

Direct Medical Cost Analysis Among Coronary Heart Disease and Heart Failure Outpatients at One Hospital

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ABSTRACT

Long-term treatment of cardiovascular disease may give impact in a high burden of medical cost for the patient. A concern arises whether the health budget allocation prepared by the Indonesian Government through "*Jaminan Kesehatan Nasional*" program is enough to cover medical cost for the outpatient treatment. This study aims to calculate the direct medical cost of patients with coronary heart disease and heart failure and compare it with the Indonesian Case Base Groups (INA-CBGs) tariff. This is a prospective and observational study carried out in one of the public hospitals in East Java between February and April 2015. All data related to outpatients with coronary heart disease and heart failure were analyzed. Direct medical cost analysis in this study calculated from a combination of cost of medication, health professional services, electrocardiography, emergency care services, and laboratory test component, then it was compared with INA-CBGs tariff from ICD 10. Total of 390 patients included were 387 patients with coronary heart disease (99.23%) and three (3) patients with heart failure (0.77%). Average direct medical cost for patients with coronary heart disease and heart failure were IDR 130.593,6 (range IDR 50.282 – IDR 385.911) and IDR 128.587 (range IDR 112.832 – IDR 140.103), respectively. Even though this study showed that budget allocation of INA-CBGs could cover the average direct medical cost of patients with both of diseases, some patients had a direct medical cost higher than the limit of INA-CBGs allocation. Therefore, an optimal interprofessional collaboration between physician and pharmacist needed to provide medical treatment based on patient needs and keep it within budget allocation range. Keywords: *coronary heart disease, heart failure, direct medical cost.*

INTRODUCTION

The burden of medical cost that needed in health system for patient with coronary heart disease is enormous^{1,4}. Analysis related to the bill that patient with coronary heart disease and heart failure should pay was carried out in China and Korea, and the result is about US\$ 17 million and US\$ 2.52 trillion in a row^{1,2}. Direct medical cost is a biggest component in the analysis that carried out in both countries^{1,2}. In detail, the burden of indirect cost that must be borne by Korean government related to coronary heart problem are as follows: Economic burden due to productivity loss; 33,6%, transportation (8,1%), and informal caregiver cost; 4.9%)². The burden of country's medical cost for heart failure patients are not cheap. The result of medical cost analysis that conducted in 197

countries show that the total amount of money those countries need to pay for heart failure case is US\$ 108 trillion per year. Around 60% of it is used for direct medical cost³. The result of a recently published systematic study shows the amount of money that must be incurred in dealing with heart failure cases is around \$908-\$84.434 per patient/year⁴. Medical cost will increase as the patient condition is getting worse⁴. Therefore, there should be a preventive action to minimize the deterioration of patient's condition as an attempt to control the swelling of medical cost of a country.

In a relatively stable condition, coronary heart disease and heart failure patients will get outpatient healthcare service. There are two main goals of giving drug therapy to a patient

with coronary heart disease, that is: to eliminate the pain when an attack occurs and to prevent the attacks from happening again⁵. In an effort to achieve the second goal, there are several things that must be controlled, those things are: reduce the thickening of plaque that clog the blood vessels, maintain the stability of heart plaque so it does not break, and prevent a thrombosis to occur⁵. Nitrate categorized drug, beta receptor blockers (β -blockers), and calcium channel blockers are drugs that recommended when heart attack occurs, while antiplatelet drugs, lipid-lowering agents, and *renin-angiotensin-aldosterone system blockers* (RAAS) is a drugs that must be given to prevent repeated attacks and death⁵. Therapy for heart failure patients is aimed to improve clinical conditions, capacity to carry out activities, and the life quality of patients and preventing the need for hospitalization and death⁷. Some first-line therapies that are recommended for improving the function of the heart and blood vessel systems will be given to patients, including the blockers class *angiotensin-converting enzyme* (ACE) and beta receptor blockers (β -blockers) for heart failure patients^{6,7}. The choosing of main therapy above is adjusted by several factors and the most vital is the record of the myocardial infarction occurrence⁷. In addition to these two drugs, heart failure patients also need to get statin drugs in an effort to prevent attacks and prolong life⁷. Diuretic drugs, especially loop diuretics, are generally also given to treat the patient's symptoms. The use of drugs in patients with coronary heart disease and heart failure is lifelong and continuous usage is needed. Results of some researches prove that the continuous usage of drugs in coronary heart disease and heart failure patients show signs of positive impact in clinical outcome of the patients and medical cost controlling^{8,9}. Full-covered medical cost is one of the factors that give contribution to continuous usage of drugs in heart and blood vessel disorders¹⁰.

Indonesian government through their program called Jaminan Kesehatan Nasional (JKN), show a commitment to develop health insurance comprehensively for Indonesian citizen. Through the program, it is expected that health needs of Indonesian citizen and the continuous medication of coronary heart disease and heart failure patients are guaranteed. However, until now, it is not yet known whether the budget allocated by the government through the Badan Penyelenggara Jaminan Sosial (BPJS) has met the medical needs of patients with coronary heart disease and outpatient heart failure including the cost of doctors' consultation, laboratory examinations, and drugs. The lack of such information could cause inefficiency of healthcare service to coronary heart disease and heart failure patients, consist of: 1) Drugs only given for short period of time, 2) laboratory tests that are not carried out regularly and continuously. Insufficiency of drugs for long period of time causes outpatients to get the drugs in healthcare facilities more often and the consequence is those outpatients tend to disobey the continuous usage of drugs. Laboratory results, particularly the levels of low-density-lipoprotein (LDL), are needed as a consideration for adjusting the dosage of lipid-lowering agent drug therapy. The lack of information related to LDL level causes patients to get same therapy dosage since their first therapy, and higher the chance that the dosage they get is lower than their actual needs.

Information regarding the adequacy of BPJS budget in providing healthcare service for coronary heart disease and heart failure outpatients is vital to be understood, considering the huge number of coronary heart disease and heart failure patients in Indonesia.¹¹ Without this information, not only put the patients at high risk of getting insufficient healthcare service, but also could cause confusion in the hospital management

in managing funds. Therefore, a research related to medical cost analysis, particularly in direct medical cost of coronary heart disease and heart failure outpatients needs to be done.

Hospital setting Where Data is Taken

The hospital where the data is taken is a type B hospital, consists of 202 beds. There is one doctor specialized for heart and blood vessels. The average outpatient visit is 300 patients/day. Medication for chronic disease participants in the hospital where the data is taken is served for one month with proportion: the need for medicine for seven (7) days is provided by the hospital with the costs included in the INA-CBGs rate and as much drug requirements for twenty three (23) days are served at a hospital pharmacy installation that works with BPJS healthcare with a cost outside the INA-CBGs bills¹²⁻¹⁴. Medication services for twenty three (23) days with costs from outside the INA-CBGs bills based on the provisions of the minister of health, namely additional prescription drug costs for chronic diseases (based on the National Formulary) are collectively billed through separate claims to Badan Penyelenggara Jaminan Sosial (BPJS) healthcare using Asterix Pelayanan Apotek software from PT Askas (Persero).

This study aims to calculate the direct medical cost of coronary heart patients and heart failure outpatients for seven (7) days medication needs compared to the Indonesian Case Base Groups (INA-CBGs) rates at a public hospital in East Java.

METHODS

This study was an observational study conducted prospectively during the months of February–April 2015 at the outpatients' polyclinic in a public hospital in the East Java province. All outpatient data with diagnosis of coronary heart disease and heart failure that meets the inclusion criteria will be taken to be involved in the process of further analysis. Patient inclusion criteria in this study were patients with a diagnosis of coronary heart disease and heart failure with complications and without complications who received

the drug for 7 (seven) days and patients registered as BPJS Kesehatan participants. The research sampling process began after obtaining permission from Head of National and Political Unity Agency (Kepala Badan Kesatuan Bangsa dan Politik) (Letter Number 070/512 / 416-206 / 2015) and Hospital Director (Letter Number 423.4 / 1461 / 416-211 / 205).

The source of cost data in this study is patient billing data obtained from the Hospital management information system (sistem informasi manajemen/SIM), Pharmacy SIM, INA-CBGs data rates collected through databases from computers equipped with the 10th edition of International Classification of Diseases (ICD 10). Patient data contained in medical records of outpatients is used if needed. The following data are recorded for each patient who fulfills the inclusion criteria and is further analyzed: 1) patient characteristics (age, sex, and diagnosis); 2) drug characteristics (type and dosage of drug); medical expenses (drug costs, professional services, electrocardiography costs, service fees at the emergency department (instalasi gawat darurat/IGD), and laboratories).

The direct medical cost analysis is done by summing up the cost of medicines, professional services, electrocardiography costs, IGD fees and laboratories for the needs of 7 (seven) days contained in the billing. The perspective of health care providers (providers' perspective) was used in this study. After calculating the direct medical cost of coronary heart disease patients and heart failure from billing that represents the amount of the charge (charge), the value is converted into the real cost (real cost) charged by the hospital to patients. The conversion process is done by using a cost to charge ratio (CCR) obtained from published research. Analysis of direct medical cost data is compared with INA-CBGs rates based on the diagnosis of coronary heart disease and heart failure. If the direct medical cost is lower than the INA-CBGs rates, then the INA-CBGs rates are sufficient, and vice versa if the direct medical cost is higher in the INA-CBGs rates, then the INA-CBGs rates mean that they are not

Table I. Characteristics of Heart Patients Outpatient

	Characteristics	Number of Patients	Percentage (%)
Age group (year)	15-24	-	-
	25-34	1	0.26
	35-44	30	7.69
	45-54	95	24.36
	55-64	120	30.77
	65-74	109	27.95
	75+	35	8.97
Sex	Male	181	46.41
	Female	209	53.58
Diagnosis	Heart Failure	3	0.77
	Coronary Heart Disease	387	99.23

Symbol: Percentage calculation is done by dividing the number of patients for certain characteristics by the total number of patients then multiplying by 100

sufficient. The process of adjusting costs using the inflation rate was not carried out in this study because the amount of direct medical costs and the rates of INA-CBGs were in the same year.

RESULTS AND DISCUSSION

A total of 390 patients' data was recorded and analyzed in this study. Information about the characteristics of heart patients which includes age group, sex and diagnosis (Table I). The amount of data from patients with a diagnosis of coronary heart disease was 387 people (99.23%) and heart failure patients was 3 people (0.77%). From a total of 387 patients with a diagnosis of coronary heart disease, there were 21 patients with a diagnosis of acute myocardial infarction and 366 people with a diagnosis of atherosclerotic heart disease. Most patients are female (53.58%). The highest age prevalence was in the age group 55-64 years (30.77%). The average age of a heart patient is 60 years.

Drug class data in heart patients outpatient for the needs of 7 (seven) days (Table II). The drug class that is often used in heart patients outpatient for the needs of 7 (seven) days is the angiotensin II receptor antagonist (19.46%). The average patient in this study received 3 (three) classes of drugs with a minimum of 1 (one) and a maximum

of 7 (seven) classes of drugs.

Based on Table II, it can be seen that the drug angiotensin II receptor antagonist is given more to the patient than the class of angiotensin converting enzyme inhibitors. In this study, the background of the use of angiotensin II receptor antagonist was unknown. One of the advantages of the use of the angiotensin II receptor antagonist is that the risk of cough is relatively lower compared to the angiotensin converting enzyme inhibitor class¹⁵. This can be considered by doctors in choosing the angiotensin II receptor antagonist class. In addition to this, Win et al. (2015) found that the incidence of angioedema due to the use of angiotensin converting enzyme inhibitor class in Thai patients was more than that of angiotensin II receptor antagonist¹⁶. Pharmacovigilance studies related to the risk of angioedema due to the use of angiotensin II receptor antagonist and angiotensin converting enzyme inhibitor in the Indonesian patient population are needed to ensure the safety of the use of angiotensin II receptor antagonist and angiotensin converting enzyme inhibitor in Indonesia. Regardless of the considerations, it is important to note that the use of angiotensin converting enzyme inhibitor is more recommended in cases of heart failure than

Table II. Drug Classes in Heart Patients Outpatient for The Needs of 7 (Seven) Days

	Drug Classes	Number of Patients	Percentage (%)	
Drugs for chronic disease	Angiotensin II receptor antagonist	211	19.46	
	Nitrate	162	14.94	
	Calcium antagonist	134	12.36	
	Beta blockers	121	11.16	
	Potassium-sparing diuretics	71	6.54	
	Strong diuretics	58	5.35	
	Angiotensin converting enzyme inhibitors	52	4.79	
	Antiplatelet	41	3.78	
	Cardiac glycosides	40	3.69	
	Antiarrhythmias	11	1.01	
	Xanthine oxidase inhibitors	11	1.01	
	Statins	9	0.83	
	Sulfonilurea	5	0.46	
	Biguanida	2	0.18	
	Drugs for symptomatic disease	Vitamin	31	2.86
		Proton pump inhibitors	22	2.03
		Non-steroidal anti-inflammatory	14	1.29
Supplement		11	1.01	
Benzodiazepines		10	0.92	
Opiates		9	0.83	
Antihistamines		9	0.83	
Mucolytic		8	0.74	
Antagonist H 2		7	0.64	
Antacids		5	0.46	
Cephalosporin		4	0.37	
Expectorant		3	0.27	
Sucralfat		3	0.27	
<i>Xanthine bronchodilator</i>		3	0.27	
Histamine analoque		2	0.18	
Corticosteroids		2	0.18	
Anti-tuberculosis		2	0.18	
Antiseptic		1	0.09	
Antithyroid		1	0.09	
Tricyclic antidepressants		1	0.09	
Penicillin		1	0.09	
Macrolide		1	0.09	
Quinolone		1	0.09	
Rifampicin	1	0.09		
Antispasmodics	1	0.09		
Alpha adrenergic blockers	1	0.09		
Serotonin antagonist 5H3	1	0.09		
Antipyretic analgesics	1	0.09		
Total	1084	100		

the angiotensin II receptor antagonist class⁷. The recommendations are based on five research evidence (published between 1987-1999) which stated that the use of a class of angiotensin converting enzyme inhibitor in heart failure patients, especially with a decrease in ejection fraction, reduces the risk of death⁷. Heart failure patients in this study, namely as many as three patients, received II receptor antihypertensive antagonists' therapy. A systematic study and meta-analysis of 22 randomized controlled studies revealed that there was no significant difference between heart failure patients who received a class of angiotensin converting enzyme inhibitor and angiotensin II receptor antagonist in reducing the risk of death, hospitalization, myocardial hospitalization. Infarction, and stroke¹⁷. Thus, the use of the angiotensin II receptor antagonist can be used in patients with chronic heart failure who have a history of unwanted drug reactions when using a class of angiotensin converting enzyme inhibitor.

Not all patients in this study received antiplatelet drug class. The provision of antiplatelet to coronary heart patients is an attempt to prevent thrombosis which could occur at any time due to a rupture of the plaque in blood vessels¹⁸. The medical history or comorbidities of gastrointestinal bleeding can be the reason to not give antiplatelet, especially aspirin, to patients¹⁹. The risk of upper gastrointestinal bleeding can still occur if aspirin is used chronically even at low doses (RR 2.3; 95% CI 2.0-2.6)¹⁹. However, these risks are not greater compared to the benefits produced after antiplatelet administration⁵⁻⁷. Concerns about bleeding can be anticipated with the use of drugs with proton-pump inhibitors^{18,19}. In a meta-analysis, Tran-Duy et al. (2015) prove that the provision of proton pump inhibitors can reduce the risk of gastrointestinal bleeding by 50% (RR 0.5; 95% CI 0.32-0.80)²⁰.

Aside from antiplatelet, lipid-lowering agents, in this research statins were not given to all patients. The provision of statin is not only intended to reduce low-density

lipoprotein (LDL) but also to produce pleiotropic effects, namely stabilization of the plaque and prevent rupture of the blockage that can trigger thrombosis²¹⁻²⁴. Positive impact of statin prevention on the occurrence of attacks Repeat heart is also evident in patients with LDL levels that have reached the therapeutic target even less than the target of therapy²⁵. Thus, the provision of statins must continue to be given to patients regardless of the LDL value the patient has⁵⁻⁷.

Collaborative research between pharmacists and doctors conducted prospectively needs to be done to see the accuracy of antiplatelet use and lipid lowering agents in patients with heart problems. Through this research, the pharmacist can confirm to the doctor to identify the reasons for not giving a class of drugs to the patient and discuss the best alternative solutions to achieve a good patient clinical outcome.

The total direct medical cost for all patients in this study for treatment needs for seven (7) days is Rp.50,925,420. Details of costs for all patients (Table III). Drug costs provide the largest distribution of Rp.24,095,690 (47.31%) of the total direct medical costs. Schlatter et al. (2017)²⁶ conducted to patients with ischemic heart disease and research conducted by Ogah *et al.*, (2014)²⁷ on heart failure patients with outpatient settings stated that the cost of drugs as the largest direct medical cost financing component was also found in this study. The amount of the health budget that must be spent on the components of the drug needs attention from various parties, especially hospitals and BPJS, taking into account the budgetary trends for drugs which tend to increase²⁸. Some of the factors that led to the increase include: price changes due to inflation, volume increased use, increase in population, especially elderly, and use of non-generic drugs²⁹. Strategies to control the rate of increase in drug use costs should be sought by applying a combination of interventions not only to health workers, especially doctors but also to patients as consumers and drug manufacturers as drug supplier³⁰.

Table III. Total Direct Medical Cost for All Heart Patients Outpatient

Component	Total Costs in 2015 (Rp)	Percentage of Total 2015 Costs (%)
Drug Costs	24,095,690	47.31
Professional Services	14,465,000	28.40
EKG ^a Costs	11,640,000	22.85
Laboratory Costs, Radiology ^b	660,000	1.29
IGD Costs	64,730	0.12
Direct Medical Cost	50,925,420	100

Remarks Table III: ^a388 patients received an electrocardiography (ECG) examination; ^bSeven (7) patients received laboratory and radiological examinations; ^cOne (1) person through the IGD

Table IV. Average Direct Medical Cost Details for Each Patient

Component	Average Costs (Rp)	Cost Range (Rp)
Drug Costs	61,783.82	2,415.0 – 161,524.0
Professional Services	37,089.74	25,000.0 – 60,000.0
EKG ^a Costs	30,000.00	-
Laboratory Costs, Radiology	94,285.71	30,500, - 170,000.0

Table information IV: ^aCosts set by the hospital

The average per-patient cost detail (Table IV), while the direct medical cost per patient based on diagnosis (Table V). Based on Table IV, the average cost of drug use in patients with a diagnosis of coronary heart and heart failure is the highest compared to other direct medical cost components. However, the cost of the drug is not entirely indicative of heart and blood vessel disease (Table II). It is very likely that patients with major problems with heart problems have other comorbidities that are not always chronic diseases. Seeing the potential for drug provision for other health problems, especially those that are symptomatic, cooperation and communication between doctors and pharmacists is needed to determine the best treatment for patients without exceeding the budget limit set by the BPJS. In this research, the upper limit of the range of drug costs given to patients was Rp.161,254.0, which meant that it had spent 97.49% of the BPJS budget.

LDL levels were not examined in all patients in this study by noting that only seven

(7) of the total 390 patients received laboratory tests. LDL levels should be examined as much as possible in patients with periodic and continuous impaired cardiac function because the plaque process and is strongly influenced by LDL levels³¹. Increased costs are one consequence of the need to examine LDL levels in patients with impaired heart function. Therefore, further studies need to be done regarding the frequency of LDL level examinations most ideally implemented in Indonesia.

In addition to producing some important information related to financing the health of outpatients with impaired cardiac function, this study has a number of limitations. First, the results of this research do not describe the magnitude of the direct medical cost burden of heart care patients in a health institution for a whole period of the budgetary budget. Second, the direct medical cost burden in this study, both in total and per-patient average, does not reflect the magnitude of the burden on private health institutions. Differences in drug prescribing

Table V. Average Direct Medical Cost for Each Patient Based on Diagnosis

Diagnosis	Number of patients	Average Costs (Rp)	Cost Range (Rp)	BPJS Budget (Rp)
Coronary heart disease	387	130,593.4	50,282.0 – 385,911.0	
a. Atherosclerotic heart disease	366	129,549.9	50,282.0 – 385,911.0	165,400.0 ^a
b. Myocard Infarc	21	148,779.1	69,963.0 – 252,860.0	
Heart failure	3	128,587.0	112,832.0 –140,103.0	165,400.0 ^b

Remarks Table V: ^aBudget allocation that can be billed using the INA-CBGs Z098 code (Follow-up examination after other treatment for other conditions) combined with I251 (Atherosclerotic heart disease) or I219 (Acute myocardial infarction, unspecified); ^bBudget allocation that can be billed using the INA-CBGs Z098 code (Follow-up examination after other treatment for other conditions) combined with I500 (Congestive heart failure)

patterns can affect the difference in direct medical cost burden between public and private health institutions.

CONCLUSION

The budget allocated by BPJS for outpatients with a diagnosis of coronary heart and heart failure through INA-CBGs, in general, is sufficient for the patient's direct medical cost for seven (7) days of treatment. Further analysis shows that costs for drugs are the highest direct medical cost financing component compared to other components. Coordination between health workers in an effort to guarantee the quality of treatment and control the increase in costs related to drug use needs to be pursued by considering the possible use of drugs which consumes almost all of the fund allocation.

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CONTENT OF INTEREST

The researcher stated that there was no conflict of interest in this study.

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