

COST ANALYSIS USING TIME DRIVEN ACTIVITY BASED COSTING FOR PHYSIOTHERAPY CONSULTATION PRICING

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ABSTRACT

The demand for physiotherapy services in Indonesia continues to grow, yet tariffs that are not based on actual cost structures risk margin distortion and reduced operational efficiency. This study calculates the cost of physiotherapy services and evaluates consultation tariffs at Physiotherapy Clinic ABC using the Time-Driven Activity-Based Costing (TDABC) method.

A descriptive quantitative design was employed, utilizing 2024 operational data across three service durations: 30, 45, and 60 minutes. Labor costs, non-time direct costs, and overhead were allocated, and unused capacity was assessed.

Results show TDABC-based service costs of IDR 563,079, IDR 711,476, and IDR 859,872, while cost-plus pricing yields recommended tariffs of IDR 732,003, IDR 996,066, and IDR 1,289,808, respectively. Comparison with the clinic's actual tariffs (IDR 620,000; IDR 930,000; IDR 1,240,000) indicates undercosting for shorter sessions. The highest unused capacity, approximately 66%, was observed at the receptionist level.

The study demonstrates that TDABC provides more accurate and detailed cost information than conventional methods. These findings offer a practical basis for tariff adjustments and capacity management to enhance efficiency, sustainability, and resource utilization in physiotherapy services.

INTRODUCTION

The increasing demand for physiotherapy services in Indonesia reflects a shifting pattern in healthcare consumption, moving from injury recovery toward maintaining quality of life and productivity. This trend has stimulated the growth of physiotherapy clinics, particularly in urban areas such as Jakarta. However, alongside rising demand, a fundamental issue has emerged regarding service pricing, which is often not based on accurate cost-of-service calculations.

Empirical evidence from Physiotherapy Clinic ABC shows that tariff determination is still carried out through benchmarking against competitors, without a formal cost accounting system that considers the actual consumption of resources. This practice risks creating distortions in the form of undercosting, which reduces profit margins, or overcosting, which decreases competitiveness. Such tariff distortions also affect operational efficiency and cash flow sustainability, as excessively thin

margins may weaken the clinic's ability to reinvest and expand services.

The literature highlights the limitations of conventional methods in reflecting actual costs and identifying unused capacity. Fatmawati (2022) demonstrated that the application of TDABC in a hospital laboratory unit produced more accurate cost information. Pramitasari (2021) found unused capacity as high as 94% in inpatient units an insight that traditional approaches failed to capture. Kaplan and Anderson (2007) emphasized that the strength of TDABC lies in its simplicity, requiring only two parameters: the capacity cost rate and time equation.

A clear literature gap exists due to the limited research applying TDABC in physiotherapy services, particularly with duration-based segmentation (30, 45, and 60 minutes). This novelty forms the contribution of this study, which applies TDABC to calculate the unit cost of physiotherapy consultation services, compares it with conventional methods and actual tariffs, and reveals unused capacity. The importance of this research lies not only in its theoretical contribution, by providing empirical evidence of TDABC's effectiveness in the physiotherapy context, but also in its practical value for clinic management in designing fairer, more transparent, and sustainable tariffs. Accordingly, this study proposes TDABC as an alternative approach to enhance the accuracy of cost information while supporting clinic operational efficiency.

Aligned with this objective, the study focuses on calculating the unit cost of individual physiotherapy services using TDABC, comparing it with conventional methods and actual tariffs, and analyzing managerial implications for tariff setting and capacity efficiency. To strengthen the conceptual foundation, the next section presents a literature review covering theories, concepts, and relevant empirical findings.

LITERATURE REVIEW

According to Sugiyono (2017), a theoretical framework is a tool used by researchers to formulate and structure variables as well as their interrelationships within a study. This framework guides hypothesis formulation and the selection of appropriate research methods. The starting point of this study is the empirical condition that Physiotherapy Clinic ABC has no formal system for calculating the cost of services. Its tariffs are determined entirely by benchmarking against competitors, using the market average. Such a practice risks creating cost distortions, either underpricing or overpricing, since it disregards actual cost structures.

To address this, the study estimates service costs using two approaches. First, the conventional method, which allocates costs proportionally based on service duration. Second, the Time-Driven Activity-Based Costing (TDABC) method, developed by Kaplan and Anderson (2007). TDABC was chosen because it requires only two key parameters: the capacity cost rate (CCR) and the estimated time of each activity (Kaplan & Anderson, 2007; Zul Azmi, (2018)). During implementation, each physiotherapy service type (30, 45, and 60 minutes) was analyzed separately, based on variations in time and resource consumption. Field observations were used to construct the time equation for calculating service costs according to actual time consumption.

The cost estimates obtained from the conventional and TDABC approaches were then compared with the clinic's actual tariffs. This comparison aimed to identify potential underpricing or overpricing across service durations. Additionally, the study examined unused capacity, defined as available time capacity that is not optimally utilized (Pramitasari, 2021; Wardani & Pribadi, (2025)). This analysis is important as it provides an evaluation of operational efficiency, particularly in workforce and facility utilization.

Thus, the final outcome of this study is a recommendation for a more accurate and rational tariff structure based on TDABC. Beyond academic contribution, the research is expected to provide practical benefits for Physiotherapy Clinic ABC Clinic's management, both in designing fairer tariff policies and improving the long-term efficiency of resource utilization.

RESEARCH METHODS

Data Collection Methods

This study used primary data obtained directly from Physiotherapy Clinic ABC in 2024. The data were collected through three techniques: direct observation, in-depth interviews, and literature review.

1. Direct observation

The researcher observed clinical activities during physiotherapy service delivery. The focus was on both core and supporting activities, such as patient registration, equipment preparation, therapy sessions, and administrative completion.

2. In-depth interviews

Interviews were conducted with the clinic manager and administrative staff as key informants to gather information about the clinic's profile, types of services, facilities and equipment, details of direct and indirect costs, and the time required for each therapy session (30, 45, and 60 minutes). The interview results were qualitatively analyzed and presented in descriptive tables, which served as the basis for compiling cost and activity-time information.

3. Types and Sources of Data

Relevant journals, books, and documented written sources, such as published academic articles, textbooks, and official guidelines, related to service cost calculation methods, particularly TDABC, were reviewed. This secondary data supported the theoretical framework and provided benchmarks for analysis.

Data Analysis Methods

A descriptive analysis method was employed to interpret the research object in line with actual conditions. To calculate physiotherapy service costs, the study

applied TDABC, which emphasizes time consumption for each activity in the service process. Cost and time data were systematically organized into tables for easier analysis. The TDABC-based cost calculation was carried out in several stages:

1. Identifying activities

Mapping out clinical workflows to distinguish main and supporting activities in physiotherapy services.

2. Assigning indirect costs to activities

Distributing overhead to activities proportionally based on usage, to obtain total activity costs.

3. Calculating Capacity Cost Rate (CCR)

Obtained by dividing total capacity costs by total available time capacity.

$$\text{CCR} = \frac{\text{Total Capacity Costs}}{\text{Available Time Capacity (minutes)}}$$

4. Constructing the time equation

Estimating the time required for each physiotherapy session (30, 45, and 60 minutes) based on activity consumption.

5. Calculating activity costs

Multiplying CCR by activity duration.

$$\text{Activity Cost} = \text{Duration (minutes)} \times \text{CCR (IDR/minute)}$$

6. Determining total service costs

Summing direct costs and activity-based (indirect) costs for each service duration.

RESULTS AND DISCUSSION

Types of Physiotherapy Service Products

Physiotherapy Clinic ABC provides physiotherapy services differentiated by therapy duration: 30 minutes, 45 minutes, and 60 minutes. Each service type has distinct characteristics and objectives. A 30-minute session is generally used for patients requiring short treatment, follow-up therapy, or a focus on specific body areas. The 45-minute session represents the standard service, which includes initial assessment, physiotherapy intervention, and patient education for self-care at home. Meanwhile, the 60-minute session is intended for patients with more complex conditions or intensive rehabilitation needs, allowing for longer therapy duration to achieve optimal outcomes.

Cost Components of Physiotherapy Services

The calculation of physiotherapy service costs is based on two primary components: direct costs and indirect costs.

1. Direct costs are those that can be directly traced to each physiotherapy service, such as therapist fees per patient and consumables including ultrasound gel and disposable items used during therapy.

2. Indirect costs (overhead) cannot be attributed to a specific service but are essential for operations. These include salaries of reception and administrative staff, utilities (electricity, water, internet), equipment and facility maintenance, and administrative/documentation expenses. Indirect costs must also be allocated as they absorb clinic resources in service provision.

Service Cost Calculation Using TDABC

The cost of physiotherapy services at Physiotherapy Clinic ABC was calculated using the Time-Driven Activity-Based Costing (TDABC) method, which traces costs according to the actual time consumption of each activity involved in service delivery.

1. Identification of End-to-End Activities

The first step in TDABC is to identify all primary and supporting activities within the clinic. Each activity was analyzed to ensure it consumes resources, whether direct or indirect. These estimates were used as parameters in constructing the time equation for each service duration. The durations represent actual working time under normal operating conditions, observed directly at the clinic. With this detailed mapping, cost allocation based on

time and resource consumption becomes more accurate and representative of real operations.

2. Capacity Cost Rate (CCR) and Available Time Capacity

The next step was to calculate available time capacity for all human resources (HR), measured in minutes per year. Practical capacity was adjusted to reflect actual operational conditions. (Kaplan & Anderson, 2007).

Table 1

Annual Working Time Commitment of Clinic Staff (2024)

No.	Description	Work Day	Work Hour	Minutes
1	Therapist	356	6	128.160
2	Receptionis	356	8	170.880
Total Available Capacity				299.040

Source: Processed by author (2025)

Practical capacity is calculated based on the number of employees per shift, ensuring that the capacity used reflects actual operational conditions. Idle time is expressed as the percentage of unused capacity, calculated by comparing available capacity with capacity used.

$$\text{Idle Time (\%)} = \frac{(A - U)}{A} \times 100\%$$

Idle time was then determined, showing therapists had 36% idle capacity (64% effective) and receptionists had 66% idle capacity (34% effective). Table 2 presents a breakdown of the annual workforce capacity based on the number of minutes worked per year, multiplied by the number of employees per day in each category. In this study, the workforce classification consisted of therapists and receptionists.

Table 2

Available Capacity Labor Minutes

No.	Human Resource	Minutes/Person	Person/Day	Available Capacity	%	Capacity Used
1	Therapist	128.160	4	512.640	64	330.405
2	Receptionist	170.880	3	512.640	34	176.352
Total		299.040		1.025.280		506.757

Source: Processed by author (2025)

With a total available time, capacity of 506,757 minutes per year, this value will be used in calculating the capacity cost rate (CCR) as the basis for assigning costs to each physiotherapy service activity.

The Capacity Cost Rate (CCR) is the per-minute cost rate for each human resource (HR) and is used to allocate costs

proportionally based on the time spent in physiotherapy service activities. The CCR is calculated by dividing the total HR capacity cost by the effective available time capacity. The capacity cost and effective capacity for each staff category were calculated, along with the capacity cost rate (CCR) per minute.

Table 3
Calculation of CCR per HR in 2024

Human Resource	Capacity Cost (Rp)	Effective Capacity (min)	CCR (Rp/min)
Therapist	1.531.446.761	330.405	4.635
Receptionist	1.265.965.001	176.352	7.179
Total	2.797.411.762	506.757	11.814

Source: Processed by author (2025)

The calculation results show that the CCR for receptionists is significantly higher than for therapists. This per-person approach aligns with Kaplan & Anderson's (2007) recommendation in developing the TDABC method, which emphasizes that the accuracy of cost allocation depends on per-minute rates that reflect the reality of each resource type.

After obtaining the Capacity Cost Rate (CCR) for each resource, activity costs are calculated using the time equation, which involves multiplying the activity duration by the CCR of the person performing the activity. This method takes into account the actual time spent by each staff member for each activity, resulting in more accurate cost estimates than conventional methods. Table 4 shows the activity cost calculations for 30-, 45-, and 60-minute physiotherapy services:

3. Activity Costs Based on the Time Equation

Table 4
Activity Cost Calculations

No.	Activity	Human Resource	Cost 30' (Rp)	Cost 45' (Rp)	Cost 60' (Rp)
1	Patient Registration	Receptionist	14.357	14.357	14.357
2	Preparing equipment and rooms	Receptionist	21.536	21.536	21.536
3	Initial examination/patient condition assessment	Receptionist	21.536	21.536	21.536
4	Therapy service	Therapist	139.052	208.578	278.104
5	Documenting therapy results	Therapist	23.175	23.175	23.175
6	Sterilizing and tidying up equipment	Receptionist	21.536	21.536	21.536
7	Processing therapy payments	Receptionist	21.536	21.536	21.536
8	Processing insurance claims	Receptionist	35.893	35.893	35.893
9	Claim billing and follow-up with insurance partners	Receptionist	35.893	35.893	35.893
Total			334.514	404.040	473.566

Source: Processed by author (2025)

4. Allocation of Non-Time Direct Costs

After the labor cost estimate is calculated using the time equation, the next step in TDABC is to allocate non-time direct costs, namely clinic expenses that are not based on staff work minutes. The main components include: consumables, patient consumption, therapy equipment usage, laundry, EDC machines & insurance, training, and parking facilities. Non-time costs are allocated using two approaches: per number of sessions for fixed costs per session, for example, laundry, EDC, training, parking, and per service minute for costs proportional to duration, for example, consumables, therapy equipment, patient consumption. Table 5 shows the average allocation of non-time costs per service duration:

Table 5
Non-Time Cost Allocation Results Per Service

Service Duration	Cost 30'	Cost 45'	Cost 60'
Patient Consumables	2.326	3.489	4.652
Laundry Fees	9.275	9.275	9.275
Consumables Fees	9.282	13.923	18.564
Therapy Equipment Fees	6.348	9.523	12.697
EDC and Insurance Fees	13.822	13.822	13.822
Training Fees	46.683	46.683	46.683
Patient Parking Fees	1.045	1.045	1.045
Total	88.781	97.759	106.737

Source: Processed by author (2025)

This allocation shows that non-time costs increase with service duration because some components (consumables, therapy equipment, patient consumption) are proportional to time. Meanwhile, fixed costs per session, such as laundry, EDC, training, and parking, remain constant. This approach reflects resource consumption more proportionally and rationally, providing a more accurate estimate of the cost of services for each service duration.

5. Overhead Cost Allocation

After allocating time-based labor costs and non-time-based direct costs, the next step in TDABC is calculating overhead costs, which are supporting operational costs not directly related to therapy activities, such as building rent, electricity & water, software applications, facility depreciation, cleaning & IT salaries, and branding licenses. In this study, allocations were made proportionally to the duration of service (minutes per session). This approach reflects facility utilization: longer sessions use more resources. The basic allocation formula is:

$$\text{Overhead Cost} = \frac{\text{Service duration} \times \text{cost driver minutes}}{\text{minutes}}$$

With a total overhead of Rp1,539,517,968 and a total service duration of 330,405 minutes, the allocation per minute is obtained, then calculated per service duration as follows:

Table 6
Overhead Cost Allocation Per Service

Service Duration	Cost 30'	Cost 45'	Cost 60'
Electricity and Water Costs	7.028	10.542	14.056
Building Rental Costs	77.423	116.135	154.846
Software Application Costs	13.566	20.349	27.131
Facility Depreciation Costs	23.481	35.222	46.963
Cleaning Salaries	1.975	2.963	3.950
IT Salaries	14.777	22.165	29.554
Branding License Fees	1.534	2.302	3.069
Total	139.785	209.677	279.569

Source: Processed by author (2025)

This allocation ensures that all components of basic labor costs, non-time direct costs, and overhead are calculated comprehensively and proportionally per service duration, so that they are ready for the basic cost recapitulation stage and cost-plus pricing-based tariff determination.

6. Summary of Basic Costs and Determination of Physiotherapy Service Rates

After all labor cost components including the time-based labor cost calculated via the time equation non-time direct costs, and overhead expenses are fully allocated, the total cost of physiotherapy services is summarized for each service duration. Labor costs are determined based on the capacity cost rate (CCR) multiplied by the duration of each activity, while non-time direct costs are allocated either per minute or per session, depending on the nature of each cost component. Overhead expenses are proportionally distributed according to service duration, meaning that longer sessions bear a correspondingly larger share of the total overhead. This allocation method ensures that the cost assigned to each service accurately reflects the resources consumed during its delivery.

Table 7

Allocated Cost of TDABC Services

Component	Cost 30'	Cost 45'	Cost 60'
Time Equation (HR)	334.514	404.040	473.566
Direct Costs	88.781	97.759	106.737
Overhead Costs	139.785	209.677	279.569
Total Cost of TDABC Services	563.079	711.476	859.872

Source: Processed by author (2025)

Based on the total basic costs calculated for each service category, the service rates are determined using a cost-plus pricing method. The applied margins are tiered to account for variations in service duration and complexity, with rates set at 30% for 30-minute sessions, 40% for 45-minute sessions, and 50% for 60-

minute sessions. The following table presents the detailed calculation results:

Table 8

Allocated Margin for Pricing

Duration	Cost	Margin (%)	Price TDABC
30 minutes	563.079	30%	732.003
45 minutes	711.476	40%	996.066
60 minutes	859.872	50%	1.289.808

Source: Processed by author (2025)

This approach ensures rates reflect actual costs, service duration, patient complexity, and facility utilization, while also considering staff fatigue, idle time risk, and price benchmarking. The TDABC method, combined with cost-plus pricing, results in a proportional, transparent, and sustainable cost and rate structure consistent with modern healthcare practices.

7. Comparison of Cost of Goods, Tariffs, and Unused Capacity Analysis

A comparison of the cost of physical therapy services and their rates using three conventional approaches, TDABC, and actual rates, reveals significant differences. The conventional method tends to underestimate the cost of short services (30–45 minutes) and overestimate the cost of long services (60 minutes), as overhead allocation does not account for variations in actual activity consumption. In contrast, TDABC provides more accurate estimates based on actual time and activity consumption. The clinic's actual rates are lower than the TDABC rates, indicating a risk of undercosting that could potentially reduce profit margins.

Table 9

Comparison of Cost of Goods, Tariffs, and Unused Capacity Analysis

Durations	Basic Cost Conv.	Basic Cost TDABC	Tariffs Conv.	Tariffs TDABC	Tariffs Actual
30 min	458.638	563.079	596.229	732.003	620.000
45 min	687.957	711.476	963.140	996.066	930.000
60 min	917.276	859.872	1.375.914	1.289.808	1.240.000

Source: Processed by author (2025)

Furthermore, an analysis of unused capacity revealed substantial idle time:

36% for therapists and 66% for receptionists. This means that a significant

portion of capacity is underutilized due to patient cancellations, scheduling imbalances, or waiting times, resulting in unproductive fixed costs.

This finding is consistent with previous research. Erfandi Ahmad et al. (2021) demonstrated that TDABC is more realistic because it accounts for idle time compared to conventional methods. Fatmawati et al. (2022) also found that conventional methods tend to inflate costs for high-volume services, while TDABC is more proportional. Chusnul Mubarak (2024) reported that actual rates are often lower than TDABC estimates, posing a risk of undercosting stroke services. Meanwhile, Ulfatun (2023) emphasized that TDABC is superior to ABC and conventional methods, especially in the healthcare sector, because it captures activity variations and capacity allocation in greater detail.

Thus, the results of this study strengthen the empirical evidence that TDABC provides more accurate and transparent cost estimates, while highlighting the need for managerial evaluation of rate setting to prevent undercosting. Furthermore, the analysis of unused capacity demonstrates the importance of capacity management strategies such as patient scheduling and optimizing staff roles to improve clinic efficiency and financial sustainability.

CONCLUSION

This study concluded that conventional methods for calculating the cost of physiotherapy services tended to yield lower results than the Time-Driven Activity-Based Costing (TDABC) approach. Using the conventional method, the cost was recorded at IDR 458,638 for a 30-minute service, IDR 687,957 for a 45-minute service, and IDR 917,276 for a 60-minute service. Meanwhile, the TDABC method produced more accurate results: IDR 563,079 (30 minutes), IDR 711,476 (45 minutes), and IDR 859,872 (60 minutes).

This difference confirms that TDABC captures variations in resource consumption based on service duration, unlike the conventional method, which only allocates costs proportionally. When compared with the actual rates applicable at the Physiotherapy Clinic ABC in 2024 (IDR 620,000 (30 minutes), IDR 930,000 (45 minutes), and IDR 1,240,000 (60 minutes)) all service types were underpriced. The recommended TDABC-based rates using a cost-plus pricing approach are IDR 732,003, IDR 996,066, and IDR 1,289,808 for 30-, 45-, and 60-minute durations, respectively.

The largest difference occurs for the 30-minute service, with a negative deviation of IDR 112,003, while the smallest difference is for the 60-minute service, at IDR 49,808. This indicates the risk of thin or even negative profit margins if rates are not adjusted.

Another relevant finding is the presence of unused capacity in non-medical resources. For instance, receptionists have idle time of approximately 66% of available capacity, indicating potential inefficiencies in workforce utilization. Overall, these results not only emphasize the need for service tariff adjustments but also highlight TDABC's utility as a managerial tool for improving efficiency, consistent with Kaplan and Anderson (2007).

The primary contribution of this study is providing empirical evidence regarding the relevance of TDABC in the healthcare sector, particularly physiotherapy services. The results confirm that TDABC is superior to conventional methods in providing transparent, detailed cost information that reflects actual resource consumption. From a practical perspective, these findings offer a strong basis for clinic management in setting fair tariffs proportional to service duration and oriented toward cash flow sustainability and service package strategies.

IMPLICATIONS AND LIMITATIONS

The study has several practical and managerial implications. First, the findings support the adjustment of service tariffs based on TDABC calculations to ensure adequate profit margins. Second, the presence of substantial idle capacity among non-medical staff highlights the need for management to optimize workforce utilization, which can enhance operational efficiency.

However, the study also has limitations. Activity time estimation was performed manually, potentially introducing bias. Cost analysis across clinic branches was conducted in aggregate rather than on a branch-by-branch basis. Additionally, profit margins in cost-plus pricing calculations were assumed without conducting sensitivity testing.

Other factors such as patient satisfaction, seasonal dynamics, and patient segmentation were not analyzed in depth. Therefore, future research is recommended to incorporate automated timekeeping systems, perform branch-level analysis, test the sensitivity of profit margins, and integrate patient perspectives into value-based pricing models. Such developments would provide a more comprehensive, adaptive, and practical approach to the study of physiotherapy service costs and rates, benefiting both clinical management and academic research in healthcare management accounting.

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