

The role of activity based costing (ABC) system in governmental hospital services in Iran

A Rajabi*

University of Science and Technology, Tehran, Iran

Abstract

Background: Activity based costing or (ABC) is one of the new costing methods with an increasing application throughout the world. This study uses ABC method for calculating the cost price of services in governmental hospitals in southern Iran.

Methods: After finding out the present method's weaknesses, with regard to the services offered, all hospital units were divided into three main categories including administration, diagnostic services and hospitalization. Then, by using activity analysis method, activity centers in each one of the above-mentioned parts were defined followed by costing in each activity center. The costs of Administrative activity centers were divided into diagnostic and operational based on cost driver using "concurrent equations method" to find the percent of giving and receiving services to/from other centers. After determining the costs of diagnostic and operational activity centers, based on the volume usage of activities, the cost price of the hospital services was calculated.

Results: The cost price from ABC method differed significantly with that from Tariff method. ABC method represented useful information about the volume and combination of cost of activity services, cost price of hospital services and could calculate the cost level constituent services.

Conclusion: ABC can be used as an efficient method in health centers in developing countries which is beneficial for both managers and the policy and decision makers.

Keywords: Activity Based Costing; Governmental hospitals; Iran

Introduction

Nowadays with the growth and development of advanced technology in different dimensions, as well as the increasing variety of complex activities, understanding these changes and the evaluation of their effects on the organizational costs are very important. This requires designing a good method for costing to detect the variety and complexity of such activities and the evaluation of their effects on the costs of the services offered. The traditional costing methods, especially the methods used in the hospitals of the country, can not practically meet these expectations. These methods determine the

cost price of the offered services based on the fixed tariffs and regardless of the conditions of the hospitals.^{1,2} So using proper and effective methods of costing is a fundamental necessity. Activity Based Costing (ABC) is one of the new costing methods with an increasing application throughout the world. This method, in calculating the costs, makes use of the effects of activities' changes, complexity, variety and specific features. A distinct feature of this method is the ability of exact diagnosis of costs and presenting the non-financial information to improve the performance and efficiency of the activities.^{1,2} Meanwhile, by applying ABC method, one can diagnose the organizational unused capacity resources and so decrease the cost of presenting the services, using them in other activities.^{3,4} This study was performed to determine a proper model for the cost price of the offered services to patients, compare the enacted tariffs for the offered services to the patients

*Correspondence: Ahmad Rajabi, MSc, Instructor of University of Applied Sciences and Technology, Tehran, Iran.
Cell phone: +98-917-713-8627, e-mail: arajabi53@hotmail.com
Received: January 20, 2007 Accepted: March 9, 2008

with ABC method, detect the unused capacity in hospital methods regarding the information provided by the proposed method, presenting the proper information for standardizing activities and appraisal of performance (Benchmarking) and provide the necessary information for hospital budgeting, especially Activity Based Budgeting (ABB) system in Shahid Faghihi Hospital as a governmental one.

Materials and Methods

To design stages for applying ABC method, whole activities in governmental Faghihi Hospital in southern Iran were observed by a system designing team during a period of 8 months. The ABC system was designed regarding the financial information of the hospital in 2005 and then the cost price services and other relevant data were collected in different parts of the hospital. 11 steps were undertaken for designing the proposed method.

In step 1, the existing situation and its weaknesses and insufficiency were determined. First the current method (fixed tariff) was evaluated to find out its weaknesses, activities performed in each hospital unit, and the possibility of separation and classification of different centers in later stages.

In step 2, a system of teamwork was organized. Therefore, the related groups in various parts of the hospital designed the proposed method before collecting the information regarding the cooperation of specialists and various parts of treatment units. The objectives of designing the method and the related duties of each team member were determined.

In step 3, the existing units of the hospital based on their functioning were separated. So, the whole units of the observed hospital were divided into three general parts based on the services offered to patients including operational divisions such as recovery, operating room, heart surgery, and emergency units offer services to hospitalized patients, diagnostic divisions offering diagnostic services to the hospitalized patients and outpatients (laboratory, radiology, etc.) and administrative and service divisions that are units responsible for facilitating and offering services to all hospital units. These divisions such as accounting, hospital management, and administrative units have no special physical output.

In step 4 tracing and separating of the operational activities of hospital were undertaken to determine the activity centers and perform the activity analysis.

In this step, the necessary activities in providing the services for patients were identified by consulting with team members. The activities (Unit level and Batch level activities) related to services in surgery units were determined. A surgery operation consisted of some activities requiring numerous sources involving some costs.

In Step 5, the activity centers based on operational, diagnostic and administrative units were defined. After separation of the existing units in the hospital, the activity centers were identified for costing operation since each of these units includes other subdivisions. The definition of the activity centers in each hospital unit (administrative, diagnostic and operational) is different. In administrative units, having no role in offering services to patients directly, each subdivision can be considered as an activity center based on its duties in the organization chart, and then the detailed activity centers can be identified by using activity analysis method in each activity center and the costing operations can be performed by this center. Therefore, the accuracy of cost price operation and its calculation would increase. For example, if the accounting unit is considered as an activity center and the costs allocating operations are performed based on this general activity center, the divided costs will not be allocated correctly in this activity center because various activities are performed in accounting unit, some of which have no relation with services to other activity centers at all. Therefore, its costs should not be allocated to these activity centers. For example, the activity center of accounting of patient discharge only provides services for released patients. It is obvious that all costs of these centers should be allocated only to the discharged patients (cost object). However, the activity center of accounting of salary performs the accounting operations and pays the personnel's salary in the hospital; therefore, its costs should be allocated to the personnel of this division. In diagnostic divisions, the activity centers were defined based on the kind of their output. For example, the laboratory output is based on the number of accomplished tests or radiology division is the number of accomplished radiography. Therefore, the laboratory and radiology divisions are defined as two separate units. Of course, each activity center is divided into some subsections with their own specific outputs based on which the costing operations and calculation of the cost price are performed. For example, the activity center of the laboratory is divided into laboratory activity center of Hematology, laboratory activity center of cytology etc. An activity center in the operational divisions was de-

defined according to the kind of service it offers to the patients. For example, each in-patient departments offering the necessary services to patients pre- and post-operation were considered as an activity center. The activity center outputs in such units were identified based on bed occupancy day.

In step 6, activity analysis in the activity centers was evaluated. The purpose of activity analysis is identifying the activities for necessary information about the kinds of activity, activity level, the activity purpose, the necessary resources and the time of activity accomplishment. Activity analysis is an important and fundamental stage in ABC method. In this stage, by applying the activity analysis form, the activities performed along the determined goals were identified. In addition, the amount and kind of consumed materials, their cost and the cost of the equipment depreciation were calculated.

In step 7, standardizing and time measurement of the activity were undertaken. Considering the fact that determining the time of each activity performance has a direct effect on calculating the costs of manpower and allocating the indirect costs to each activity, in this stage, after analyzing the activity based on each division, the activities performed in each activity center was converted to standard ones. Then by using time measurement methods, the time performance of these activities was recorded.

In step 8, the costs of resources of activity performance were identified. In this step, by using the information of activity analysis and accounting data during the considered period, the costs of each activity center consisting of consumed material costs, manpower costs, the costs of equipments depreciation, etc. were identified based on unit level costs, batch level costs, hospital level costs and sustaining level costs.

In step 9, allocation of the costs of activity centers to

one another was done. In this step, with regard to the volume of the services of each activity center offered to other activity centers, the costs are allocated. The administrative and servicing centers' costs are allocated to other activity centers, using cost driver criterion, so such center's costs will be zero.

In step 10, Allocation of the resource costs to the activities was done. In this step, the cost of the consumed resources was allocated to the activities. For example, the necessary activities of radiography include patient reception, radiography operations and preparation of the final picture. In this stage, the cost of each activity was calculated separately, and then according to the total cost activities, the cost price of services was determined.

In step 11, Allocation of the activity cost to cost object and the cost price of services were calculated. In this step, with regard to the use of outputs or cost object, the activity cost was allocated to cost object. Moreover, the costs of the services offered or their cost price were determined. Since the activity volume and services in these centers are based on bed occupancy day, direct cost (unit and batch level costs) and indirect cost (hospital and sustaining cost) were calculated based on the activity center. Then, with regard to bed occupancy day, the cost price of every bed occupied in each day was calculated.

Results

The activities (Unit level and Batch level activities) related to services in surgery units are displayed in Figure 1. A surgery operation consists of some activities requiring numerous sources involving some costs. Only the unit level and batch level have been indicated in this Figure and the activities of sustaining level and hospital level are not included.

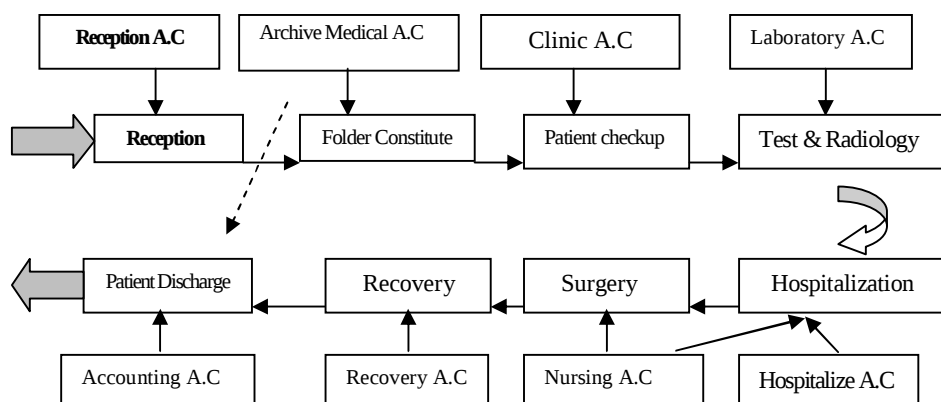


Figure 1: Activity centers and the process of offering service to patients.

The cost of drug store activity center was allocated according to the number of prescriptions or the costs of utility and technical services activity center were allocated according to physical space of each activity center (Figure 2).

Regarding the use of numerous bases for allocating the costs in ABC method, using one-side and/or two-side allocation is inappropriate. The concurrent equations method was used in this research for cost allocation. That is the whole identified activity centers in the hospital were displayed on a line and columnar matrix. Then, the percentage of services offered to other centers was identified based on the cost allocation. Since there is a give and take relationship between activity centers, the concurrent equations

method with 3844 variables was used to determine the real volume of services in each activity center, using inverse matrix. Finally, the allocated costs to other activity centers were identified regarding the collected costs of each activity center (Figure 3).

In Table 1, cost price of services of radiography activities is identified according to the unit and batch cost (consumed material, the cost of manpower) of each output, hospital and sustaining (equipments and building depreciation and allocated costs from other activity centers). Based on the activities employed by each service, its cost price was calculated. In the last column of Table 1, ABC method is compared with the present tariff method and the deviation is presented.

In the last column of the Table 2, the cost price of

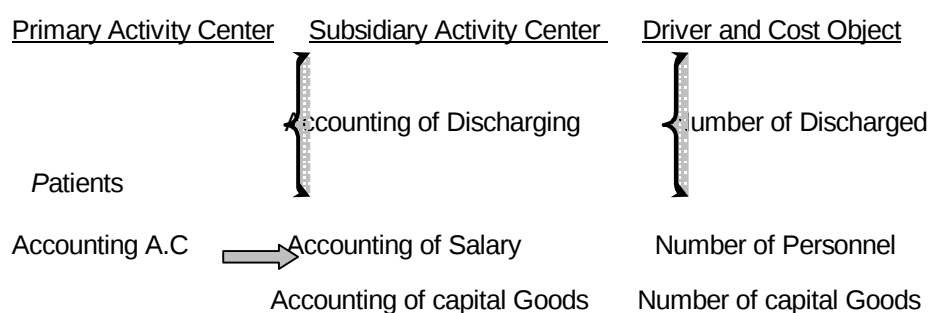


Figure 2: Activity Center definition Process and Cost Assignment in Hospital Accounting Activity Center.

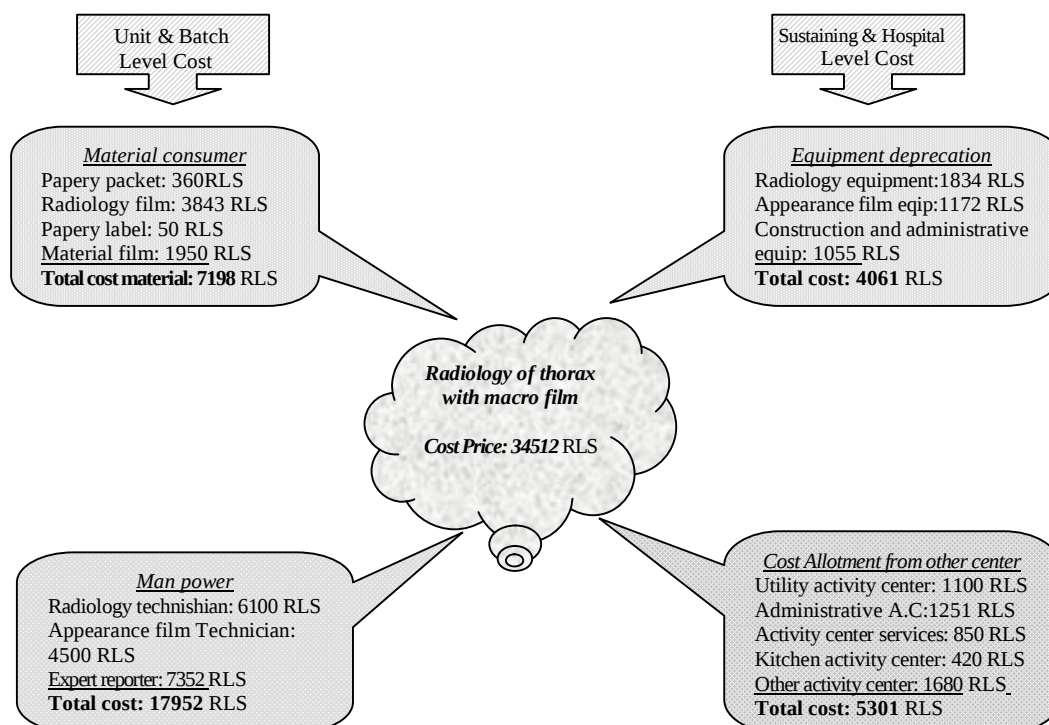


Figure 3: Costing process and cost allotment in radiology activity center.

Table 1: Cost price of services of radiology by ABC method and its comparison with Tariff /cost based in Rials.

Type of cost	ABC Method					Cost of services with tariff method	Deviation of ABC cost price and tariff
	Radiology Services	Cost of material for each unit	Cost of man power for each unit	Total direct costs for each unit	Cost of assignment from other activity center (indirect cost)	Cost of price from ABC method	
	Radiology of thorax with macro film	7198	17952	25150	9362	34512	9362
	Radiology of thorax with medium film	6288	17749	24037	9256	33923	9256
	Radiology of pelvis	6288	17749	24038	9256	33289	9257
	Radiology of urinary	6766	17747	24513	9255	33768	9255
	Radiology of sinuses	2119	13807	15925	7200	23125	7200

Table 2: Cost price of bed occupancy day by ABC method and its comparison with Tariff/cost based in Rials.

Type of cost	Cost of activity center		Bed occupancy-day	Cost of price wWith ABC method			Costs of bed occupancyday based on tariff	Cost price deviation bed occupancy day of ABC method andtariff
	Direct costs for each activity center (unit and batch level cost)	Indirect costs for each activity center (hospital and sustaining level cost)		Cost price of bed occupancy day based on direct costs	Cost price of bed occupancy day based on indirect costs	Cost price of occupancy bed day based on total cost		
Hospitalized and ICU Parts								
Recovery	258959072	192887945	6991	37042	27591	64633	-	-
emergency	393020282	685657170	6900	56959	99371	156330	79530	-76800
Heart CCU	234580488	352672184	2027	115728	173987	289715	193200	-96515
Heart ICU	416779037	252631014	916	454999	275798	730797	386500	-344297
Internal ICU	357354227	251352903	1458	245099	172396	417495	386500	-30995
Surgical ICU	242759617	219278567	939	258530	233524	492053	386500	-105553
Surgicalunit	269685657	355966261	4620	58374	77049	135422	79530	-55892

the two methods was compared and the deviation of cost price was determined.

In this study the cost prices of a hospital, based on direct costs (the costs of unit level and batch level) and indirect costs (the costs of hospital level and sustaining level) were calculated and separated. The cost price of bed occupancy day in the Emergency Department was equal to 170 US\$ of which 64% was the allocated costs from the servicing activity centers. The cost price of Thorax Photography was 28 US\$, of which the allocated costs from servicing activity centers was 11 US\$ (37%). The high volume of indirect costs indicates that the capacity of operational activity centers, (pivotal patient) and pivotal outputs are not

used property because indirect costs related to preparing the side facilities for offering the services had a fixed nature from a behavioral point of view. If the volume of output was high, the indirect costs decreased fast that it ultimately decreased the cost price. The difference in cost price in ABC method from that in tariff method was another result of our study. The cost of bed occupancy day was calculated about 170 US\$ in internal emergency unit but the enacted tariff for this bed by Health Ministry was 87 US\$ with an unfavorable price deviation equal to 83 US\$. It is considered that all deviations were negative based on the kind of bed occupancy/day. One of the other important results was the identification of the cost price

difference of bed occupancy/day in intensive care units (ICU) with that in other departments. The main reason for the cost of bed occupancy/day was the cost of deprecation of equipment, facilities and expert manpower for preparation, the sustaining cost and low number of beds occupied. The cost of every bed occupied in the Heart Surgery Ward was about 795 US\$, which had the negative deviation of 375 US\$ in comparison to that in the enacted tariff (421 US\$). One of the reasons for the negative deviation of the costs of bed occupancy/day, specially, in intensive care units (ICU), is the low number of beds. Bed occupancy/day in the Heart Surgery ICU was 35.3% during the observed period. Regarding the high volume of costs, their full capacity has not been used, but the whole fixed cost of these activity centers was only allocated to bed occupancy/day and then the cost of every occupied bed/day had increased significantly. Determining the capacity and unused resources in various departments of the hospital was another result. In thorax photographing, the standard time for presenting the output should be equal to 810 hours, but it was 4435 hours. So the whole available resources were not used completely. On the other hand, about 3625 hours of resources (manpower, facilities and other equipment) were not made use of.

Discussion

From the beginning of 1850s, the medical tariff began in California by employing the coding method and listing the services. The first results of this information were published in 1956. In this method, a three number code with special listing was used for the classification of medical services. This coding method was published

as a book entitled “Relative Valuation of Medical Services” in 1984.^{1,5} With regard to the drawbacks in the tariff method of remedy services in the late 1980s, most of the hospitals made their tariff’s calculating method based on Diagnosis Related Groups (DRG). In this method, instead of fixed tariffs the cost price of hospital services was calculated for patients based on the opinion of the authorities.⁶ After the remarkable development and success of ABC method in industry, its application has been considered in other settings, especially in healthcare centers and hospitals since early 1990s. Kaplan (1990) had a key role in the development of this method. Meanwhile, by introducing this method, the accuracy of the calculated costs in health systems became so important for hospital managers, physicians, investors and governments so that over 20% of hospitals in America and Canada used this method in 1990s.²

With regard to the efficacy of ABC method, it was used with the assistance of the related management accounting in the clinic of “Brook wood” for controlling the costs of management plans, leading to cost reduction.² Marteau and Perego used ABC method for determining the costs of patient care in “General Zonal Hospital” in Buenos Aires State of Argentina in 1998. This hospital provides services to 190,000 patients in 26 treatment units. Finally, the cost prices of services were calculated based on the kind of disease, being so different from the available methods.⁷ A study was performed by the Group of Quality Guarantee in America as ordered by WHO for the possible applicability of ABC method in developing countries. To apply this method, the group chose a center of health services in Peru, called “Maxlud”. Ten stages were selected for applying the method. The results revealed that ABC could be used as an efficient method in health centers in developing countries.⁸

References

- 1 Rajabi A. Applying ABC System for Calculating Cost Price of Hospital Services (Case Study: Shahid Faghihi Hospital of Shiraz). National Project of Ministry of Health, Treatment and Medical Education, June 2003.
- 2 Namazi M. Study activity based costing in accounting management and its behavior respects. Accounting and audit studies. Seventh Years 1999;26:71-106.
- 3 Cooper R, Kaplan RS. ABC measuring the cost of resource usage. Accounting Horizons, 1992; pp.2-13.
- 4 Rajabi A. Aligning TOC with ABC for assigning optimal production. *Admin J Isfahan Univ* 2004;4:127-152 (In Persian).
- 5 Rajabi A. Designing and ABC method for calculating cost price of student education in medical majors (case study: Shiraz, Yazd and Fasa Universities of Medical Sciences). National Project Studies of Ministry of Health, Treatment and Medical Education, September 2005.
- 6 West T, West D. Applying ABC to healthcare. *Management Accounting* 1997;4:22-33.
- 7 Mrateau R, Perego K. Applying ABC System for calculating cost price in healthcare. *Management Accounting* 1998;2:27-39.
- 8 Eldenburg L, Soderstrom N. Accounting system management by hospital operating in a changing regularity environment. *Accounting Review* 1995;2:23-41.