

# Cost Calculation of Dental Service at Pratama Clinic Using Activity-based Costing Method in Padang, West Sumatera, Indonesia

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# Cost Calculation of Dental Service at Pratama Clinic Using Activity-based Costing Method in Padang, West Sumatera, Indonesia

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## Abstract

**Aim:** Indonesian health-care system evolution is attributed to billing and insurance of the health service, especially on basic dental service through capitation payment. Administrative cost estimation is important to equalize the allocation of health insurance expenditure spread over the dental clinic in Indonesia. The aim of this study was to calculate unit cost value at urban and suburban dental services at Pratama Clinic at Padang, West Sumatera, Indonesia. **Materials and Methods:** Two dental services at Pratama clinics at urban and suburban areas selected by random sampling. Unit cost patient day was applied by Activity-Based Costing method. **Statistical analysis:** The cost was calculated by using computerized Microsoft Excel analysis. **Results:** Suburban dental service Pratama Clinic has higher activity driver value than urban counterpart, but there is no significant difference between resource driver at urban and suburban dental service Pratama Clinic. The unit cost calculation of dental service at urban and suburban Pratama Clinic is US\$5.26 and US\$5.36, respectively. **Conclusion:** These findings outline that unit cost value at suburban is higher than urban dental service Pratama Clinic. So, these usefull to provide the basic information regarding the government to implement the equal and efficient health-care expenditure, particularly on each area in Indonesia.

**Keywords:** Activity-Based Costing, Cost-Calculation, Dental Service, Health Care, Pratama Clinic

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## INTRODUCTION

Evolution of the Indonesian health-care system has been considerably implemented by a National Health Insurance (NHI) called Jaminan Kesehatan Nasional (JKN), which is covered by Badan Penyelenggaraan Jaminan Sosial (BPJS). Health-care system in Indonesia has currently changed into two stages, the First Level Health Facility (FLHF) and Advanced Health Facilities (AHF). FLHF serves as the community-based health service called Puskesmas and primary health society clinic (Pratama Clinic) that is generally managed privately or by an individual.<sup>[1]</sup>

The implementation of JKN in Indonesia still has some problems such as BPJS's funding for one health treatment


lower than the real cost value.<sup>[2]</sup> In addition, the different locations and characteristics of health-care facilities also affect clinically the operations to the health services.<sup>[3]</sup> The concept of the JKN system has not been optimally applied to cover the national social security of Indonesian.<sup>[2]</sup> So, the real unit cost of dental health service at FLHF needs to be calculated in each region, specifically in urban and suburban area. To the best of our knowledge, the unit

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cost of Pratama Clinic has never been conducted after the reformation of Indonesian NHI, especially in oral health. During this time, the existing research discussed more about general health. This study can be the first one of Indonesian unit cost calculation in urban and suburban area.

## MATERIALS AND METHODS

**Study setting:** Pratama Clinic is one of the first-degree health-care systems that acts as a basic health service in Indonesia. In this study, two dental services at Pratama Clinic were selected with criteria as follow: (1) clinic in collaboration with BPJS; (2) accessibility of clinical data, including detail clinic expenditure, workforce, and service data; (3) the number of dental patients more than 10 per day. Twenty-five dental clinics were grouped into urban and suburban area, consisting of 16 and 9 clinics each, respectively. Two Pratama Clinics, one in urban and another in suburban, were eligible for this study as selected by random sampling technique.

**Data collection:** This is a cross-sectional study with quantitative approach. Sample was selected by purposive and random sampling methods to choose the clinic that provides dental treatment and serves more than 10 patients per day. One clinic at urban and one at suburban were determined by random sampling that represent each criteria. Ethical approval accepted to interview and assemble all the information related to clinic profile. The data were collected for three months from April to June 2016.

The data were collected by (1) reviewing the investment, dental clinic administrative record, and logistic information; (2) identifying the potential informant; (3) preparing the simple self-questionnaire; and (4) conducting the interview with responsible staff to validate the data. The collected data contained the fundamental characteristic of the dental clinic, capital asset, number of the staff, job desk, salary, bonus and staff allowance, medicine and medical supplies, number of dental equipment, routine expenditure of dental clinic, and current maintenance cost. Statistical analysis was carried out by computerized method by using Microsoft Excel 2016 (version 16.0).

**Costing methods:** The Activity-based Costing (ABC) method was selected in this study. Flowchart of a dental record consisting of (1) the date of patient appointment, (2) registration, (3) medical record, and (4) dental health-care service (some referral cases to the hospital) was necessarily identified before calculating the unit cost of dental service. All payment costs in ABC method were in Indonesian Rupiah (IDR), which was then converted to US dollar (US\$1 = 13,956 IDR). There are eight steps to evaluate the dental health service in Pratama Clinic, which are as follows:

- Step 1: Identifying dental health-care activity: Grouped the inside and the outside of unit production
- Step 2: Grouping the cost related to dental health service: Investment, operational, and maintenance cost were grouped in each resource driver
- Step 3: Classifying the level activity of dental health service. Each level was grouped into the direct and indirect cost. Direct cost including the allowance cost, cost of equipment and consumables, and medicine and medical supply. The allowance cost and routine expenditure of Pratama Clinic was classified into the indirect cost
- Step 4: Entering the direct and indirect cost into the same level of activity: Classified into three activity levels, including unit, batch, and organizing-sustaining level
- Step 5: Determining the cost pool based on the same cost: The amount of cost pool in dental health service activities depended on the level of activity and the number of cost drivers. Categorizing each cost pool and grouping by cost pool A–E based on the same activity level and cost grouping counterpart. Cost pool A (activities in the unit level) and B (activities in the batch level) were classified into direct costs with the cost driver, including the activity driver. Meanwhile, cost pool C (activities in the batch level activity), D (activities out of the organizing-sustaining activity), and E (activities in the organizing-sustaining activity) were classified into indirect cost with the cost driver, including the resource driver and activity driver
- Step 6: Determine the cost driver: The cost driver was used to calculate unit cost pool as changing the cost factor. Cost driver used Cokins grouping and was differentiated into activity driver and resource driver
- Step 7: Allocating the cost driver to each cost pool: Each cost pool was determined by each cost driver as activity cost trigger

**Table 1: Annual cost recapitulation by usage cost groups at urban and suburban dental service Pratama Clinic**

No.	Fee group	Cost of dental service Pratama Clinic (US\$)	
		Urban	Suburban
I	Investment costs		
	Facilities costs	1,086.63	1,366.83
	Infrastructure costs	1,815.05	3,403.94
II	Operating costs		
	Allowance costs		
	Salary	23,215.82	25,021.49
	Bonus	1,934.65	13,306.10
	Cost of equipment and consumables		
	Dentistry	2,837.88	2,881.75
	General	36.54	384.67
	Medicine and medical supply	210.24	495.82
Routine expenditure of Pratama Clinic	1,781.04	2,688.29	
III	Maintenance cost	1,547.72	7,337.34

Currency US\$1 = 13,956 IDR

8. Step 8: Unit cost calculation: Summarize all unit cost pools to calculate the unit cost value

## RESULTS

Table 1 shows that the highest cost comes from operating costs in allowance cost category. The amount of salary and bonus at suburban dental service Pratama Clinic (US\$38,327.60) was higher than that at urban counterpart (US\$25,150.47). It corresponded with the maintenance cost category, with suburban at US\$7337.35 and urban at US\$1547.72. The investment cost is obtained from all capital costs of facilities and infrastructures issued for dental health services investment and calculated for one year (annualized investment cost). The operational cost of dental service Pratama Clinic is derived from the allowance cost composed of salary and bonus based on each officer activity, dental and general medical equipment—consumable cost, pharmaceutical cost, routine expenditure, and maintenance cost of clinical facilities and infrastructure for one year.

Cost recapitulation of dental service is classified into a unit, batch, and organizing–sustaining level. Moreover, the determination of each cost pool depends on the level of activity and direct or indirect cost of dental service. Table 2 shows all of the cost pools at suburban dental service Pratama Clinic has a higher value than that at suburban dental service Pratama Clinic.

Cost driver consists of resource driver (ratio of dental patients compared to general patients) and activity driver (total patient visit the clinic). As shown in Table 3, suburban dental service Pratama Clinic has more common activity driver (3386 patients) with lower resource driver (0.085) than urban counterpart (2700 patients; 0.159, respectively).

Table 4 shows that cost driver determines each cost pool. Cost pool A (allowance cost and operating cost) and B (medicines cost) are determined by activity driver directly correlated to dental service. On the contrary, cost pool C (allowance cost), D (routine expenditure cost), and E (maintenance cost) are defined by activity and resource driver indirectly related to dental service.

Our results showed that total unit cost calculation of dental service at urban and suburban dental service is US\$5.26

and US\$5.36, respectively; the highest value was shown in unit cost pool A at urban and suburban dental service Pratama Clinic. Unit cost pool A calculated from salary and bonus for the dentist and dental assistant and costs of dental consumables and dental health care facilities is directly related to dental health service. The lowest value was cost pool B on urban Clinic that calculated from cost of medicines. According to Table 5, there is no significant difference in unit cost value between two dental service Pratama Clinics.

Table 6 shows the highest cost pool A resourced from cost pool A, including workforce cost. Suburban dental Pratama Clinic has a higher cost in total salary and bonus than urban dental Pratama Clinic. Meanwhile, deviation unit cost pool A with the total unit cost pool between urban and suburban dental Pratama Clinic was US\$1.03 and US\$0.87, respectively.

We found that there were three dental caretakers involved in dental service at the urban and suburban Pratama Clinic. Each area possessed two dentists and one dental assistant working in each dental health service. Suburban dental service Pratama Clinic had more job desk personnel in one year than the urban clinic. Therefore, the mean cost per personnel per year at urban dental service Pratama Clinic had less cost than the suburban area, meanwhile, unit cost per service was not far different between urban

**Table 3: Determination of cost driver**

Cost driver	Cost recapitulation of dental service Pratama Clinic	
	Urban	Suburban
1. Resource driver (ratio)	0.159	0.085
2. Activity driver (total patient)	2700	3386

**Table 4: Cost driver allocated to each cost pool**

Cost pool	Cost driver
A	Activity driver
B	Activity driver
C	Activity driver and resource driver
D	Activity driver and resource driver
E	Activity driver and resource driver

**Table 2: Annual cost recapitulation based on level activity at urban and suburban dental service Pratama Clinic**

No.	Level activity	Cost of dental service (US\$)					
		Cost pool	Direct		Cost pool	Indirect	
Urban	Suburban		Urban	Suburban			
1.	Unit level	A	11,413.05	15,202.19			
2.	Batch level	B	210.24	495.68	C	6,054.74	13,635.71
3.	Organizing-sustaining level	D	1,446.48	6,092.24	E	6,599.31	21,460.30

Currency US\$1 = 13,956 IDR

**Table 5: Total unit cost pool**

Unit cost pool		Unit cost recapitulation of dental service Pratama Clinic (US\$)	
		Urban	Suburban
		1. Unit cost pool A	4.27
2. Unit cost pool B	0.078	0.15	
3. Unit cost pool C	0.36	0.34	
4. Unit cost pool D	0.21	0.15	
5. Unit cost pool E	0.39	0.54	
Total unit cost		5.26	5.36

Currency US\$1 = 13,956 IDR

**Table 6: Analysis of unit cost pool A**

Cost pool	Dental Pratama Clinic (US\$)	
	Urban	Suburban
Total cost pool A	11,413.05	15,202.19
Total salary and bonus	10,289.87	13,450.69
Unit cost pool A	4.23	4.49
Deviation unit cost pool A with the total unit cost pool	1.03	0.87

Currency US\$1 = 13,956 IDR

**Table 7: Comparison of unit cost per service of dental caretaker**

Cost pool	Dental service Pratama Clinic	
	Urban	Suburban
Dental caretaker	3	3
Job desk per personnel	900	1,128
Total salary and bonus dental caretaker (US\$)	10,289.87	13,450.69
Mean cost per personnel/years (US\$)	3,429.96	4,698.52
Unit cost per service (US\$)	3.81	3.97

Currency US\$1 = 13,956 IDR

and suburban dental service Pratama Clinic (US\$3.81 and US\$3.97, respectively) [Table 7].

## DISCUSSION

The later Indonesian Health System was designed to revitalize the inequitable primary health service and unprofessionalism in health development. Allocation of fund originating from government and community was based on mutual cooperation. The programs provide health protection and insurance incorporation with many health-care facilities in Indonesia with the main focus on a curative program.<sup>[4]</sup> According to the World Health Organization,<sup>[5]</sup> 60.4% of private and 39.6% of the

government sector had contributed to Indonesian health expenditure.

On the basis of Regulation of the Minister of Health No. 9, 2014,<sup>[6]</sup> Pratama Clinic is a primary clinic with basic medical and dental services including promotive, preventive, curative, and rehabilitative services for individual and group in one day care, outpatient visit, and home care. The payment method of FLHF is capitation, whereas in AHF, it is by using Indonesian-Case Based Group's (INA-CBG's) way. Capitation in first clinical services by BPJS is mainly influenced by service utilization and unit cost. BPJS is responsible to cover the cost of health care focusing on free simple medical and dental care in health facility services. Meanwhile, inappropriate unit cost calculation leads to less or higher costing that affects the capitation value and decreases the quality of health service. Furthermore, it may cause a financial clinical catastrophe.<sup>[5-7]</sup>

Unit cost is the cost per unit of production. In simple terms, the unit cost of a service is known from the total cost per service capacity provided.<sup>[8]</sup> Traditional costing and ABC are the methods used in determining an accounting system. The ABC method is able to calculate each activity cost to cost object, services, or customers based on the activities offered and to early analyze the financial effectiveness and efficiency.<sup>[9,10]</sup>

Horgren *et al.*<sup>[11]</sup> reported that the ABC system implementation starts from identifying the production activity and is classified into direct and indirect cost, then to determine the cost allocation to the product and services and further to calculate the unit cost value. Moreover, Cokins<sup>[12]</sup> divided the ABC process into two-stage approach: first, each cost is distributed to the cost object through resource drivers; and second, cost accumulation of each object is distributed through activity drivers.<sup>[12]</sup> Operational dental service plays an essential role in determining the unit cost of service.

Dental health care is one of the health service programs at FLHF in Indonesia, and funding is by capitation method.<sup>[6]</sup> In the JKN era, capitation is the cost provided by BPJS per JKN participant to pay health services without looking at the number and type of services that have been calculated for one year. All activities related to dental health service are noted, classified, and calculated to determine the actual unit cost per service including the investment cost such as facilities and infrastructure cost for dental service Pratama Clinic. So, on the basis of Table 1, suburban dental Pratama Clinic has more investment cost than the urban counterpart. It is caused by the cost facilities of urban area, which is cheaper than suburban area, and is related to large building structure at the suburban Pratama Clinic compared to that at the urban.

Furthermore, suburban utilization of dental health service by the JKN participants is higher than an urban area due

to accessible facilities, free of cost. In addition, the urban JKN participants are accustomed to getting dental health care from private dentists that have more advance and extensive care than Pratama clinic.

The magnitude of cost calculation at urban and suburban dental Pratama Clinic using ABC method was not significantly different. The average cost of dental health services at urban dental Pratama Clinic was US\$5.26 and at suburban dental Pratama Clinic, it was US\$5.36. This study has similar result to a study by Febrian *et al.*,<sup>[3]</sup> which investigated the unit cost value on the same FLHF, but different section at the community-based health service (Puskesmas), resulting in the unit cost at rural (US\$7.79) to be higher than urban Puskesmas (US\$6.21). It may be caused by more optimizing usage of free cost dental health service by the JKN participants at suburban than that at urban area. Although the JKN participants at urban Pratama Clinic can also use the free-cost service, they are accustomed to obtaining dental health care from private dentists. It caused by private dentist offer the extensive care and elaborate the advance dental treatment. On the contrary, free-cost service of FLHF has limited services, and it just covers the simple dental treatment. So, it is confirmed that different clinical locations and characteristics also affect the clinical operations.<sup>[3]</sup>

Our result showed that overall cost pool A is the highest among other cost pool at FLHF, cost pool A dominated cost of salary and bonus; however, cost of salary and bonus at suburban clinic is higher than that at urban, but unit cost per service is not far different between urban and suburban dental service Pratama Clinic (US\$3.81 and US\$3.97, respectively), which means that both clinics have calculated the amount of salary and bonus based on the number of activities carried out, the dental caretaker workload equals to the income received.

Our study revealed that highest cost resources from the operational cost including employee budgeting. This result was also similar to the results by Aji *et al.*<sup>[13]</sup> and Kurniawan *et al.*,<sup>[14]</sup> which calculated the unit cost in one medical treatment, then stated that personnel expenditure took over cost in hospital budgeting. Its suggested that well budgeting and cost planning must be priority conducted and applied in health care facilities.<sup>[13,14]</sup> ABC method showed that the most significant cost value for a dental service comes from allowance cost, besides the average income of dental caretaker in a year was very low (IDR 65,572,594 equal US\$4698.52), a dentist in United States as a salary recipient was paid in the amount of US\$132,370/year.<sup>[15]</sup>

The result of unit cost research by ABC method gives a lot of information previously unknown, including unit cost pool value, unit cost pool, the workload of dental health

services at each FLHF, and others.<sup>[9-12]</sup> Last but not least, this finding suggested that the Indonesian government can consider the policy to decide the effectiveness of FLHF capitation rates based on the number and the workload of personnel. An effective calculation of tariff rates related to increase the patients quality services by the care-providers.<sup>[16]</sup> So, these findings suggest that unit cost value at suburban is higher than that at urban dental service Pratama Clinic. Through unit cost calculation by activity cost costing method, it can provide accurate information about what burdens the cost of a product so that the decision makers can analyze to make savings, calculate the workload of each officer, and improve the activity by increasing the number of services. In addition, unit cost calculation using ABC method helps the stakeholder to make the cost projection and to improve the medical services with the efficient allocation of resources and dental service Pratama Clinic performance as the primary health-care providers.

*Limitation:* Actual calculation for one dental treatment was not possible in this field due to FLHF, which was paid by capitation method and differed from AHF by INA-CBG's. In addition, the annualized unit cost fluctuates every year based on each activity and on other regions in Indonesia.

#### Ethical policy and institutional review board statement

This research was a multicenter study and approved by the Committee of the Research Ethics, Faculty of Medicine, Andalas University (096/KEP/FK/2016). Interviewing the respondents aimed to collect the cost of all activity and total patient visit the Clinic. Self-form was provided to obtain the cost.

#### Data availability statement

The data set used in this study is available (option as appropriate): (1) repository of Andalas University, (2) name of the public domain resources at <http://scholar.unand.ac.id/id/eprint/36093>, (3) data availability within the article or its supplementary materials, (4) available on request from ([febrian/febrian@dent.unand.ac.id](mailto:febrian/febrian@dent.unand.ac.id)), and (5) dataset can be made available after embargo period due to commercial restrictions.

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#### Conflicts of interest

There are no conflicts of interest.

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