

Analysis of Cost Price and Net Profit of Paraclinic Services in Private and Public Sectors: A Case Study of Kerman City 2014

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ABSTRACT

Introduction: Cost is becoming a growing concern for the managers of health and treatment institutes both in private and public sectors. Based on the opinions of pathology and radiology specialists and experts, one private and one public center for radiology and laboratory were selected to study in Kerman City.

Method: This is a cross-sectional and applied study. The two centers were similar in frequency of their services, different tests they were conducting, and their number of personnel. Afterwards, the costs of services in both fields were determined using the activity-based costing method. This study was carried out from March 21 to September 22, 2014. The costs of services in both private and public sectors were compared to the tariffs of the Ministry of Health in 2014.

Results: Laboratory results indicated that the costs in all the selected tests were higher than the tariffs and the largest difference (app. 84,930 Rls) was observed in the TSH test while the smallest difference was observed in the ferritin test (11,940 Rls). However in the private sector, vitamin D and FBS tests were not profitable with differences of about 5500 and 6500 Rls, respectively. In other tests, the costs in the private sector were lower than the tariffs for the private sector. In the private sector radiology center, only the MRI services were not profitable but the other services were. The cost of MRI services in the private sector studied in this research was 190,000 Rls higher than the private sector tariffs.

Conclusion: In this study, the results showed that CT scan services were the most profitable services and the price difference was about 203,000 Rls per service. However, all of the radiology services were unprofitable in the public sector and the largest price difference was seen in MRI services which was about 590,000 Rls per service.

Keywords: Radiology, Laboratory, Cost price, Activity-based costing, Private and public tariffs

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Introduction

Today, the health and treatment systems of many countries are dealing with severe shortage of financial resources. Hence, health authorities should be able to make the best of the existing resources. Optimal utilization of resources calls for precise and accurate information about the flow of resources while awareness about the allocation of resources influences the quality and performance of resources. Collecting and analyzing data about the cost of each program provide very useful information about different kinds of health and treatment services. The resulting information not only reveals the financial resources required for continuing the program, but also can help assess the employment of human forces for providing healthcare and evaluate the effective use of

equipment, instruments and resources (1).

Cost is a growing concern for the administrations of health and treatment centers. This issue is of importance to both public and private sectors (2).

According to the report by the World Health Organization, hospitals and diagnostic and treatment centers in the developed and developing countries are known as essential social resources that need to be run in line with social interests (3).

Costing and cost analysis are techniques for direct or indirect price assignment. In fact, costing methods are known as instruments for changing and regulating data or information stored in the existing accounts with the aim to obtain information about the cost of services provided by different centers (4).

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Precisely structured cost data can yield information about the performance of cost units. The information can be compared to the predictions of budget performance so as to identify problems that require immediate attention. The data provides the raw material for the required assessment and modification of operations to the managements. In addition, awareness about costs (including unit or total costs) can help plan and formulate future budgets (as the performance index) and create a reception table for patient services (5).

A health policy maker cannot regulate prices and real demands associated with costs unless the costing system precisely assigns direct and indirect costs to appropriate units (6). Finally, costing and cost analysis are important to the management as they ensure the costs are not going to surpass the existing incomes and subsidies (2).

However, the objective of this study was to examine the cost prices in the private and public sectors so as to compare the prices of paraclinic services and net profit of these institutes with the 2014 private and public sectors' tariffs announced by the government assuming that quality of services remains unchanged.

Methods

This applied research was conducted with a retrospective descriptive approach. In this study, there was an attempt to use the activity-based costing method (ABC) to examine the cost prices of radiology services (including ultrasound, MRI, etc.) and laboratory services including FBS, UA, CBC, PTH, Ferritin, HBS, TSH, blood group, Procalcitonin, and vitamin D tests. Also, this study was conducted in Kerman University of Medical Sciences.

The aforementioned tests and services were selected based on the opinions of radiologists and pathologists because these services and tests formed 70% of the total activity of such centers. This study was carried out in a public center and a private center with similar test frequencies and paraclinic services. The main research objective was attained using the activity-based costing method which consists of the following seven steps.

After calculating the cost prices of para-clinic services, a comparison was made between the calculated results and the 2014 private and public sectors tariffs. The net profit for each center was calculated by multiplying the frequency of each test or service by the difference between the approved tariff and cost price of that particular service in that center.

What is noteworthy regarding the present research is that for the radiology part, the average public and private sectors' tariffs were used due to the diversity of radiological services. For instance, a total of 110 CT scan services are defined in the tariff book but the researcher only managed to consider 50 services provided by the center in the research period and therefore used the average tariffs of the 50 services in calculations. Based on the test frequencies and cost prices, it was possible to calculate the net profit per service and also discuss the losses and profits of each center. It is worth mentioning that the price of laboratory kits was calculated based on Alexis and not the ELISA or VIDAS (from Akbarieh Co. list). Moreover, the price of laboratory kits was calculated based on the free exchange

rate and not on the basis of the exchange rate used by the Ministry of Health.

The project procedure and techniques in the course of implementing the project are explained as follows:

Step one: At this stage, the activity centers at the paraclinic centers are defined. An activity is a task accomplished by a human or a machine or a combination of both to achieve a predetermined goal (2). The main factor in defining an activity is its cost. Centers of activity are places where activities are done. These centers induce direct expenses for them while they also attract indirect expenses from other activity centers. The interview and observation method is used to identify the centers of activity (7).

Step two: At this stage, the identified centers of activity are classified based on the type of operations they handle. In this research, direct activity centers were human, consumption and depreciation activity center but indirect activity centers were overhead cost that includes management center, energy cost center, etc.

Step three: At this stage, the output of each activity center is determined. In other words, this stage is meant to identify the output of each activity center. For instance, the output of a hematology laboratory might be different tests such as blood concentration tests, blood sugar tests, etc. Since each center has a different output than the others and since each output has its own specific cost price, for costing purposes it is necessary to classify all activity centers based on their output and then carry out costing operations based on the outputs (7).

Step four: At this stage, costing is carried out for each activity center. After studying and analyzing the existing evidence and documents, costs associated with each activity center (including human resources, materials, supplies, depreciation, food, and overhead costs) are determined. Sharing basis for cost center included human center, consumption material, and depreciation cost center consisted of the number of tests; for energy center it was space (m³).

Step five: At this stage, the costs calculated for each activity center are assigned to the terminal cost centers.

Step six: At this stage, the cost prices are determined per output. After identifying the costs associated to terminal activity centers or centers with outputs, the cost price of each output is calculated through dividing the total costs assigned to each activity center by the number of outputs defined for that center. The result of this division is the cost price per output (8).

Step seven: Finally, at this stage the costs of activity centers and the share of each cost cause are compared for the aforementioned centers.

Results

In this study, the data were collected and standardized using the design proposed by the Ministry of Health (Tariff Office). In this section, research findings from the centers in public and private sectors are analyzed separately for radiology and laboratory services. Table 1 shows different specifications of the centers under study.

Table 1. Specifications of the studied radiology and laboratory centers (private and public sectors)

Center	Number of personnel with BA	Number of specialized physicians	Area (m2)
Public radiology center	8	1	150
Private radiology center	7	3	185
Public laboratory	7	2	115
Private laboratory	5	1	140

As shown in the table, there was no considerable difference between the numbers of experts and specialized physicians in the selected para-clinic centers. Moreover, the investigations revealed no significant difference between the salary of BA personnel working in the public and private sectors. However, the salaries of radiologist and laboratory specialists in the private sector were about 15% more than those in the public sector. The difference was a little bit smaller for laboratory specialists than radiologists. It is noteworthy that the difference between salaries is completely different from the net profit of a radiologist who owns a paraclinic center. That is to say, the difference only shows the cost of the time spent by a specialist in a paraclinic center.

In this study, depreciation expense under straight line method is calculated by dividing the depreciable amount of the fixed asset by the useful life of the asset. Another important point about laboratory costs is that the price of devices and equipment required for blood sugar and UA tests was assumed to be about 1000 million rials, that of the CBC test device was assumed to be about 600 million rials and that of devices required for PTH, Ferritin, HBS and TSH tests was considered to be about 1000 million rials.

The lifetime of devices was assumed to vary between 10 to 15 years for calculating the depreciation of devices.

Based on the interviews with the process owners, the annual tax was approximately 20 million rials and the cost of the hardware and software required for starting a laboratory was about 100 million rials.

Moreover, since other costs such as the costs of laboratory equipment may also be involved, 100 million rials was added as the overhead cost to the total costs based on the documents available in the cost center. For the radiology center, the cost of MRI was assumed to be 50 billion rials and the costs of maintaining the device were estimated to be 200 million rials. The costs of the CT scan device and its maintenance were also assumed to be about 7000 and 700 million rials, respectively. In addition, the costs of the ultrasound device and its maintenance were considered to be 4000 and 150 million rials, respectively. Table 2 presents the cost prices of different laboratory tests in the public and private sectors.

According to the calculation results, the largest difference between the test cost price and public sector tariff was seen in the TSH test which was about 84,930 rials. The smallest difference was also seen in the ferritin test (app. 11,940 rials). It is worth mentioning that after the TSH, which has the first place, the differences for other tests were as follows: vitamin D (68,580 rials); PTH (21,880 rials); FBS (26,520 rials); CBC (19,790 rials); HBS (15,630 rials); UA (14,130 rials); blood type tests (12,030 rials); and Ferritin (11,940 rials).

As shown in Table 3, the share of the cost centers was identified. In some tests, the share of labor costs than other centers, such as FBS, UA, CBC, Blood groups.?? But in other cases, centers' sharing was related to the kit center.

Table 2. The cost prices of different laboratory tests in the public and private sectors (Rials)

Test type	Cost price in the public sector	Public sector tariff	Cost price in the private sector	Private sector tariff
FBS	38520	12000	32500	26000
UA	38130	24000	33800	54000
CBC	39790	20000	37500	54000
PTH	124880	83000	113440	194000
Ferritin	91940	80000	81840	244000
HBS	153630	138000	150400	307000
TSH	132930	48000	13000	132000
Blood group	36030	24000	35400	53000
Procalcitonin	300000	-----	282000	290000
Vitamin D	177580	109000	170500	165000

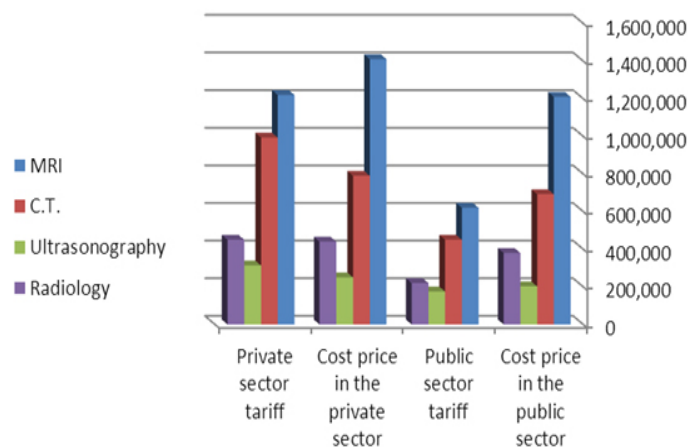
Table 3. Cost center sharing for laboratory tests

Test Type	kit share	Overhead cost share	human share
FBS	0.066006	0.213	0.720949
UA	0.07065	0.2148	0.714583
CBC	0.078383	0.2029	0.718761
PTH	0.703671	0.1662	0.130124
FERITIN	0.556041	0.1431	0.300828
HBS	0.760656	0.0864	0.152929
TSH	0.357312	0.4426	0.200083
blood group	0.098862	0.1558	0.745374
procalcitonin	0.753333	0.18	0.066667
vitamin D	0.752229	0.1351	0.112623

As shown in Table 3, the share of the cost centers was identified. In some tests, the share of labor costs in such tests as FBS, UA, CBC, blood groups was more than other centers,. But in other cases, centers' sharing was related to the kit center. The cost price of MRI services in the private sector center studied in this research was 190,000 rials more than the private sector tariff. However, CT scan services were the most profitable services and the difference between the private sector prices and tariff was about 203,000 rials per service. This service was followed by ultrasound services and radiology services with price discrepancies of about 63,120 rials and 10,000 rials, respectively. However, in the public sector all of the radiology services were shown to be unprofitable and the largest price difference was observed in MRI services with 590,000 rials per service. The lowest difference (27,000 rials) was also seen in ultrasound services.

The net profit of each center was calculated by multiplying the frequency of each test or service by the difference between the approved tariffs and cost prices. The net profit of the public laboratory turned out to be negative and the center lost about 120 million rials per month. However, in the private sector the net profit was positive and it was estimated to be 150 million rials. In addition, the loss caused by radiology services in the public center was very significant (-482,370,000 rials) while the private sector had a net profit of 157,326,000 rials by providing the same number of services.

Graph 1. Cost prices of radiology services in the public and private sectors (IRR)



Discussion

First, it is necessary to mention the weaknesses and strengths of this research. One of the weaknesses of this study was that due to the volume and diversity of radiology services, the cost price of each service was not taken into account and instead the total price of radiology services was studied. The total price used in this study was in fact the average cost price of these services in the public and private sectors. However, one of the strengths of this study is that it can help policy makers in making decisions and obtaining general estimates.

One of the studies in this field was the research by Nasiripour et al. (7) entitled “Calculating the cost price of clinical laboratory services in ValiAsr Hospital of Tehran in 2008 using the activity-based costing method”. They concluded that the largest and smallest sources of all costs were human forces (44%) and energy (5%), respectively. Moreover, among the activities the highest share of costs belonged to specialized activities accounting for 97% of all activity costs. The findings reflect the significant effect of the costs of human resources (especially costs of specialized human forces) on the cost price of services. The largest share of the cost price belonged to urinalysis (11%) and the lowest one belonged to sediment in the biochemical group (21%). This finding also indicates that with an increase in the frequency of services, the cost price of the services declines. Finally, the difference between the calculated average cost price and tariffs of the Ministry of Health was 63%. The difference was caused by the unrealistic tariffs that differed from cost prices of services.

Mousavi et al. (9) also carried out a study entitled “analysis of the average cost price of treatment services in the inpatient and imaging units of the Al-Zahra Training and Treatment Center of Isfahan and a comparison between this cost price and average tariff in 2010”. The researchers found out that the average cost price of services in the clinics of the center was 142,000 rials. Moreover, the average costs of services in the laboratory, radiology, ultrasound, CT scan, MRI, EEG, ECG, and rehabilitation units were 7000, 46000, 28000, 105000, 245000, 90000, 25000, and 58000 rials, respectively. Based on the

calculations, the average differences between the cost prices and tariffs in the clinics, laboratory, radiology unit, ultrasound unit, CT scan unit, MRI unit, EEG unit, ECG unit, and rehabilitation unit were 82000, 300, 10000, 67000, 87000, 229000, 120000, 1000 and 37000 rials, respectively. It was also concluded that except for some of the paraclinic units and center units, a significant difference existed between the cost prices and tariffs of treatment services and that difference was the cause of the losses in the centers under the study.

Saber Mahani et al. (10) also conducted a study entitled "calculation of the cost price of radiology services in Shafa Hospital in 2008". The effort by these researchers revealed that the personnel cost (777,676,772 rials) accounted for 55.70% of the total costs of the sector and, therefore, it had the largest share of the costs. In addition, the costs of consumables (105,701,719 rials), food (17,160,478 rials), water, electricity, telephone and fuel (4,381,061 rials), and depreciation (208,824,509 rials) formed 7.57%, 1.23%, 0.32%, and 14.96% of the total costs, respectively. The total cost of the center under the study was 1,396,273,212 rials. Of the aforementioned total cost 136,381,205 rials (97.68%) belonged to direct costs and 32,412,007 rials (2.32%) to indirect costs.

Results of the study by Ghiasvand et al. (11) on calculating the cost price of radiology services using the activity based costing method indicated that the services provided by the diagnostic sectors of hospitals are among the cost units that own a large share of costs. The objective of their study was to determine the cost price of radiology services in 2010 and 2011 in four public teaching hospitals affiliated with Ardabil University of Medical Sciences and Health Services. Their research was a cross-sectional retrospective study in which data were collected using a series of standard forms provided by the Ministry of Health as well as evidence and documents available in the administrative and support units and sectors. Using Excel, the costs of radiology services were calculated using the activity-based costing method for 2010 and 2011. A major share of costs in all of the four hospitals under the study belonged to direct costs, among which the costs of different radiology films and personnel had the largest share. The average unit cost of radiology services provided by the four hospitals namely Imam (RIP), Dr. Fatemi, Alavi, and Bou-Ali in 2010 was 102737, 90968, 96422 and 80459 rials, respectively. Moreover, the average unit cost of radiology services provided by the four hospitals namely Imam (RIP), Dr. Fatemi, Alavi and Bou-Ali in 2011 was also 112530, 108280, 1072422 and 10325 rials, respectively. The cost of one radiology service in this study was drastically different from the cost reported by other studies. Some of the reasons for the difference can be passage of time and the considerable increase in the inflation rate in the health sector, especially after implementation of the Iranian subsidy reform plan. Seemingly, the load of patients visiting centers and problems associated with financial management of hospitals (regarding planning, resource allocation and capacity) led to an increase in the average costs of radiology services in the centers under the study. Results

of this study showed that there was a difference between actual costs of radiology services and approved tariffs. It was also found out that the difference increased with an increase in the number of active beds and specialization of hospitals. Hence, the aforementioned hospitals need to repair their financial structure and even benefit from cost exemptions to be able to provide desirable services.

Finally, Torabi et al. (12) also carried out a study entitled "calculation of the cost price of radiology services in 2009 in Golestan Teaching Hospital of Ahwaz". These researchers found out that the costs of only three radiography services including two-sided lumbosacral (6348 rials), anteroposterior and lateral dorsolumbar (3995 rials), and the standing vertebra and waist (12001 rials) were less than the approved tariffs of 2009. However, the costs of the other 32 radiography services were significantly higher than approved tariffs of 2008 and 2009. In sum, the total cost assigned to the radiology sector was 5,795,152,383 rials, the largest share of which belonged to human resources (43.3%). One of the strengths of their study was that it addressed each radiology service in detail.

Conclusion

Results of the present study indicated that there was a difference between the actual costs of radiology and laboratory services and approved tariffs. The difference was significant in the public sector and was manifested in the form of financial losses for hospitals. Among the centers under the study, the largest difference between tariffs and costs was seen in the public radiology centers. The difference was highly significant. In this sector, which works with public tariffs, MRI services had the largest share of losses with a price difference of 590,000 rials. Moreover, it should be mentioned that losses caused by MRI services were also about 190,000 rials in the private sector which indicates that tariffs do not comply with actual costs. Hence, in order to improve the financial systems of hospitals and reduce their expenses, it is necessary to calculate the price of the service using precise costing method such as the activity-based costing method (ABC).

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