of losses in each public health center due to uncontrolled CNIK supplies which have an impact on the high risk of damage due to expiration and high inventory storage costs.

In contrast to the preparations of the CNIK group, the preparations that are included in the ANIK group must receive supervision over the preparations to avoid vacancies. Procurement of preparations in the ANIK group must be carried out as well as possible with the right method. This is because the preparations in this group have a relatively high turnover, so it is hoped that the right procurement can provide benefits for the

District Pharmacy Warehouse with the right method will provide benefits for the Public Health Center. One of the advantages that may be obtained is the advantage in the form of a much cheaper preparation price. In addition, because these preparations are often used in the management of therapy, these preparations will not require large storage costs so that the risk of damage due to expiration is also minimal.

The highest suitability of demand and procurement in 2020 was obtained by Lisu Health Center with a percentage of 115.82% followed by Padongko Health Center in second place with a percentage of 107.23%. Meanwhile, the public health center with the lowest level of suitability for demand and procurement was Bojo Baru Health Center with a percentage of 48.26%. The percentage of conformity that is more than 100% is caused by the District Pharmacy Warehouse distributing pharmaceutical preparations that sometimes distribute pharmaceutical preparations more than demand or without demand which causes excess pharmaceutical preparations at the public health center.

The discrepancy between demand and procurement itself occurs, because not all pharmaceutical preparations submitted by the public health center in the LP-LPO are available and can be provided by the District Pharmacy Warehouse. This is because the availability of pharmaceutical preparations in the District Pharmacy Warehouse is uncertain so that it becomes an obstacle to the fulfillment of pharmaceutical preparations at the public health center. If the drug proposed by the public health center is available, the District Pharmacy Warehouse will provide it according to the amount listed. However, if the amount is insufficient or not available at all, the District Pharmacy Warehouse will provide partial or no fulfillment of the request for the public health center. The demand for pharmaceutical preparations by the public health center is carried out based on usage in the previous month, this is done with the hope that the need for pharmaceutical preparations at the public health center can be met and avoid drug shortages. The total demand for pharmaceutical preparations by the Barru District Health Center in 2020 is 7,364,699 with a total procurement of 5,613,246. The percentage of fulfillment of the demand for supplies by the District Pharmacy Warehouse is 76.19%.

Conclusion

Analysis of the value of use of pharmaceutical preparations at the Barru District Health Center resulted in an average percentage of preparations that were included in the ANP group as much as 13.45%, the BNP group as much as 13.59%, and the CNP group as much as 72.96%. The investment value of pharmaceutical preparations at the Barru District Public Health Center

resulted in an average percentage of preparations that were included in the ANI group as much as 22.34%, the BNI group as much as 24.71%, and the CNI group as much as 52.95%. The total investment of the Barru District Public Health Center in 2020 is IDR 178,371,949,020. The critical index value of pharmaceutical preparations at the Barru District Health Center resulted in an average percentage of preparations that were included in the ANIK group as much as 16.42%, the BNIK group as much as 16.23%, and the CNIK group as much as 67.35%. The total demand for pharmaceutical preparations by the Barru District public health center in 2020 was 7,364,699 with a total procurement of 5,613,246. The percentage of fulfillment of the demand for supplies by the District Pharmacy Warehouse is 76.19%.

References

1. Satibi S, Indarti TR, Yuniarti E. Pengendalian persediaan obat dengan minimum-maximum stock level di instalasi farmasi RSUP Dr. Sardjito Yogyakarta. J Manajemen Pelayanan Farmasi. 2019;9(3):192. https://doi.org/10.22146/jmpf.45295

2. Mukhlis T. Manajemen Pengelolaan Obat Di Dinas Kesehatan Kota Lhokseumawe Tahun 2016, In Thesis. Indonesia: Universitas Sumatera Utara; 2016.

3. Ministry of Health of the Republic of Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 49 Tahun 2016 Tentang Pedoman Teknis Pengorganisasian Dinas Kesehatan Provinsi dan Kabupaten/Kota. Indonesia: Ministry of Health of the Republic of Indonesia; 2016. https://doi.org/10.31227/osf.io/m6nrk

4. Barru District Health Office. Daftar 10 Penyakit Terbesar di Puskesmas Kabupaten Barru. Michigan: Barru District Health Office; 2021.

5. Budruk V. An inventory control using ABC analysis and FSN analysis. Int J Eng Bus Enterp Appl 2016;16:24-8.

6. Management Sciences for Health. In: EmbreyM, Ryan M, editors. MDS-3: Managing Access to Medicines and Health Technologies. 1st ed. United States: Management Sciences for Health; 2012.

7. Harlan J, Sutjiati R. Metodologi Penelitian Kesehatan. In: Pusdik SDM Kesehatan. 2nd ed. Indonesia: Universitas Gunadarma; 2018.

8. Sugiyono. Qualitative, Quantitative, and R & D Research Methods. 1st ed. Bandung: Alfabeta; 2016.

9. Setiawati E, Purba AV, Hidayat WU. Analysis of drug planning and control at the pluit hospital in 2015. J Ilmu Kefarmasian Indonesia. 2020;18(1):7-14. https://doi.org/10.52643/marsi.v6i1.2163

10. Mulyawati OF. Analisis kesesuaian antara perencanaan dengan pengadaan obat di puskesmas "X" kabupaten gresik. Calyptra. 2016;5(1):1-12.

11. Davaki K, Mossialos E. Plus ça change: Health sector reforms in Greece. J Health Polit Pol Law. 2005;30(1-2):143-68. https://doi.org/10.1215/03616878-30-1-2-143
    PMid:15943391

12. Gupta RK, Gupta KK, Jain BR, Garg RK. ABC and VED analysis in medical stores inventory control. Med J Armed Forces India. 2007;63(4):325-7. https://doi.org/10.1016/s0377-1237(07)80006-2
    PMid:27408040

13. Antonoglou D, Kastanioti C, Niakas D. ABC and VED analysis of medical materials of a general military hospital in Greece. J Health Manage. 2017;19(1):170-9. https://doi.org/10.1177/0972063416682643

14. Azwar B, Lestari F, Fithri P. Combining ABC and VED analysis for managing medicine inventory (case study at community development elderly in Indonesia). Int J Adv Sci Eng Inform Technol. 2019;9(3):952-9. https://doi.org/10.18517/ijaseit.9.3.7153

15. Kastanioti C, Mavridoglou G, Karanikas H, Polyzos N. ABC analysis: A tool of effectively controlling pharmaceutical expenditure in Greek NHS hospitals. J Pharm Health Serv Res. 2016;7(3):173-9. https://doi.org/10.1111/jphs.12137

16. Chethana T, Rajan B, Selvaraj A, Pruthvish S. ABC analysis of drugs used in health camps organized in villages of Chintamani Taluk, Karnataka, India. Int J Community Med Public Health. 2017;4:186. https://doi.org/10.18203/2394-6040.ijcmph20164735

17. Mathew B, Panavila L, Sindhu K, Rajaneesh P, Bharath V, Doddayya H. A study on inventory management by ABC, VED and ABC-VED matrix analysis in pharmacy department of a tertiary care teaching hospital. Asian J Pharm Health Sci. 2016;6(4):1563-8.