

Costing the Outpatient Rehabilitation Services: Time-Driven Activity Based Costing Approach

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Abstract

Background: Considering the necessity of health services costing, the aim of this study is to calculate the cost of rehabilitation services in an outpatient rehabilitation clinic in Tehran, Iran.

Methods: The data for this study were categorized as financial data and information about the process of rehabilitation services. The first category was extracted from the financial documents and the second one is obtained by observation of patient flow and interviewing the clinic staff in 2016. The cost of rehabilitation services has been estimated using the time-driven activity-based costing approach.

Results: The findings show that the cost of physical occupational therapy in the Asma rehabilitation center was \$18.79 per unit of service. This amount for speech therapy services was \$17.23 to \$19.40, taking into account the difference in the quality of the service delivered. The cost of mental health occupational therapy service was also between \$19.46 and \$23.57. Comparing the cost of these services with their government's tariffs makes it clear that there is a huge gap.

Conclusion: The limited number of patients referred to the center has made the cost of one unit of rehabilitation services much higher than their official tariffs. This is true for almost all similar institutions and makes the profitability of small rehabilitation institutions extremely unstable. Therefore, proper marketing for rehabilitation services by promoting patient referral links with larger healthcare centers and the formation of integrated rehabilitation complexes can play a significant role in their profitability.

Highlights

- Time-driven activity based costing (TDABC) facilitated the identification of cost drivers of providing rehabilitation services.
- TDABC identifies the utilized and unused capacity of production resources.
- Scientifically costing the rehabilitation services may help to assure the profitability of the institution's services.
- Long-term losses for rehabilitation clinics will limit the future of such services and will put the welfare community at a greater disadvantage.

Background

One of the main challenges in the sustainability of healthcare organizations is the development of a cost information system that is necessary for pricing decisions and strategic management [1, 2]. Healthcare managers should be aware of all existing methods to provide affordable and high-quality services, because these organizations have faced increasing diversity and complexity of services as well as budgetary limits [3]. So, utilizing an effective costing framework becomes the essential for healthcare providers to survive in a competitive economic environment is to know the cost details [4, 5]. Different costing methods have been used for healthcare services, and over time, the accuracy of these methods

has been enhanced. The traditional approaches, where there is no solid connection between the activities and the amount of used resources, can be employed in cases with limited activities and confined costs [6]. Due to this problem, the Activity Based Costing (ABC) method has been developed. Nevertheless, setting up an ABC system is time consuming and this system should be updated regularly, which would considerably increase the cost of accounting [7]. The constraints of this approach have led to move towards the Time Driven Activity-Based Costing (TDABC) approach. This method is developed by Kaplan and Anderson in [8, 9] that helps health organizations to identify the unused capacities [10, 11] and enable them to reduce the cost of services [2, 12] and finally achieve to the develop more efficient service delivery and profitability [13].

Unlike the ever-increasing need of the Iranian community for rehabilitation services [14], many of these services are out of the insurance coverage in Iran. This will make access to rehabilitation services more difficult for many poorer groups and exacerbate the social cost of disability. Considering the advantages of TDABC [13, 15], the present study has used this framework to calculate the cost of speech therapy services, physical occupational therapy and mental health occupational therapy services at the Asma Rehabilitation Center (ARC). Besides that, the unused capacity of each department enables the management of the ARC to derive the appropriate decisions for developing a profitable business. The ARC has various departments, including speech therapy, physical occupational therapy, mental health occupational therapy, psychology, audiology, neuro-feedback, hand occupational therapy, and physiotherapy. This study intends to calculate the cost of first three services that their choices were based on their high contribution to the workload and earnings of the ARC.

Methods

The present study is a retrospective case study. The data needed for this research could be divided into two categories: financial data and information about the process of providing the rehabilitation services. The first category includes personnel costs, depreciation cost for office equipment and medical equipment, rent cost and overhead costs, which collected from the financial documents of the ARC in 2016. The second part of data were gathered by observing the services process and informal interviewing the staff of the ARC after obtaining the necessary permissions. In time-driven ABC method, estimation of the two parameters are necessary: cost of a unit of resources, and the time required for each activity [12, 16, 17]. More precisely, the TDABC process has been performed based on the following steps: [15]

1. Identifying the various departments: First of all, the map of the rehabilitation services process was drawn up by observing the process of activities in different departments and talking with the authorities in each department. [Figure 1 represents the process map of these 3 services. Afterwards, the various resource groups had identified.
2. Estimating the total cost of each resource group: The cost groups were identified through interviews with the Finance and Property Departments. Cost groups include buildings, overheads, human resources, and equipment (including medical equipment and office equipment). Through the aggregation of these costs, the total cost of each section was determined. Then, direct and indirect

costs were counted on each department. Costs that could not be categorized in the above categories (such as educational and research expenses, printing and purchasing of periodicals, the cost of materials and supplies, and the cost of transport and communications) were included in the form of other overhead costs. The area (squared meter) occupied by each department is considered as basis of cost sharing for the building, and maintenance of other assets.

3. Estimating the practical capacity of resource groups: At this stage, the practical capacity of each group was calculated. Staff hours are from 8:00 am to 2:30 pm from Saturday to Wednesday, and from 8:00 am to 1:00 pm on Thursdays. Therefore, the total working time is 1956.5 hours per year equals to 117390 minutes per year. Subsequently, the practical capacity of each group was considered as 85% of the theoretical capacity (Kaplan and Anderson, 2007) that equal to 99781 minutes in a year. The practical capacity of medical and non-medical equipment and machinery were also considered in terms of the useful life of this equipment.
4. Calculating the unit cost of each resource group: After calculating the total cost and practical capacity for each cost group, the cost of each unit was obtained by dividing these two variables into each other.
5. Identifying the time equation: Knowing that the patient is referring to which units to receive a service, the time taken to receive each of these services has been measured. This time was measured by observation and timing for four patients, and finally, time equations for rehabilitation services were set.
6. Aggregating the costs and calculating the final price of each service: This step was acceded by multiplying the unit cost of each resource group in time equations.

Results

The cost of rehabilitation services

The number of rehabilitation sessions required by each patient varies according to the severity of the disability and the type of service required. Of course, sometimes, due to the financial hardship the patient does not attend all the sessions. Based on the time equations, the total personnel costs of each department were obtained per unit of service (Table 1).

For departments where services are provided by a workforce with varying degrees of expertise (including speech therapy and mental health occupational therapy), rehabilitation activities were divided in terms of quality. By placing the cost per minute for the rehab specialist (having a Ph.D in that field) and putting the cost per minute of the rehab expert (with a bachelor's or master degree in that field) in the time equations, the cost of high quality (HQ) services and medium quality (MQ) services acquired, respectively. In order to estimate the average rehabilitation session for each patient, we have considered a regular 10 session course for these services. Given that the counseling and evaluation of the general practitioner are provided only two times, so this item is counted only at the beginning and the end of a regular 10-session rehabilitation.

The non-personnel costs of each department are also admeasured according to the number of visits or area occupied by each department. For this purpose, the cost of depreciation of equipment, rent of the building, repair and maintenance costs, administrative cost, calculated and proportionate to the different departments according to the contribution of each department to the activities of the institute. The result of this cost breakdown is presented in **Error! Reference source not found.**

The cost of rehabilitation services categorized by personnel and non-personnel costs of each department and presented **Error! Reference source not found.** The highest non-personnel costs in the physical occupational therapy and speech therapy sectors were related to the “other overhead cost”; while in mental health occupational therapy department, the cost of renting was the highest one and account for the highest proportion of non-personnel costs. Given the small scale of the ARC, the cost of repair and maintenance of office equipment has been the lowest non-personnel cost for all three departments. The ratio of non-personnel costs to the total cost in the departments of speech therapy, mental health occupational therapy, and physical occupational therapy was 71.14%, 75.81%, and 70.52%, respectively.

A closer look at the cost components shows that he shares of employees compensation and benefit in the total cost of speech therapy, physical occupational therapy, and mental health occupational therapy services were 24.4%, 29.5%, and 30.8%, respectively.

Profitability of the rehabilitation services

The government’s tariffs for a session of speech therapy, physical occupational therapy and mental health occupational therapy in 2017 are shown in [Table 3 about here]

. The government’s tariffs did not cover the costs of any of these services for the ARC. Regarding the comparison of the tariffs for rehabilitation services and their cost, it is clear that the ARC has obviously suffered losses for the provision of the services in 2016. The gap in the cost and government tariffs for some health services has been reported in various studies [2, 18, 19][Demeere, 2009 #1;Tabibi, 2010 #12;Markazi Moghaddam, 2016 #17]. The largest gross loss in the clinical activities was due to the high quality health mental occupational therapy.

Unused human capital capacity

Beforehand, the practical capacity of personnel was calculated throughout the year. By multiplying the practical capacity and the number of personnel in each department, the practical capacity of that department is specified.

The comparison of unused capacity shows that the clinic’s cashier has the highest rate of idle time (**Error! Reference source not found.**). Total cashier activities in the clinic account for only 14.2% of his practical capacity. This ratio was less than 17 percent for receptionists. Rehabilitation specialist staff also has a considerable rate of unused capacity. Meanwhile, mental health occupational therapists have the highest

work less time (83% total practical capacity) among the different departments. Interestingly, general practitioners in the clinic are those who their activity time and their practical capacity are very close together.

The unused capacity of human resources in the ARC shows that a new combination of work reassignments and better management of human resources could lead to more efficient workforce utilization and lower average cost of personnel. For example, if the clinic has plans to expand its rehabilitation activities, given the unused capacity calculated, it only requires more general practitioners to apply. Therefore, the development of rehabilitation activities at ARC not only does not have high costs, but also reduces per capita indirect costs and ultimately reduces the cost of the services.

Discussion

The results indicate that the cost of providing the rehabilitation services at ARC is much higher than the government's tariffs for these services. The calculations showed that the cost of high quality services for speech therapy and mental health occupational therapy was 2.76 and 3.82 times of the tariffs of these services, respectively. This ratio was 2.39 for physical occupational therapy services. Evidently, the high share of the cost of providing rehabilitation services, especially high-quality services, has been related to human resource costs. Among the various types of personnel costs, the compensation of the rehabilitation specialist had the highest share. Indeed, the reason for this high cost should be inquired in the high work less time of rehabilitation specialists.

The highest non-personnel costs are due to "other overhead costs". This matter emphasizes the importance of the production scale in the ARC. In other words, due to the low number of patients, overhead costs were divided among a few patients and contributed significantly to the increase in the cost of rehabilitation services. With that in mind, it is expected that the increase in the number of ARCs patients, could significantly reduce the cost of the rehabilitation services and make its activities profitable. This finding can be extended to all rehabilitation clinics that operate on a small scale.

A review of studies conducted using the TDABC method in the health sector shows that the major contribution to the cost of services has been the cost of compensation for human resources [5, 20, 21]. Healthcare is one of the services that have a high diversity of human resources with cost variations of more than 10:1 [17]. In this regard, the use of the TDABC in this sector could be effective in determining the exact contribution of each type of human resources to the cost. This feature could improve transparency and decision making in healthcare, which lead to control the growth of health costs, that is a growing challenge [22] for many countries in the world.

Conclusion

In the present study, firstly, costs are calculated with a more accurate method based on the allocated time for each activity. Secondly, by mapping the process, all stages of the rehabilitation service have been identified for ARC. This framework facilitated the identification of cost drivers of providing rehabilitation services at ARC. The findings indicate a significant gap between the cost of services and government tariffs. One of the main reasons for this gap is the existence of unused human resource capacity in the ARC. Thereupon, if the ARC's staff operates in a situation where their utilized capacity increases, fixed costs per unit of service will be reduced and resulting in lower prices as well.

Another major reason behind the high cost of services at ARC was the building leasing cost. So, avoiding the leasing costs (through purchasing a building or integration with other rehabilitation institutions) can play an important role in the profitability of the institution's services.

One consequence of the high cost of rehabilitation services at ARC was the formation of the gap between the cost of service and government tariffs. As a result of this gap, the ARC activities have been financially detrimental. However, a more accurate costing framework may contribute to lower the costs and increased revenues for rehabilitation activities.

This study attempted to apply a more accurate method for costing rehabilitation services, in addition to sensitization about the loss of rehabilitation activities for small institutions. Long-term losses for rehabilitation clinics will limit the future of such services and will put the welfare community at a greater disadvantage.

The research has been accompanied by a few limitations. One of the limitations of the research was that the cost of some rehabilitation activities has been calculated. This selection was based on the number of patients referring to departments, and the time and money limits made it impossible for all departments make calculations. In addition, it should be stated that all information was provided by the Asma Rehabilitation center and the accuracy of this information has not been independently investigated. Ultimately, these calculations were related to a small scale rehabilitation center and the findings cannot be generalized to all active businesses in the rehabilitation services.

List Of Abbreviations

TDABC

Time-driven activity based costing

ARC

Asma Rehabilitation Clinic

ABC

Activity Based Costing

HQ

high quality service

MQ

medium quality service

Declarations

Ethics approval and consent to participate

This article has been approved by the Research Ethics Committee IR.USWR.REC.1396.111 at the University of Social Welfare and Rehabilitation Sciences, Tehran, Iran. This article conducted without financial support. The research did not involve human participants and informed consent are not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from the Rehabilitation and Medication Office in University of Social Welfare and Rehabilitation Sciences but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of University of Social Welfare and Rehabilitation Sciences.

Competing interests

The authors report no conflict of interest concerning this study or the findings specified in this paper.

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This research conducted as a master thesis without any financial supports. University of Social Welfare and Rehabilitation Sciences provided us with data and logistic supports and did not play any role outside that.

Authors' contributions

MB and FM conceptualized and designed the study. MB, FM and NA collected and analyzed the data. MB and SHMK wrote the manuscript. FM and NA critically reviewed the analysis and provided feedback on the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1: Personnel cost for a regular 10-session rehabilitation

	Time (Minutes)	Cost per minute (\$)		Cost (\$)	
		MQ	HQ	MQ	HQ
Reception	1.52	0.08	0.08	0.12	0.12
Counseling	28	0.18	0.18	5.04	5.04
Speech therapy	31.3	0.11	0.18	3.44	5.63
Evaluation	12	0.18	0.18	2.16	2.16
Fee payment	1.3	0.08	0.08	0.10	0.10
Total cost of a regular 10-session Speech Therapy				4	6.18
Reception	1.52	0.08	0.08	0.12	0.12
Counseling	28	0.18	0.18	5.04	5.04
Mental health occupational therapy	30	0.08	0.21	2.4	6.3
Evaluation	12	0.18	0.18	2.16	2.16
Fee payment	1.3	0.08	0.08	0.10	0.10
Total cost of a regular 10-session Mental health occupational therapy				2.95	7.07
Reception	1.52	0.08	0.08	0.12	0.12
Counseling	28	0.18	0.18	5.04	5.04
Physical occupational therapy	53.6	0.09	-	48.24	-
Evaluation	12	0.18	0.18	2.16	2.16
Fee payment	1.3	0.08	0.08	0.10	0.10
Total cost of a regular 10-session Physical occupational therapy				5.34	-

Table 2: Cost of resources for rehabilitation services (US \$)

	Speech Therapy	Mental Health Occupational Therapy	Physical occupational Therapy
Total non-personnel costs	29035.71	23982.67	15446.18
Rent	8049.95	8017.94	4345.06
Utilities	442.51	440.76	238.84
Medical equipment depreciation	134.76	302.65	98.79
Office equipment depreciation	324.54	214.18	186.85
Outsourcing contract services	3661.70	2413.78	1911.31
Repair and Maintenance of equipment	58.59	38.61	30.58
Repair and maintenance of other assets	5248.75	5227.88	2833.06
Other overhead cost	742.77	489.63	387.70
Non-personnel cost of a rehabilitation session	13.03 (71.14%)	16.31 (75.81%)	13.25 (70.52%)
Personnel cost of a MQ rehabilitation session	4.20 (24.38%)	3.15 (16.19%)	5.54 (29.48%)
Personnel cost of a HQ rehabilitation session	6.37 (32.84%)	7.26 (30.80%)	- -
Non-technical personnel cost	10387.04	6847.06	5421.76
Total cost of a MQ rehabilitation session	17.23	19.46	18.79
Total cost of a HQ rehabilitation session	19.40	23.57	-

The numbers in parentheses represent the share of each cost in the total cost.

Table 3: Profitability of a regular session for rehabilitation services (\$)

Rehabilitation service	Tariffs	Cost		Gross profit (Lost)	
		MQ	HQ	MQ	HQ
Speech therapy	7.01	17.23	19.40	-10.22	-12.39
Mental health occupational therapy	6.17	19.46	23.57	-13.29	-17.40
Physical occupational therapy	7.85	18.79	-	-10.94	-

Table 4: Different capacities for rehabilitation services (minutes)

Unused capacity	Used capacity	Practical capacity	
97853 (83.36%)	19537 (16.64%)	117390 (100%)	Secretary
63276 (28.17%)	161364 (71.83%)	224640 (100%)	General practitioner
185261 (72.63%)	69799 (27.36%)	255060 (100%)	Speech therapist
228120 (83.80%)	44100 (16.20%)	272220 (100%)	Mental health occupational therapist
172390 (73.43%)	62390 (26.57%)	234780 (100%)	Physical occupational therapist
100681 (85.77%)	16709 (14.23%)	117390 (100%)	Cashier

The numbers in parentheses represent the share of each capacity in practical capacity.

Figures

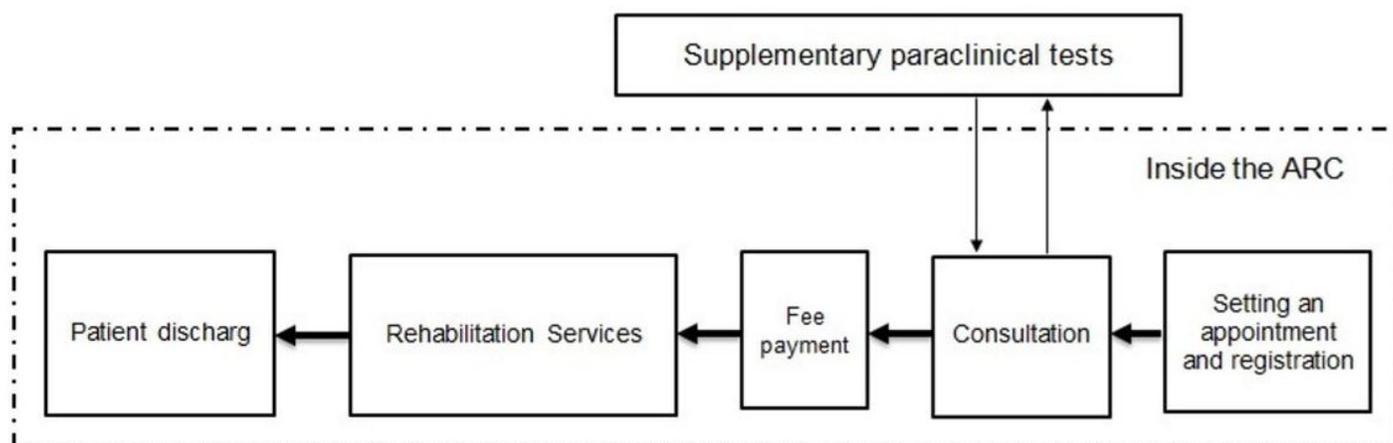


Figure 1

Rehabilitation services process map in ARC