

## Prime Costs of Hospital Services in Ghaem Hospital in Firouzabad, Fars

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### Abstract

Activity-Based Costing puts a price on service systems and recognizes the opportunities for saving the costs. It foresees the main financial lines of organizations and can be a suitable guide for resource allocation. Using Activity-Based Costing model, the present study calculated the Prime costs of all services provided by Firouzabad Ghaem Hospital in Fars province. This is a cross-sectional study carried out in 2010 in a descriptive-analytical method. The research population included all diagnostic and therapeutic sections of a hospital in Fars province. The required data was collected through information forms, and the price was calculated by using Activity-Based Costing model. In the present study, the highest costs were for human resources (60.93%) and the lowest ones for consumable items and materials (1.85%). According to the obtained results, the radiology department had the most profitability (34.91%) while CCU and ICU were the most loss-making units (-0.03%). According to prime cost calculations, the hospital is profitable and the loss-making units can reach economic efficiency through the better management of human resources.

**Keywords:** Activity-Based Costing; hospital; costs.

### Introduction

The health sector plays an important role in economic and social structure of societies so that every kind of investment in this sector influences the efficiency of other economic and social sectors. One of the requirements of improving economic structure in health and treatment sector is to improve methods of budgeting and resource allocation (Cooper, 1997). Nowadays, health systems form one of the greatest economic sectors worldwide. The international costs of medical and health care in 2000 were almost equal to 8% of gross domestic productions (World Bank, 1987). In most developing countries about 5% to 10% of government expenditures have allocated to the health sector (Giokas, 2003). All over the world, the costs of health care are increasing due to demographic reasons, emerging patterns of diseases, modern technologies and increasing expectations (World Bank, 1999). About 50% to 80% of the health sector budget as well as a good deal of trained people and experts are allocated to hospitals (New Brander et al, 1992). In Iran about 6% of gross domestic product belongs to health care sector costs and 40% of the health costs is allocated to hospital care. Therefore, the effective use of the resulted financial and credit analysis and then the evaluation of organizational performance lead to facilitation of activity continuity and make it possible to minimize the prime cost of services and manage the organizations economically (Jacobs, 2003). One of the systems whose usage in service activities is ever-increasing is activity-based pricing (Thyssen and Israelen, 2006). Contrary to traditional pricing model in which the expenditures were divided into two groups including fixed and variable groups, in activity-based pricing model the expenditures are divided into activities in the levels of units, groups, products and institutes (Lera, 2000). The activity-based pricing model is able to calculate the costs of doing special activities, prevent excessive costly activities, put a price on service systems and recognizes the opportunities for saving the costs, foresee the main financial lines of the organization and act as a suitable guide

for resource allocation (Tollington and Wachter, 2001). Today, the health sector researchers use the activity-based pricing model a lot to carry out their research on calculating and pricing various services as well as their prime costs. For instance, Nourouzi (2013), Rajabi (2012), Mahani S. et al (2010), Mousavi et al (2010), Rajabi (2008), Morno (2007) and Mashhadsari (2005), in their studies, determined the costs and prime costs of various services and concluded that the average prime cost of the calculated therapeutic services had a significant difference with their tariffs and it resulted in losses in the sections under study during that period. They have suggested that for the purpose of reducing consumption expenditures, the performance management, especially regarding human resources and standardization of consumption, should be improved in order to reduce the prime cost of services.

Suman et al (2005) in their research concluded that the required time for working with nuclear medicine machines, the time consumed by the personnel, and the cost of medications used to treat the patients have the most effects on the expenditures emerged in treatment by nuclear medicine.

In addition, Antony Kine (2005) in his work concluded that the most expenditure consumed in that hospital was for surgeries and due to useless existing capacities.

Finally, in their research Lions et al (2003) found that in the radiology center under study, most expenditure relate to personnel and equipment costs, and most personnel costs relate to therapeutic activities.

Since in their studies the researchers found that almost all researches carried out in this field were conducted in just one section of the hospital, in the present study they dealt with calculating the prime cost of all services provided in Firouzabad Ghaem Hospital in Fars province of Iran and used activity-based costing model to collect some useful required information for improving performance management and controlling the expenditure.

### **Methodology**

This applied study is a descriptive-analytical cross-sectional one carried out to calculate the prime cost of services through the use of activity-based technique and the data relating to the year 2009.

Firouzabad town is located in Fars province (the fourth most populated provinces in Iran). Firouzabad hospital has 122 available beds as well as different clinical and paraclinical sections.

After getting permission and making required coordination, the researcher collected the data and, by using Excel 2007 software and the prime cost formulation, calculated the prime cost. The data was collected by using 11 data-collection forms based on the hospital expenditure, outputs and activities. No sampling was done for conducting this research; rather, the total statistics of the hospital were used. The following steps were taken to calculate the cost of each activity unit.

Step 1: determining the resources of each activity unit

1. Human resource costs
2. Depreciation allowance and capital gain
3. Energy costs
4. The costs of materials and tools used
5. Other expenditure including food, transportation and welfare

Step 2. Activity centers based on their activities

1. Management activity
2. Specialized activity
3. Support activities
4. Service activity

Step 3. Determining the output of each activity unit

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Step 4. Determining suitable resource stimulators and the activities for relating resources to activities and also relating activities to outputs .

Relating resources to activities and relating activities to outputs were done by using resource stimulators and activity stimulators, respectively.

In general, the direct expenditures in this study including the ones that appear in each activity center, like direct human resources, specialized consumption materials, and depreciation of specialized equipment were shared directly on the output based on one year output regarding the kind of activities. The indirect expenditures including the ones allocated by other activity centers to each activity center are shared by stimulators. The following is how these expenditures are calculated:

***The formula of calculating depreciation in each financial period***

The depreciation cost of the building, equipments and capital goods has been calculated by using Straight Line Depreciation Calculator approach. By knowing the purchase price, salvage value and useful life, the depreciation cost can be calculated.

$$\text{Depreciation} = \left( \frac{\text{standard use load during a year}}{\text{real use load during a year}} \right) \times \left( \frac{\text{useful life}}{\text{salvage value} - \text{purchase price}} \right)$$

$$\text{Standard use load during a year} = \frac{\text{total capacity of the machine}}{\text{the number of outputs}}$$

$$\text{Real use load during a year} = \frac{\text{machine use load}}{\text{the number of outputs}}$$

$$\text{Machine efficiency during a year} = \frac{\text{standard use load}}{\text{real use load}} \quad (22)$$

In the present study, due to the lack of enough information about the medical equipments' price, year of purchase and end of useful life, re- evaluation of those equipments has been done by experienced experts (20).

$$\text{Salvage goods depreciation} = \frac{\text{estimating salvage value}}{\text{estimating useful life by an expert}}$$

$$\text{Installations depreciation} = \frac{\text{purchase price}}{\text{useful life in iran}} \quad 45$$

$$\text{Medical equipments depreciation} = \frac{\text{purchase price}}{\text{useful life in iran}} \quad 10$$

$$\text{Building depreciation} = \frac{\text{purchase price}}{\text{useful life in iran}} \quad 70 \quad (13, 16, 21, 22, 23)$$

***Capital profit***

The experts of Islamic Republic of Iran's Central Bank designated 21% capital profit.

$$21\% \times \text{total value of fixed assets} = \text{specialized capital profit}$$

Land capital profit was also designated 5% by the experts of Islamic Republic of Iran's Central Bank with regard to its value added.

$$5\% \times \text{land value} = \text{capital profit of the building}$$

$$(13, 16, 21, 22, 23)$$

***Prime Cost of a service***

Prime Cost of a service = costs of direct and indirect human resources + costs of specific consumption goods of a service + shared depreciation costs + specific costs depreciation (specialized equipments of laboratories) + energy cost share + other expenditures.

$$\frac{\text{total output in a year}}{\text{cost price}} = \text{prime cost of a service}$$

$$N_1 U_{c1} + N_2 U_{c2} + \dots = \sum N U_c = \text{total costs of each unit}$$

$$\frac{\text{total output of a unit}}{\sum N U_c} = \text{prime cost of each unit}$$

$$(22, 24, 25)$$

### Findings

Table 1 shows the resources used in each activity unit of the mentioned hospital during the year.

**Table 1: All resources used in the mentioned hospital in 2010**

| Activity/resources                    | Energy costs | Consumption material costs | Capital depreciation costs | Human resource costs | Indirect costs |
|---------------------------------------|--------------|----------------------------|----------------------------|----------------------|----------------|
| hospitalization departments           | 6366176139   | 156703483                  | 339818733                  | 70958633589          | 6019453449     |
| Diagnosis departments                 | 3368310054   | 7189937081                 | 6893911786.8               | 69969882.57          | 2276823517     |
| specific departments                  | 2121097546   | 226459365                  | 267589459.9                | 35419266385          | 1914684761     |
| Operation room and maternity hospital | 3137320240   | 14694224                   | 282762947.3                | 14312020297          | 3205836447     |
| outpatients departments               | 12082400454  | 120082366                  | 801473849.7                | 557738178.7          | 3348297751     |
| Special departments                   | 1176917690   | 29853499                   | 125389833                  | 53581005.5           | 833494529.2    |
| clinic                                | 1131325337   | 25038430                   | 101289209.9                | 48873847.15          | 2356454282     |
| Physiotherapy                         | 255055870    | 5130350                    | 46751828.6                 | 9945837.442          | 456178227.7    |
| Other departments                     | 17967122378  | 0                          | 1378439836                 | 43635158.06          | 9063963048     |

According to table (1) the most costs out of the total resources have been allocated to human resource costs. Among human resource expenditures, the most and the least costs were for plastering rooms in outpatients departments (10.04%) and the environmental health department (0.04%), respectively. Of the total expenditures, the most equipment depreciation costs were for radiology sector (1.79%) and the least ones were for female operation department (0.02%). Besides, among the total energy costs in production department, the most costs were for Internal Medicine Department (19.24%) and the least ones were for outpatients plastering room (0.1%). It should be noted that activity centers are the cause of creating direct expenditures in those centers and the cause of absorbing indirect expenditures from other activity centers. In the present study the most indirect costs out of the total costs were for emergency department (11.5%).

Table 2 shows the activities done in Ghaem Hospital classified based on the departments, and also the average costs of medical service tariffs.

**Table 2. Ghaem Hospital activities classified based on the departments and the average costs of medical service tariffs in 2010**

| activity                              | The number of activities done | tariff      |
|---------------------------------------|-------------------------------|-------------|
| hospitalization departments           | 57491                         | 46923270.73 |
| Diagnosis departments                 | 288563                        | 13664599053 |
| specific departments                  | 6056                          | 1834551.818 |
| Operation room and maternity hospital | 8487030                       | 3476655008  |
| outpatients departments               | 395126                        | 3687128.528 |
| Special departments                   | 9732                          | 569647.1994 |
| clinic                                | 18064                         | 2919660869  |
| Physiotherapy                         | 7391922                       | 252874562   |
| total                                 | 15653984                      | 21366804091 |

Among all activities done in this hospital, the most and the least activities were done in operation room (50.94%) and Thalassemia and patient hand-over units (0.01%), respectively (table 2).

Table 3 shows the prime cost as well as the profit and loss of the same hospital in 2010.

**Table 3. The prime cost as well as the profit and loss of the same hospital in 2010.**

| activity                              | Resources   | Average activity cost | Difference with tariff |
|---------------------------------------|-------------|-----------------------|------------------------|
| hospitalization departments           | 39541765425 | 6776549.833           | 40136720.89            |
| Diagnosis departments                 | 23650321336 | 95401.11928           | 13664503652            |
| specific departments                  | 21476647077 | 13317211.62           | -11382659.8            |
| Operation room and maternity hospital | 7770364197  | 5073555.427           | 3471481353             |
| outpatients departments               | 31062319546 | 4359558.942           | -672430.4137           |
| Special departments                   | 21218238368 | 1176428.13            | -606780.9702           |
| clinic                                | 26665953999 | 226751.0136           | 2919434118             |
| Physiotherapy                         | 5411071863  | 100.0142439           | 252874462              |
| total                                 | 1.76897E+11 | 10621.90284           | 21366793469            |

According to the calculations, the most profitability was in radiology unit (34.91%) while the most losses incurred in CCU and ICU (-0.03%) (Table 3).

### Discussion

Activity-based costing is an important tool for planning, observing, controlling and evaluating services, and its calculation results in reducing losses and eliminating excessive, unusual costs. In this study the human resource cost as the greatest cost was 60.93%. Therefore, the results of this study suggest that human resource performance management is really important for increasing economic efficiency of the hospital. According to World Health Organization reports, about two third of costs in health sector is used for human resources (2). The results obtained from some other studies confirm these findings (Nourouzi, 2013; Rajabi, 2012; Mahani S. et al , 2010; Mousavi et al, 2010; Rajabi, 2008; Morno, 2007 and Mashhadsari 2005).

It is believed that human resource costs should ideally be about 60% of hospital costs (Shepard, Hodgkin and Yvann, 2001). As can be seen, human resource plays a significant role in hospital economy and its significance is noticeable among effective variables on consumption costs in health system. Hence, policy-makers should do an appropriate planning for human resources. Supplying human resources without essential need assessment in hospitals, not using them in positions proportionate to their qualifications and educations, increasing skills and motivations in the work force, in-service training courses under the supervision of experts, and opportunities for job rotation and promotion can influence the output of health systems and the costs of providing services.

Another effective resource on prime cost is the cost of consumption goods. In this study the cost of consumption and specialized goods was 1.85% of the total hospital costs. Findings of some studies (Emmanuelle, 1998; Lievens, Y. Slotman, 2003) do not conform to those of the present study. It might be for the reason that in this study the private sector was responsible for supplying



the patients with specialized and consumption goods and this had a positive effect on reducing hospital costs.

Another effective factor on prime cost was the depreciation of assets, equipments, installations and building which was 5.29% in this study. Since the hospital under study is in its first decade of activities, it is still following a desirable procedure. In her study, Nourouzi calculated the depreciation cost of 17% and found that the effective factors on depreciation are the use of unnecessary equipments and taking less advantage of the capitals as well as not using the equipments completely or using the existing equipments, resources and spaces in an inappropriate way. Findings of the study carried out by Rajabi indicated that the most depreciation costs in the hospital under study were for the laboratory due to its installation costs and the depreciation cost of its specialized assets, and since the machines and equipments used in that laboratory are very expensive, these costs are justified (Rajabi and Dabiri, 2012). Lions et al believe that the cause of cost increase is the equipments (Lievens and Slotman, 2003).

Indirect costs are the ones that are not directly incurred for services and have an indirect effect on prime cost. In the present study the indirect costs were 27.28% of the total costs. Privatization, using multi-skill staff and other strategies can reduce the indirect costs. In his work Rajabi emphasized on the effect of indirect costs in hospitals on the prime cost. Antony Kine says indirect costs increase means the capacities are not used properly. But findings of a research conducted in Irland hospital in 2006 showed that at most 50% of prime costs were for direct costs (Duffy, 2008). Besides, another study carried out in Canadian hospitals revealed that indirect costs were 45% of hospital costs (Eden, 2006).

The more the production activities increase, the less the indirect and direct costs relating to production sector will be. If production increases, the costs and prime cost will decrease. A research in a hospital laboratory in India showed that the increase of production and activities that lead to production results in price reduction (Nair, 2010). In the present study the average annual production activities in Ghaem Hospital are 925221 activities and they have a direct relationship with the prime cost. Sadghiani believes that the unreasonable daily increase of hospital bed costs means that the beds are useless, the medical and paramedical staff are absent or do not work properly, there is no supervision over revenues and expenditures, and finally, inefficacy and ignorance of the executive system which is one of the most primary principles of management (Sadaghyani, 1996).

In Nourouzi's opinion, the most activity costs in **Valiasr** Hospital belong to specialized activities (97% of the total activity costs) and this can be due to being a training hospital as well as the presence of faculty members among the laboratory staff. In his work, Rajabi states that most expenditure is allocated to treatment-related activities.

Finally, the prime cost of Ghaem Hospital was 9.25% more than its governmental tariff. In this study the hospitalization departments were making losses due to the costs relating to medical specialists. Specialist physicians are usually attracted by private hospitals since the private sector is profitable.

Nourouzi's research indicated that the laboratory under study was facing 63% budget deficit and the high amount of losses in the hospital was due to the kind and method of its management. Antony Kine proved that the calculated costs based on activity-based costing are higher than the authorized tariffs. He believes that the lack of considering useless capacity costs is the main reason for this difference and states: "It seems that what the service tariff-makers have ignored is the need for considering the costs that are indirectly imposed on activity centers having outputs, and this is exactly the point that activity-based costing model, unlike other usual costing models, is able to identify.

In addition, Antony Kine, Nourouzi (2013), Salem Safi (2004) and Nouza Chang (1995) have noted in their works that the real prime costs are higher than their governmental tariffs and it leads to the decrease of hospitals' effectiveness and efficiency.

### Conclusion

Regarding the appropriate management structure and the optimal performance of the staff, this hospital is profitable. The reason for performance improvement might be the acts of the hospital manager in combining therapeutic departments at the time of having fewer patients, using multi-functional staff, decreasing the work force when there were fewer patients, and using specialist physicians per case.

According to the research findings and regarding the increase of profitability in different units of the hospital, it can be suggested that the government should determine a ceiling on revenues of physicians in the private sector and cause them to allocate more time to the governmental sector. Moreover, since some parts of the hospital including special patients, hemodialysis, and emergency departments as well as training departments provide free services and the patients do not have to pay any money, the hospital manager can apply suitable motivating factors to retain the human resources working in these departments.

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