

*Original Article***Calculating the Total Cost of Services at One Health Center Before and After Assignment (2014-2016)**Alireza Jabbari<sup>1</sup> Yasamin Molavi Taleghani<sup>2\*</sup> Reza Khadivi<sup>3</sup> Marzieh Hadian<sup>4</sup>

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**Abstract**

**Background and purpose:** Accurate calculating and evaluating of cost of services would result in clarity on the ways to achieve the desired goals in outsourcing of health centers and health comprehensive centers. The present study was carried out to calculate the total cost of services at one health center before and after assignment to private sector (2014-2016) in Iran.

**Materials and methods:** This research was a descriptive-applied type of study conducted by using cross-sectional method, and based on the data collected from Yazd Abad health center in 2014-2016 and its affiliated and non-affiliated bases. The collected data were analyzed by developed forms, interview, and observation, based on the activity-based costing system. Excel Software was then used to analyze the collected data.

**Results:** The total number of services in nine sub-branches at the target health center was 783231 before assignment and 793589 after assignment. Sum of other costs was 446112820 Rials before assignment and 615112820 after assignment. The mean cost of a one-minute service at the Health Center was 90749 before assignment and 96295 after assignment. Among the nine branches, the highest cost service before and after assignment was related to school health branch and the lowest cost was related to oral health services branch.

**Discussion:** Total cost of each service provided a clear picture of the way of spending the costs in the process of production and providing health services. The research findings suggest that the total cost of services increased after assignment, while this increase was not significant, since the increase in total cost of services might be due to an increase in wages or a non-significant increase in providing the services after assignment. Thus, more studies are needed to assess the effectiveness of comprehensive health centers after assignment to the private sector.

**Key words:** Health evolution; Cost of services; Outsourcing; Health centers

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## 1. Introduction

Iran's Health Networks are considered as a basic framework in providing basic health services (1, 2). Research suggests that a large amount of resources in Iran is lost annually in healthcare network due to lack of economic evaluation and total cost evaluation (3). Hence, complete participation of society in the form of volunteering work, and presence of non-government sector are necessary in the process of providing the service. Thus, one of the Articles of health development plan in the health area was developed in the form of providing and promoting the primary healthcare in the form of expanding and strengthening the health network in urban areas to control the cost of health services. With such conditions, it is impossible to determine the real tariff for primary health services and, if required, assigning these services to the private sector. Thus, establishing an appropriate costing system in health service will provide very useful information on the performance of these units before and after the assignment (4). There are numerous methods for analyzing the cost of services and goods unit in various industries. One of the modern methods used to calculate total cost is activity-based costing (ABC) method. ABC focuses on activities used to manufacture a product, and pursue the cost of all activities performed to manufacture a product or provide services up to product manufacturing stage (5, 6). In developing countries, such as Iran, costing and cost analysis of a service unit can assist the manager of the departments and policy makers in determining the point that how and to which extent their units and institutions meet the public needs of the society (7). Given the importance of healthcare services and the necessity of

health services provision units to non-government sector according to contents of Article 88 of the Law on Regulation of Government Financial Regulations (8), the importance of outsourcing health service provision units has been revealed more than before (8). Additionally, legal obligations of Articles 49, 138 and 144 of the Law of the Fourth Economic, Social, and Cultural, Development Plan of the Islamic Republic of Iran (9) and Article 219 of the Fifth Development Plan Law of the Islamic Republic of Iran (10) with regard to operational budgeting, calculating the cost of services in all government executive organizations has become an essential matter. For this reason, accurate calculating and evaluating of cost of services would result in clarity on the ways to achieve the desired goals in outsourcing of health centers and health comprehensive centers. It is clear that, nowadays, one of the problems faced by health sector is the shortage of resources and the annual budget deficit, which undoubtedly needs effective control of cost and service providing processes. (4) Thus, having knowledge and information of the way of allocating and cost of the services provided can play a crucial role in controlling the price of the provided services and determining the rational rate of assigning comprehensive health service centers units to private sector. Therefore, the current research was conducted to calculate the cost of services in one health center before and after assigning to private sector

## 2. Methods

The present study was descriptive and cross-sectional type of study, which is considered among the applied studies in terms of results. The research population included all units providing service at Yazd

Abad health center and its affiliated and non-affiliated bases (A, B and C bases) in nine branches. No sampling was performed in this research. The research time was retrospectively based on the data of years between 2014 and 2016, before the assignment: based on the data of the second six months of 2014 and the first six months of 2015, and after the assignment: based on the data of the second six months of 2015 and the first six months of 2016.

This research was conducted in 7 stages based on the stages explaining the activity-based costing (ABC) method (11), which will differ from the proposed model, based on the conditions in implementation:

This Health Center was selected in this research since it is the first center in Isfahan Province and it's before assignment information was available. The organizational structure of the studied center was evaluated at this step, and all activities in the center were then described. Experts' comments were primarily used to identify the programs and activities related to the units. Designed forms were then sent to the experts and authorities in the environmental units to obtain their comments based on the operational plan and description of their tasks. The forms were then reviewed and finalized after receiving feedbacks and revisions. The costs of each unit providing services were divided into two groups of costs, including the direct costs of manpower (wages-benefits) and indirect costs of administrative consumed materials, maintenance cost, energy cost, vehicle fuel costs and facilities, cost of using drug, cost of medical consumed applicants. The final outputs of each activity unit were determined by studying each activity unit precisely through this step. The information required to determine the frequency of

services for each activity unit was obtained through the comments of authorities of each unit based on software and manual counting through the registry offices. Direct observation and interviews with the practitioner were also used for estimating the duration of each activity at Yazd Abad Health Center level, so that within each class, each activity was observed and measured three times at different times and finally recorded in the activity analysis form.

In the present study, all personnel costs, including salaries, benefits, insurance costs, deductions, etc. were collected using the designated form through personnel accounting documents. After calculating the total personnel cost, this cost was allocated by the "number-time" factor among outputs. Consumables were also classified into two main groups (health care consumables and office consumables) that were extracted according to remittances and warehouse receipts.

Furthermore, fuel costs were calculated and extracted according to statistical forms and offices, costs of energy carriers based on bills, medicine costs based on remittances, and medical equipment purchase costs based on accounting documents, and finally maintenance and preservation costs based on accounting documents. It is worth noting that since the depreciation cost share does not constitute a high contribution to the cost of services and the share is the same in the centers, it was ignored. After determining the direct and indirect costs at this stage, these costs were shared among the outputs (activity centers) using the "number-time" factor, and the share of each activity unit from costs was finally determined.

All costs were shared among various types of the outputs based on the sharing criteria and information obtained from the analysis

of the activities at this stage, and the total share of these costs for a specific output was the unit cost of that output. In other words, the cost rate of each activity and each health branch was used in this method and the final cost was estimated. Finally, the costs of services provided by this health center before and after the assignment were compared. The base stock method was then used to analyze the data related to manual counting of record offices. Descriptive statistics including frequency, percentage, and mean via Excel Software were used to analyze data related to frequency and estimation of activity duration of each unit as well as the amount in Rial of cost factors. The content validity approach was used to achieve the scientific reliability of data collection forms and checklists. The checklists were primarily prepared and adjusted using the comments of experts and then approved for review and evaluation by at least 7 health and management experts; after gathering comments, necessary modifications and corrections were made, and the final checklists were set up. Inclusion criteria for the selection of experts, senior managers, and employees

were having at least 2 years of experience in healthcare sector. Moreover, for the validity of data, all data were collected by a researcher before and after the assignment and were included in the checklists and data collection form. To increase the accuracy of service scheduling, the data collected through observation were matched with the scheduling frame from the viewpoints of service providers and experts, and if there was a significant difference, re-scheduling was performed by the researcher.

### **3. Results**

The total multiplication of services by timing of providing them at the Health Center is displayed in Table 1 separately for each of the main branches before and after assignment, and Table 2 shows the direct and indirect costs.

**Table 1.** Calculation of multiplication of services by timing of providing them at Yazd Abad Health Center before and after assignment

Health center and affiliated bases name	Time table	Calculation of multiplication of services by timing									The total for multiplication of services by timing
		oral	combat with diseases	school health education	mental health	professional-environment health	health family	nutrition	Health Education	therapeutic	
A bases	second six months of 2014	38813	14989	8714	1190	46615	47823	19711	6166	64042	248063
B bases		0	1614	285	1020	10624	10449	5207	2145	12660	44004
C bases		0	2283	375	720	29479	14800	5950	3465	9592	66664
A bases	the first six months of 2015	67415	15052	9498	1635	37244	46365	23696	5990	62876	269771
B bases		0	2127	285	1380	18236	20123	7124	5370	10100	64745
C bases		0	2886	420	910	31216	34966	7726	3060	8800	89984
A bases	the second six months of 2015	66463	14241	9377	2345	12907	48093	18796	4805	47669	224796
B bases		0	3205	330	1440	188	19980	6784	1545	8800	42272
C bases		0	3994	420	1000	278	33755	8396	1320	8748	57911
A bases	the first six months of 2016	88430	32925	9305	7530	48393	47226	18805	10773	44195	307582
B bases		0	4090	330	1710	15435	19404	8600	6945	6300	62814
C bases		0	4385	420	2110	30240	33216	9180	10515	8148	98214
<b>The total for each service</b>		305716	122811	48934	25770	370815	445406	167323	72156	370729	1929660

**Table 2.** Calculating the direct and indirect costs at Yazd Abad Health Center before and after assignment

Costs		A bases	B bases	C bases	Total cost
Direct costs	Before assignment	4692014817	1475056370	494610553	6661681740
	After assignment	4828289003	1514642593	683863237	7026794833
Indirect costs	Before assignment	308112820	69000000	69000000	446112820
	after assignment	405,112,820			615,112,820
			105000000	105000000	

The findings of current research related to 120 services provided at Yazd Abad Health Center are presented in separate tables for each of the final units of activity, which considering the high volume of data in this section, we only presented Table 3

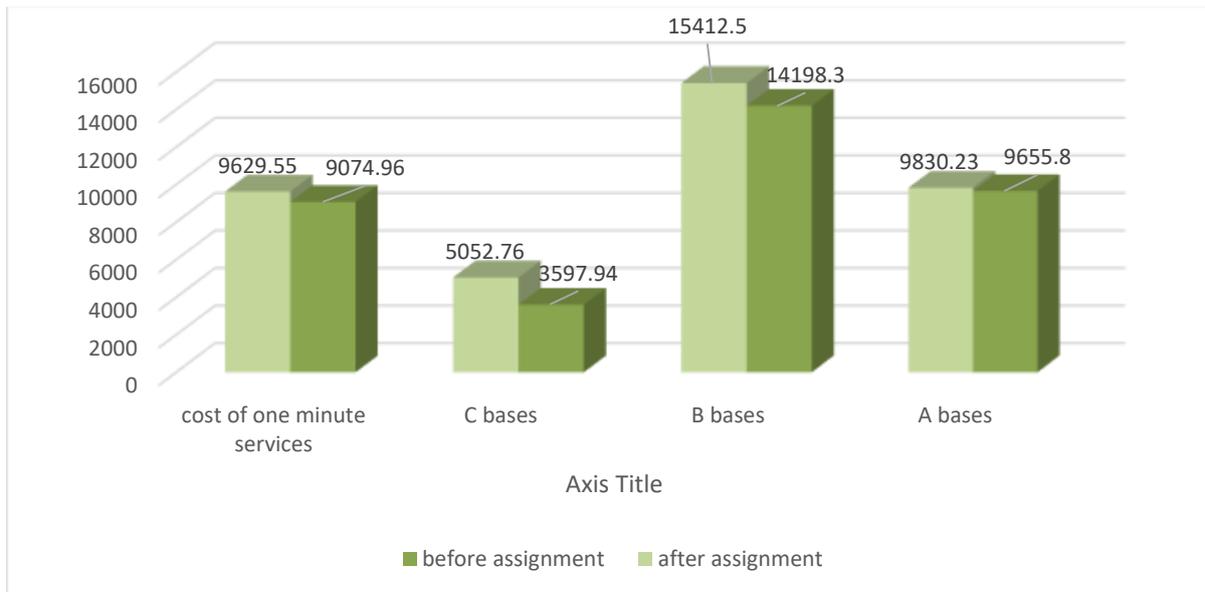
related to the cost of unit of services provided, control disease center, and findings of other units are illustrated in Table 4 in summary. Also, Chart 1 illustrates the cost of one-minute service at the target Health Center.

**Table 3.** Cost of services provided to combat with diseases at Yazd Abad Health Center before and after assignment

Cost of services	combat with diseases																						
	Hepatitis vaccine	Meningitis vaccine	MMR	Combined vaccine -Child	Combined vaccine -Adult	BCG	Polio vaccine	DTP vaccine	Sampling influenza A	Eltour sampling	Sampling of Malaria Lam	Sampling and treatment	Hypothyroid sampling	Complications of	Pediculosis (lice)	Referral of HIV cases	Referral PND Items (Tetanus)	Vaccine distribution	Neonatal Screening	Diabetes	Blood pressure	Botulism	Tuberculosis
Before assignment	27224.7	27224.7	27224.7	27224.7	27224.7	27224.7	27224.7	27224.7	45374.5	36299.6	45374.5	27224.7	72599.2	27224.7	117973.7	45374.5	90749	816741	45374.5	45374.5	36299.6	90749	90749
After assignment	28888.5	28888.5	28888.5	28888.5	28888.5	28888.5	28888.5	28888.5	48147.5	38518	48147.5	28888.5	77036	28888.5	125183.5	48147.5	96295	866655	48147.5	48147.5	38518	96295	96295

**Table 4.** Mean cost of one-minute service at Yazd Abad Health Center before and after assignment

Health center and affiliated and non-affiliated bases name	Time Table	Cost classes	Oral	Combat with diseases	School health education	Mental health	Professional-environment health	Health family	Nutrition	Health Education	Therapeutic	Share the total cost of the service
A bases	Before assignment	Manpower cost	44169.2	156187	257633.1	1660890.2	55951.2	49815.42	108093.5	385983.4	36968.8	9060.84
		Other costs	2900.49	10256.41	16918.12	109066.48	3674.18	3271.25	7098.23	25346.56	2427.65	595
B bases	Before assignment	Manpower cost	0	394294.6	2587818.1	614606.7	51110.7	48248.6	119621.7	196281.6	64809.1	13563.8
		Other costs	0	18444.2	121052.6	28750	2390.8	2256.9	5595.6	9181.6	3031.6	634.4
C bases	Before assignment	Manpower cost	0	1288775.73	8379473.8	4086921.3	109756.6	133860.1	487107.47	1020947.39	362205.4	42526.4
		Other costs	0	13348.8	86792.4	42331.2	1136.8	1386.4	5045.3	10574.7	3751.6	440.4
A bases	After assignment	manpower cost	31171.7	102367.9	258446	488940.6	78764.9	50654	128408.5	307965.8	52559.1	9069.2
		other costs	2615.4	8589.1	21684.6	41024.1	6608.6	4250.1	10773.9	25839.5	4409.9	760.9
B bases	After assignment	manpower cost	0	370328.2	4589826	885755.9	98130.3	78058.2	176121.2	218091.1	240419.4	24113.1
		other costs	0	25672.3	318181.8	61403.5	6802.7	5411.2	12209.3	15118.7	16666.6	1671.6
C bases	After assignment	manpower cost	0	155955.1	1628245.8	324105.8	22614.5	20588.3	74494.9	65036.9	83930.2	6962.9
		other costs	0	201850.13	2107411.4	419484419 484.7.7	29269.6	26647.1	96417.5	84176.2	108629.4	9012.1



**Figure 1.** Mean cost of one-minute service at Yazd Abad Health Center before and after assignment

#### 4. Discussion

According to the results of the present study, ABC was found to be a perfect tool for calculating and analyzing the cost of services provided by the Health Center. Many experts argue that using ABC system is preferred over other methods in this regard, since this system follows a process-oriented approach, and by considering all factors influencing the service providing process, it tries to identify and separate all costs (11-13). One other positive aspect of ABC system is identifying the activities with value added and without value added in the organization (14, 15). Considering the diversity of health services provided at health centers of the cities and high frequency and leveling of the services, from simple to complex, ABC method can be used to track the overhead costs and determine the share of each provided service. One disadvantage of this method is that each cluster capacity is not found in this system, and empty capacity of manpower and activities that can be managed by using this method are not calculated and revealed (16, 17).

In the current research, the maximum costs before and after assigning to private sector were related to manpower costs with 93.7% and 91.9%, respectively. In a research study conducted by Ebadi Fardazar, the share of manpower costs was found to be 67% (1). In a study conducted by Amiri et al., this percentage was also found to be 66.1% (3), and similarly, in a research done by Marie H. Federowicz, it was found to be 66.4% (18). In a different study conducted by Morgan Mandigo et al., the percentage was found to be in the range of 62% - 74% (19). Finally, the study of Katy E. French showed a lower percentage of manpower costs with 40% (20). Hence, the above-mentioned studies were found to be in line with the findings of the current research due to the high share of manpower costs.

Given high cost of manpower, enhancing the manpower productivity plays a crucial role in reducing the costs. Some of the strategies used to reduce manpower costs were integrating works, applying process-oriented approach in organizational structure, assigning some costly units to private sector, implementing control

system through determining the costs of activities and services, while creating necessary structures to develop and implement budgeting systems based on performance, meritocracy and succession fostering, especially management-related jobs, developing plans to train the managers and experts, standardizing employee support systems, balance in distributing the reward for end-service of employees, paying more attention to information systems and information flow in the organization, recognizing and eliminating activities without value-added, reducing manpower in staff departments to executive and manufacturing departments, and developing appropriate evaluation and motivation system in the organization.

Among the nine branches, the most costly service before and after the assignment was related to school health branch and the lowest cost was related to oral health branch. In the research carried out by Amiri et al. in seven branches, the lowest costs were related to occupational health, and the highest costs were related to outpatient treatment. These findings were found to be in contrast with the results of our own research (3). One reason for inconsistency in results is difference population and time of studies. In addition, one-minute service cost was calculated in this study, while timing of the service was not considered in the study conducted by Amiri. In general, there was observed a relationship between an activity cost and the frequency and time of performing that activity.

At present, assigning health services is considered as an important issue and cost effective solution in many countries throughout the world (21). In the present research, total services provided in main nine branches increased after assignment,

compared to before assignment. Young also reported that assignment resulted in an increase in the spirit of employees, and promoted capital facilities and improved service (22). Liu et al. also indicated that assignment increases the access to services (23). Additionally, in a research carried out in Turkey, the goals of assignment were reported to be reduced cost, increased service quality, participation in risk, and increased profit (24). Moreover, Mayson et al. reported the advantages of privatization as quality improvement of medical care, reduction in waiting time, access improvement, health promotion, and patient satisfaction (25).

In the health economy, cost analysis is considered as the first step, and the goal of cost analysis is to describe the fair distribution of resources, which has been regarded as one of the main factors involved in economic growth (26, 27). By calculating the service cost, the budget will be prepared and regulated, and standardization will be realized in the organization.

Based on the findings, it should be said that health system policymakers should initially strengthen the basic infrastructure of the outsourcing, such as competition in Iranian market in all sectors, the infrastructure necessary to market, as well as the culture and organizations of the country. On the other hand, it is important to reform the structure of laws and regulations, assure confidence in the economy, and pay close attention to the appropriate model with the structure of the health system. Policymakers need to develop plans to educate and reform the authorities' beliefs regarding assignments and incentive policies for private sector participation in the health sector.

## 5. Conclusion

The findings of the present research showed that the cost of activity after the assignment increased relatively, while this increase was not significant, since an increase in the cost of services might be due to an increase in wages, change in the process of providing the services, an increase in manpower, or non-significant increase in providing the services after assignment. Hence, a general increase in services is not interpretable for more efficiency as a basis for assignment, because efficiency after assignment is justifiable, if it is evaluated that whether standards have been observed in providing the services to host society. In addition, to assess the efficiency, the influential variables of inflation rate, manpower status, service providing status, cultural conditions, and so on need to be considered.

Due to shortage of resources, the issue of costing is considered among the vital issues in the health sector, and due to high volume of processing cases in this process, investigating the way of implementing costing systems in the form of comprehensive software is recommended. Moreover, it is suggested to conduct similar studies in other centers providing health services and continuous costing along with cost-reducing interventions in one center, hence comparing the findings are recommended.

### Limitations

One of the limitations of the research was the lack of knowledge of the experts and authorities of this health center regarding the cost of services method. In order to solve this problem, one of the researchers held a briefing session with the presence of all personnel of this health center, during

which, the goals and stages of the study were explained to the target group.

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**Conflict of Interest:** The authors declare that they have no conflict of interest.

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