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The ABC Analysis of Drug Use and Cost in Cardiology Outpatients - National Health Insurance

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Abstract

Background*: Cardiovascular disease is one of the chronic diseases with an increasing prevalence from year to year. The results of Indonesia's basic health research (RISKESDAS 2018) showed that it was experienced by 2.9% of the population. Ensuring the continuity of drug availability is very important in pharmacy services for this patient group. The history of drug use is considered in the planning dan procurement of drug products.* ***Objective:*** *This study aims to analyze the drug use pattern and cost of drugs for cardiology outpatients in the National Health Insurance scheme (JKN).* ***Methods****: A retrospective observational study was conducted using the prescription of cardiology outpatients JKN for March-May 2021. The ABC method carried out the analysis of drug use patterns and cost.* ***Results****: From 2,986 prescriptions for cardiovascular disease, there were 94 types of drugs from 37 therapeutic classes. In the ABC analysis of drug use for class A, 68.82% contained seven types of drugs, class B, 20.55% contained nine types of drugs, and class C, 10.63% with 78 types of drugs. The results of ABC analysis for investment value (cost) of drugs class A 66.96% contained two types of drugs, class B 19.81% with four types of drugs, and class C 14.23% with 88 types of drugs.* ***Conclusion****: ABC analysis of the drug use pattern and cost/investment showed different patterns which had value to consider in procurement planning to maintain service continuity.*

Keywords*: drug usage, cost, abc analysis, cardiovascular disease, JKN*

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INTRODUCTION

The catastrophic disease has a high cost, high volume, and high risk, making many policymakers worry about increasing disease costs (Wasis & Mugeni, 2013). Cardiovascular disease is one of the catastrophic diseases that occupies the largest proportion of catastrophic financing in the JKN program (BPJS Kesehatan, 2020 type of drug is one of the elements that affect the cost of treating heart disease (Hussey, et al, 2002). The results of the 2016 Indonesia Health Financing Research showed that Social Health Insurance Administration Body (BPJS Kesehatan) support 61,13% for inpatient care and 62,03% for outpatient care, this medical service cost compared to other insurance financing sources. Another study shows that drug expenditure in Indonesia es 40-50% of operational health costs and increases annually. This critical issue encourages all related elements to calculate the actual health service cost (Suharmiati et al., 2019). The resources and management of health provide the continuity of the health financing subsystem (Arianto & Nantabah, 2020).

Cardiovascular disease is a chronic disease in which a cardiovascular drug procurement plan must be concerned to comply with the continuity of patient needs. The problems of drug shortage from e-catalogue drug procurement or inappropriate planning result in additional drug procurement regular prices, which exceed e-catalogue drug prices (Mendrofa & Suryawati, 2016). This condition disrupts the overall logistics management cycle starting from deficiencies in budgeting, procurement, management and storage of drugs (Walujo and Septria, 2017). Planning for drug needs in hospitals must be carried out using an accountable method to avoid drug shortage or drug excess. The correct method of drug procurement planning can improve hospital stock control (Kemenkes RI, 2019). ABC analysis is one of the analytical methods used to identify the types of drugs and costs by grouping drugs or costs into three groups. The three groups of ABC analysis are group A, which uses 70%, group B, which uses 20%, and group C, which 10% of the total drug or drug costs (Setiawati, 2020). ABC analysis attained a profile of effective and efficient drug use, which can be used as an overview for drug procurement planning in the following year. Therefore, this study was conducted to provide the drug use data and to analyze the pattern of drug use and costs in cardiology outpatient –JKN.

MATERIALS AND METHODS

The study was designed as a retrospective observational study, analyzing the pattern of drug use and costs in cardiology outpatients-JKN using the ABC method. This study was carried out from drug the prescription of cardiology outpatient-JKN at the pharmacy department for outpatient services of Universitas Airlangga Teaching Hospital, Surabaya, Indonesia, from March to May 2021. The board has approved the methodology of this study of ethics of Universitas Airlangga Teaching Hospital number 151/KEP/2021.

Data collecting procedure

This study's inclusion criteria were all prescriptions from cardiology outpatient-JKN at Universitas Airlangga Teaching Hospital, and there were no exclusion criteria. The data recorded in the data collection sheet include the type of drug, strength of the drug, route of administration, number of drugs and drug prices.

Data analysis

Analysis of drug use and drug costs using ABC analysis, where group A with 70%, group B with 20% and group C with 10% of the total drug usage or drug cost.

RESULTS AND DISCUSSION

The pattern of drug use

This study obtained 2,986 prescribing and 37 therapeutic classes with 94 types of drugs used in cardiology outpatient-JKN. Total drug use based on the smallest unit (tablet, capsule) is 353,597. Ten (10) major therapeutic classes and drugs used are listed in Table 1. The therapeutic classification was based on the 2019 National Formulary, which can be accessed online through the e-Fornas website. According to the National Formulary, drugs are dispensed to JKN patients (Kemenkes RI, 2016).

The results showed that antihypertensive and heart failure drugs take the highest use of drugs in cardiology outpatient-JKN (Table 1). Beta Beta-blockers have a role in cardiovascular and non-cardiovascular treatment. Bisoprolol fumarate is the most widely used beta beta-blocker in this study. Bisoprolol is a selective beta-adrenoreceptor blocker; this drug selectively blocks beta-1 adrenoreceptors. Besides that, the antihypertensives frequently used are angiotensin receptor blockers (candesartan), calcium channel blockers (nifedipine ER), and angiotensin-converting enzyme inhibitors (lisinopril).

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Table 1. Top Ten Therapeutic Classes of Drug Use in Cardiology outpatient-JKN

No	Drugs	Percentage (%)
1	Antihypertensive and heart failure drugs	
	- Bisoprolol fumarate 1.25 mg	0.56
	- Bisoprolol fumarate 2.5 mg	18.69
	- Bisoprolol fumarate 5 mg	0.72
	- Candesartan cilexetil 16 mg	11.11
	- Candesartan cilexetil 8 mg	6.02
	- Captopril 12.5 mg	0.01
	- Ramipril 2.5 mg	0.86
	- Ramipril 5 mg	0.55
2	Antihypertensive drugs	
	- Amlodipine besylate 10 mg	0.88
	- Amlodipine besylate 5 mg	0.74
	- Diltiazem HCl 100 mg SR	0.26
	- Diltiazem HCl 200 mg SR	0.01
	- Imidapril HCl 10 mg	0.05
	- Imidapril HCl 5 mg	0.03
	- Lisinopril dihydrate 10 mg	0.58
	- Lisinopril dihydrate 5 mg	1.28
	- Methyldopa 250 mg	0.36
	- Nifedipine 10 mg	0.06
	- Nifedipine 30 mg ER	13.26
	- Verapamil HCl 240 mg SR	0.01
3	Antianginal drugs	
	- Isosorbide dinitrate 5 mg	3.65
	- Nitroglycerine 2.5 mg ER	6.12
4	Antihyperlipidemic drugs	
	- Atorvastatin calcium trihydrate 20 mg	2.67
	- Fenofibrate 100 mg	0.30
	- Fenofibrate 300 mg	0.11
	- Gemfibrozil 300 mg	0.05
	- Simvastatin 10 mg	0.01
	- Simvastatin 20 mg	6.60
5	Platelet-aggregation Inhibitors drugs	
	- Acetylsalicylic acid 100 mg	0.01
	- Acetylsalicylic acid 80 mg	7.02
	- Clopidogrel bisulfate 75 mg	0.84
	- Ticagrelor 90 mg	0.54
6	Diuretic and heart failure drugs	
	- Furosemide 40 mg	3.00
	- Spironolactone 100 mg	0.10
	- Spironolactone 25 mg	4.86
7	Vitamin dan mineral	
	- Mecobalamin 500 mcg	0.19
	- Vitamin B complex	1.19
	- Vitamin B1 50 mg	0.02
	- Vitamin B12 50 mcg	0.46
	- Vitamin C 50 mg	0.07
8	Anticoagulant drugs	
	- Warfarin sodium 2 mg	1.83
9	Antihyperuricemic drugs	
	- Allopurinol 100 mg	1.21
	- Allopurinol 300 mg	0.12
10	Antacid and antiulcer agents	
	- Antacid 60 ml suspension	0.01
	- Antacid Doen	0.06
	- Lansoprazole 30 mg	0.52
	- Omeprazole 20 mg	0.27
	- Ranitidine HCl 150 mg	0.12
	- Sucralfate 500 mg/5 ml	0.01

Note: SR = sustained release; ER = extended release

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Table 2. Grouping of Drug Usage with ABC Analysis in Cardiology Outpatient -JKN

Group	Type of Drug		Usage
	Number	%	%
A	7	7.45	68.82
B	9	9.58	20.55
C	78	82.97	10.63
Total	94	100	100

Table 3. Type of drug and ABC Category Based on Drug Usage in Cardiology Outpatients-JKN

No	Drugs	Group
1	Bisoprolol fumarate 2.5 mg	A
2	Nifedipine 30 mg ER	A
3	Candesartan cilexetil 16 mg	A
4	Acetylsalicylic acid 80 mg	A
5	Simvastatin 20 mg tab	A
6	Nitroglycerine 2.5 mg ER	A
7	Candesartan cilexetil 8 mg	A
8	Spironolactone 25 mg	B
9	Isosorbide dinitrate 5 mg tab	B
10	Furosemide 40 mg tab	B
11	Atorvastatin calcium trihydrate 20 mg	B
12	Warfarin sodium 2 mg	B
13	Ramipril 2.5 mg kaps	C
14	Clopidogrel 75 mg tab	C
15	Amlodipine besylate 5 mg	C
16	Bisoprolol fumarate 5 mg	C
17	Lisinopril dihydrate 10 mg	C

Note: ER = extended release

In Indonesia, beta-blockers were used to treat heart failure, hypertension, and myocardial infarction. Bisoprolol and propranolol were frequently used in this therapy (Sari et al., 2020).

ABC analysis

ABC analysis based on drug use

The purpose of the ABC analysis of drug use is to determine the amount of drug use during a specific period which can be used as a reference for planning and procuring drugs to meet the patient's drug needs. Of the 94 drugs used in prescription during March – May 2021, they were grouped according to the amount of use value using the ABC system (70-20-10).

The results of the ABC analysis in Table 2 show that group A (68.82% of the total drug use) contained 7 (7.45%) drugs. Group B (20.55% of total use) had 9 (9.58%) drugs. Meanwhile, drugs that are included in group C (10.63% of total use) contained 78 (82.97%) drugs.

Table 3 contains a list of seven drugs from group A and five drugs from groups B and C. The seven drugs with the highest usage value or group A are bisoprolol 2.5 mg, nifedipine 30 mg ER, candesartan 16 mg, acetylsalicylic acid 80 mg, simvastatin 20 mg tab, nitroglycerine 2.5 mg ER, and candesartan 8 mg. Moreover, tablets of spironolactone 25 mg and isosorbide dinitrate 5 mg, Furosemide 40 mg tablets, atorvastatin 20 mg and warfarin 2 mg are group B drugs with a moderate therapeutic index. Meanwhile, group C or drugs with low usage values include ramipril 2.5 mg, clopidogrel 75 mg, and amlodipine 5 mg. Group A drugs are a group of drugs which frequently used and require firm supervision to prevent drug shortage. The availability of drugs for groups B and C should not be ruled out because the drugs from both groups are still needed by patients, which is reflected in their monthly use of these drugs supporting the patient's therapeutic needs, but there should not be an overstock of drugs in this group, especially group C. The number of Category C drugs related to therapy for cardiology cases was 32%, including ramipril 2.5 mg, clopidogrel 75 mg, amlodipine besylate 5 mg, bisoprolol fumarate 5 mg, lisinopril dihydrate 10 mg, diltiazem 100/200 mg, amiodarone 200 mg, verapamil 240 mg, simvastatin 10 mg.

ABC analysis based on drug investment values

Table 4 shows the results of the ABC analysis based on the investment value. The results showed that only 2 (2.13%) drugs were included in group A with an investment value of 66.96% of the total 3-month drug

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investment value. Group B contains 4 (4.25%) drugs with an investment value of 19.81%. Meanwhile, drugs belonging to group C consist of 88 (93.62%) drugs with an investment value of 14.23%.

Group A is a group of drugs consuming about 70% of the total investments. This drug requires tight control, low safety stock, centralized purchasing authority, and short lead times. Special care must be taken in monitoring and controlling because a high investment value can result in increased storage costs and losses in the event of drug damage.(Walujo and Septria, 2017; Sari et al., 2020).

Drug group B is a drug group that consumes approximately 20% of total investment and requires moderate control, moderate safety stock, decentralized purchasing authority, and moderate waiting time; however, administrative reporting must be strict and detailed because drugs in group B also provide a significant amount of investment in hospitals, albeit not as much as group A. This class of drugs must be properly stored.. In addition, stock checking for this group is only carried out based on changing needs. Although group C has a high number of drug items (88), this group consume investments of around 10% only. Regular control, administration and monitoring were done for this group, even though this class do not provide a high investment for the hospital. In addition, stock checks are less frequent than in group A and B drugs (Sari et al., 2020).

Table 5 shows only two types of drugs in group A: nifedipine 30 mg sustained-release tablets and nitroglycerin 2.5 mg sustained-release capsules. These two drugs are also included in group A in the list of A, B, and C drugs based on usage values (Table 3). Nifedipine is a potent peripheral arterial vasodilator that selectively inhibits the transmembrane influx of calcium ions into cardiac, smooth muscle and vascular, thereby reducing calcium influx, decreasing peripheral vascular resistance, and increasing cardiac output. Nifedipine has been developed with modified or delayed release mechanisms to improve therapeutic outcomes, as well as to improve patient compliance. Extended-release CCBs are recommended as first-line agents in treating ischemic heart disease. Another prospective indication is for patients at high risk of coronary disease and diabetes (El-Masry & El-Khodary, 2020).

ABC analysis of drug use and the value of drug investment show different patterns. Group A on the use of drugs contained seven drugs, while the investment value or costs contained 2 drugs. Group B contained nine drugs and four drugs for usage and investment value/cost, respectively. Nifedipine ER and nitroglycerin ER in the analysis based on usage were entered in groups A in the 2nd and 6th order. However, in the analysis based on the investment value, they were in the position of group A and only contained the two drugs, shifting the position of bisoprolol and the drug above nitroglycerin ER in Table 3. This is because the price of ER nifedipine is eight times higher than bisoprolol (Rp. 3,986.00 vs. Rp. 495.00), and the cost of ER nitroglycerin is more than three times higher than bisoprolol (Rp. 1,640,00 vs Rp. 495.00) causing a shift in the position of nifedipine ER and nitroglycerin ER in investment analysis. This difference needs to be considered in planning the supply of drugs; there are drugs with high investment value along with another group A drugs to maintain the availability of drugs and continuity of pharmacy services. Category A drugs in this study were antihypertensive, antiplatelet, and vasodilator drugs, in line with the existing diagnoses, 41.5% hypertension and 26.8% coronary artery disease. The percentage of ABC category drugs from several studies showed different values. Category A drugs for tertiary hospitals in India and university hospitals in Turkey were 21.22 and 12%, respectively (Mathew, et al, 2016); Yigit, 2017). For planning, analysis from each institution is required.

ABC analysis considers the amount of use only and has not evaluated the drugs that must be available because they are live-saving/vital drugs even though they are used in small quantities. For JKN patients, further analysis with ABC-VED (Vital-Essential-Desirable) combination is required, in addition to conformity analysis with the national formulary.

Table 4. Grouping of Investment Values with ABC Analysis in Cardiology Outpatient -JKN

Group	Type of Drug		Investment Values
	Number	%	%
A	2	2.13	66.96
B	4	4.25	19.81
C	88	93.62	14.23
Total	**94**	**100**	**100**

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Table 5. Type of drug and ABC Category Based on Investment Values in Cardiology Outpatients-JKN

No	Drugs	Group
1	Nifedipine 30 mg ER	A
2	Nitroglycerine 2.5 mg ER	A
3	Bisoprolol fumarate 2.5 mg	B
4	Ticagrelor 90 mg	B
5	Candesartan cilexetil 16 mg	B
6	Candesartan cilexetil 8 mg	B
7	Diltiazem HCl 100 mg SR	C
8	Atorvastatin calcium trihydrate 20 mg	C
9	Warfarin sodium 2 mg	C
10	Bisoprolol fumarate 1.25 mg	C
11	Simvastatin 20 mg	C
12	Acetylsalicylic acid 100 mg	C

Note: ER = extended release; SR = sustained release

CONCLUSION

The use of drugs for cardiology outpatient-National Health Insurance in Airlangga University Teaching Hospital includes 37 therapeutic classes with 94 types of drugs. Analysis of drug usage patterns and costs shows different drug patterns that need to be considered in drug supply planning. Based on the value of use and investment, drugs included in groups A, B and C were 7.45% vs. 2.13; 9.58% vs. 4.25%; 82.97% vs 93.62%, respectively. The results of this study are expected to be used as references in drug procurement planning by considering aspects of use and investment value.

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AUTHOR CONTRIBUTIONS

Conceptualization, B.S., M.Y.; Methodology, B.S., M.Y., M.D.S.; Software, M.D.S., S.F.A.; Validation, B.S., M.Y.; Formal Analysis, M.D.S., S.F.A., D.D.; Investigation, M.D.S., S.F.A.; Resources, M.D.S., S.F.A.; Data Curation, M.D.S., S.F.A.; Writing - Original Draft, B.S., M.D.S., D.D.; Writing - Review & Editing, B.S., M.D.S., D.D.; Supervision, B.S., M.Y.; Project Administration, M.D.S., S.F.A.; Funding Acquisition, B.S.

CONFLICT OF INTEREST

The authors report no conflict of interest in this study.

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