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Analysis of Unit Cost Differences in Routine Blood Examination with ABC Method (Activity Based Costing) At Muhammadiyah Selogiri Hospital

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ABSTRACT

Background: Routine blood examination as a supporting examination facility shows the highest demand. Selogiri Muhammadiyah Hospital in determining the cost of services based on the traditional cost method and has not determined the cost based on the activity-based costing (ABC) method.

Methods: This research is qualitative research with a case study approach. The data analysis technique was carried out by collecting primary data through interviews, observation, and documentation.

Results: The results showed that the unit cost of routine blood examination and blood chemistry at the hospital based on the calculation of the ABC method was IDR 83.663 and 12.663 respectively.

Conclusion: The unit cost value for routine blood tests and blood chemistry calculated using the ABC method is greater than the real cost applied at Selogiri Muhammadiyah Hospital with a difference of IDR 12.223 and IDR 1.003 respectively.

KEYWORDS: Unit cost, routine blood tests, blood chemistry, ABC method

I. PRELIMINARY

Hospital is a health service institution that provides complete individual health services consisting of inpatient, outpatient, and emergency services. Hospitals also function as providers of health treatment and recovery services [1]. Laboratory services are part of health services and provide support to other components of health services, including clinical laboratory services and public health laboratory services. Laboratory services are laboratory services to support healing and health recovery efforts. Clinical laboratories are an integral part of clinical pemediagnoses based on evidence-based medicine are supported through clinical laboratory examinations.

Unit cost analysis (unit cost) is a way to calculate costs for various existing needs, either in total or per unit by calculating all unit costs/cost centers or service departments and distributing them to these units [2]. Many methods can be used in calculating unit costs and the most widely used method is the Activity Based Costing (ABC) method. Routine blood tests are part of clinical laboratory examinations that doctors request in the process of making medical diagnoses, both in outpatient and inpatient cases.

Selogiri Muhammadiyah Hospital owns routine blood and blood chemistry examination as a supporting examination facility, the demand for these supporting tests is the highest compared to other clinical laboratory supporting tests. Selogiri Muhammadiyah Hospital is a Type D Hospital that receives referrals from many Puskesmas and Primary Clinics in the Wonogiri Regency area. The hospital determines the cost of services based on the traditional cost method and has not made a cost determination based on the ABC method.

II. METHOD

This research is qualitative research using a case study research design. This study describes the unit cost associated with routine blood tests at Selogiri Muhammadiyah Hospital using the activity based costing method.

III. RESULT

Overview of Selogiri Muhammadiyah Hospital

Selogiri Muhammadiyah Hospital was established by the Selogiri Muhammadiyah Branch Manager who has socio-economic principles by prioritizing social principles of preaching amar ma'ruf nahi munkar and Muhammadiyah organizational development.

Overview of Laboratory Units

The laboratory unit of the Selogiri Muhamamdiyah Hospital provides a variety of laboratory services. Six analysts provide laboratory services. The profile of the tool is as follows:

Table 1. Routine Hematology Machine Profile

Brand / type	HumaCOunt 5D
Production year	2019
Made in	Germany
Operating temperature	16 – 34° C
Voltage/frequency	100 – 240 Volt / 50 – 60 Hz
Reagent	Diluent, CBC-lyse, Diff-lyse (all reagents cyanid free)
Parameter	27 parameter: WBC, RBC, PLT, HGB, MPV, HCT, PCT*, PDW*, MCV, MCH, MCHC, RDW-SD, RDW-CV, NE# & NE%, LY# & LY%, MO# & MO%, EOS# & EOS%, BAS# & BAS%, ALY# & ALY* %, LIC# & LIC* %

Table 2. Blood Chemistry Machine Profile

Brand/ Tipe	Mindray/ BS-120
Production Year	2019
Made in	China
Product Certification	ISO 13485
Voltage/ frequency	AC 200~240V, 50/60Hz, 800W

Number of Patient Visits

Table 3. Patient Data at Selogiri Muhammadiyah Hospital in 2019-2021

No.	Type Service	2019	2020	2021
1	Emergency Room	14942	12801	1682
2	Outpatient	67325	55983	7163
3	Hospitalization _	-	-	-
4	VIP Class	270	125	6
5	Class I	1128	830	130
6	Class II	1587	1066	162
7	Class III	2403	2086	146
8	HCU	70	73	10
9	Neoristi	1084	1077	145
10	Operating Room	2164	1877	241
11	Maternity Room	1195	1208	150
	TOTAL	92168	77126	9835

Table 4. Laboratory Patient Data at Selogiri Muhammadiyah Hospital in 2020

No.	Month	Laboratory Patient Data				
		SGOT	SGPT	UREA	CREAT	HEMA
1	January	46	46	94	57	754
2	February	35	35	72	72	839
3	March	32	32	60	60	817
4	April	17	17	25	25	533
5	May	18	18	35	32	545
6	June	17	16	29	29	598
7	July	13	13	68	69	598
8	August	24	22	59	61	329

9	September	10	10	72	74	634
10	October	12	13	70	72	577
11	November	17	21	59	59	488
12	December	55	56	79	80	639
	Total	296	299	722	690	7351
	Overall Total Hematology Analyzer					7351
	Total Blood Chemistry					2007
	Total of Examination					12.835

This research was carried out at Selogiri Muhammadiyah Hospital who underwent blood tests in 2020, which resulted in 7,351 Hematology Analyzer examination patients and 2,007 Blood Chemistry examination patients.

Unit cost analysis using Activity-based Costing (ABC) method

The unit cost calculation will be carried out using the ABC method [3]. The analysis process is as follows:

a. Direct Tracing

The costs consumed in each unit will be traced directly which will later be charged to the costs of each activity. If there is no activity, these costs will not appear. These costs will be direct, and can be seen in the following table:

Table 5. Direct Cost of Hematology Analyzer

Type of cost	Biaya (IDR)
Spuit 3cc	800
EDTA Tube	1.300
Swab Alcohol	300
Reagent	15.000
Analyst Fee	13.000
Specialist Fee	10.000
Total	40.400

Table 6. Direct Cost of Blodd Chemistry

Type of Cost	Cost (IDR)
Spuit 3cc	800
EDTA Tube	1.300
Swab Alcohol	300
Reagent	54.000
Analyst Fee	13.000
Specialist Fee	10.000
Total	79.400

Direct cost for routine blood examination or Hematology Analyzer is IDR 40.400 and blood chemistry examination is IDR. 79.400, then added up with overhead costs.

b. Activity center

Activities in routine blood tests and the length of time obtained based on interviews and observations can be seen in Table 7. The total time required for one routine

blood test is 43 minutes and blood chemistry is 58 minutes. This is following with standard operating procedures that apply at Selogiri Muhammadiyah Hospital.

Table 7. Activity Center Routine Blood Examination

No.	Activity Type	Hematology Analyzer		Blood Chemistry	
		Time (minutes)	Description	Time (minutes)	Description
1.	Registration	3	Number of activities	3	Number of activities
2.	Sampling	10	Number of actions	10	Number of actions
3.	Processing	10	Number of actions	15	Number of actions
4.	Examination	10	Number of actions	20	Number of actions
5.	Recording of examination results	5	Number of actions	5	Number of actions
6.	Clinical pathology doctor expertise	5	Number of actions	5	Number of actions
	Total waiting time checkup result	43		58	

c. Overhead costs

Overhead costs are additional or unrelated costs that are not directly related to the business processes and production carried out. There are four categories of overhead costs: labor-related, equipment-related, space-related, and service-related. Labor-related includes employee costs such as salaries, overtime pay, transportation, side dishes, and health funds. Equipment related include tool depreciation, tool maintenance, calibration and tool repair. Space-related consists of depreciation, maintenance, and building repairs. Service-related costs include electricity, telephone, gas, water, and cleaning costs. Overhead costs will be assigned to activities through indirect resources and direct resources, namely:

1) Indirect resources

Indirect costs come from several service units that are interrelated but are not used directly. The cost of indirect resources is the assignment of indirect costs to activities on a proportion basis. Non-functional units include non-medical units such as the board of directors and administrative staff.

Table 8. Table of Expenditures for Muhammadiyah Selogiri Hospital in 2020

Cost type	Indirect Resources (IDR)
Labor related	
Employee	6.155.053.776
Equipment related	
Depreciation and maintenance	307.246.484
Medical and non-medical equipment	
Space related	
Building depreciation and maintenance	548.688.396
Service related	
Electricity, telephone, water, and gas costs	498.849.177
Total	7.509.837.833

The non-functional unit costs charged to the laboratory unit can be observed in Table 8. In Table 8. the indirect resources overhead costs for the Hematology Analyzer and Blood Chemistry examinations were IDR 7.509.837.833 which was charged to the functional unit. Furthermore, using the basis of the income proportion of each functional unit, the indirect cost will be obtained based on the proportions of Table 9.

Table 9. Proportion of Income

Functional unit	Total Income (IDR)	Proportion	Indirect cost (IDR) by proportion
Inpatient	12.341.736.993	44,61%	3.350.377.654
Outpatient + emergency room	10.077.762.533	36,43%	2.735.782.687
Medical treatment	3.204.682.843	11,58%	869.966.504
Laboratorium	814.496.907	2,94%	221.109.252
Support	1.110.656.635	4,01%	301.506.925
Administration	114.543.502	0,41%	31.094.812
Total	27.663.879.413		7.509.837.833

After being calculated based on the proportion of income, the indirect resources cost for the laboratory is 2.94% with a value of IDR 221.109.252 and then divided by the total laboratory examination of 12.835 patients so that the indirect resources cost for each laboratory examination is IDR 17.727.

2) Direct Resources

Direct resources are an indirect cost assignment to activities through a causal relationship between the resources consumed and the activities generated [3]. This means that every routine blood and blood chemistry examination activity creates a resource requirement, which is calculated according to the proportion of the number of examinations divided by the total number of examinations in the laboratory unit. Then the part that is charged to the laboratory section, is as shown in Table 10.

Table 10. Direct Resources Blood Examination

Cost type	Cost in Laboratorium (IDR)
Labor related	
Laboratory unit employee salary	179.054.772
Equipment related	
Medical device depreciation and equipment maintenance	127.151.019
Space related	
Building depreciation	14.646.732
Service related	
Stationery fees, electricity, water, telephone, cleaning	13.316.320
Total	334.168.842

Based on the table above, the direct resources in the laboratory unit is IDR 334.168.842 to then be divided by total laboratory examination of 12.835 patients, so that the direct resources cost for each laboratory examination is IDR 26.036. After knowing the costs of indirect resources and direct resources, the next step is to add up the total

calculated overhead costs, which can be seen in Table 11 below:

Table 11. Total Overhead

No.	Cost type	Total (IDR)
1	*Indirect resources*	17.727
2	*Direct resources*	26.036
	Total	43.263

Overhead costs for blood examination services will be charged to each activity in the activity table.

d. Define Activity Center

According to Baker (1998) the next step in calculating unit costs using the ABC method is to assign overhead costs to each activity in the laboratory unit. Charges to the activity center are as follows:

Table 12. Charges into Activity Center

No.	Activity Type	Cost Hematology Analyzer (IDR)	Time (Minutes)	Cost Blood Chemistry (IDR)	Time (Minutes)
1	Registration	3.018	3	2.238	3
2	Sampling	10.061	10	7.459	10
3	Processing	10.061	10	11.189	15
4	Examination	10.061	10	14.918	20
5	Recording of examination results	5.031	5	3.730	5
6	Clinical pathology doctor expertise	5.031	5	3.730	5
	Total	43.263	43	43.263	58

In Table 12, the routine blood and blood chemistry examination service time at Muhammadiyah Selogiri Hospital is 43 minutes and 58 mintutes respectively, calculated from the patient entering the unit, until the patient leaving the laboratory unit. Meanwhile, the distribution of costs based on activities can be seen in Table 12 above.

e. Sum of Direct Cost and Overhead

The last stage is to add up the direct costs and overhead costs, which can be seen in the following table:

Table 13. Summation of Direct Costs and Overhead Costs

No.	Checking type	Total Hematology Analyzer (IDR)	Total Blood Chemistry (IDR)
1	*Direct cost*	40.400	79.400
2	*Overhead*	43.263	43.263
	Total	83.663	122.663

So based on the table, it can be read that the tariff based on calculations using the Activity-based Costing method for the Hematology Analyzer examination is IDR 83.663 and the Blood Chemistry examination is IDR 122.663.

Real Cost of Routine Blood Examination at Selogiri Muhammadiyah Hospital.

The cost of routine blood and blood chemistry examinations at the Selogiri Muhammadiyah Hospital to date is based on the fixed rate of IDR 71.440 and IDR 121.660 respectively.

IV. DISCUSSION

1. Unit Cost of Routine Blood Examination at Selogiri Muhammadiyah Hospital with Activity Based Costing Method.

Direct costs are costs used directly to produce health service production (costs in production units), for example, inpatient, outpatient and laboratory units [4]. Muhammadiyah Selogiri is a Hematology Analyzer examination is IDR 83.663 and a Blood Chemistry examination is IDR 122.663.

2. Differences in Unit Cost of Routine Blood Examination between Activity Based Costing and Real Cost Methods that Selogiri Muhammadiyah Hospital has determined

In the previous table, it can be seen that the value of the tariff determined by the Activity Based Costing model has differences, namely:

Table 14. Value of Real Cost and Unit Cost of ABC model

No.	Checking type	Real cost (IDR)	ABC model unit costs (IDR)	Difference (IDR)
1	Hematology Analyzer	71.440	83.663	12.223
2	Blood Chemistry	121.600	122.663	1.003

The difference calculated between the real cost applied by the hospital and the calculation using the ABC method for the Hematology Analyzer examination is Rp. 12,223 and the blood chemistry examination is Rp. 1,003. Selogiri Muhammadiyah Hospital is guided by the traditional tariff formulation.

Calculation of unit costs in hospitalized patients with a head injury diagnosis using the ABC method at Panembahan Senopati Hospital Bantul obtained lower costs than the real costs and INA CBG's rates [5].

Based on the research results conducted by Syifa et al., [6] the unit cost of sterilization in the CSDD unit of PKU Muhammadiyah Bantul Hospital with the Activity Based Costing method is Rp. 2,049,388.00 with a total unit cost of one sterilization procedure averaged in CSSD units. The unit cost of ORIF Femur Fracture at the Central Surgical Installation of PKU Muhammadiyah Bantul Hospital with the Activity Based-Costing method is lower and more in line with the activity [7].

V. CONCLUSION AND LIMITATION

Conclusion

1. The unit cost of routine blood tests at Selogiri Muhammadiyah Hospital based on the calculation of the activity-based costing (ABC) method is the Hematology Analyzer examination is IDR 83.663 and the Blood Chemistry examination is IDR 122.663.
2. The unit cost value for routine blood and blood chemistry tests calculated by the Activity-Based Costing (ABC) method is greater than the real cost applied at Selogiri Muhammadiyah Hospital with the difference in the Hematology Analyzers examination, which is IDR 12.223 and the examination of blood chemistry, which is IDR 1.003

Limitation

This research has several limitations in its implementation, including:

1. The data used is secondary data from hospitals in 2020 so that the results obtained are only a descriptive description of the variables studied.
2. The existing data and financial systems in hospitals have not been able to provide complete data so that some financial calculations still use assumptions in the calculations.

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