Original Article

Comparison of cost services in university hospitals with health centers

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ABSTRACT

Introduction: The increase in the cost of healthcare facilities, especially in the hospitals that account for more than 60% of the government health expenditure, has limited the government ability in other social and developmental issues. The study was conducted to determine the difference between the costs of selected services in 32-bed university hospitals with first-class 24-hour comprehensive health centers in cities (with 20,000 to 50,000 People) in Ahvaz Jundishapur University of Medical Sciences. Methods: The study was descriptive-analytical conducted as cross-sectional in 2017. Five joint services (physician visit, injection and dressing and level-one laboratory items, level-one radiology items and level-one pharmacy items) were selected to match and provide comparable conditions. Data collection tool was a researcher-made checklist. Total costs were calculated using Activity Based Costing (ABC) approach in Excel software. Results: The total cost of Lali Hospital was 14,659,758,900 and Khajeh Ghaleh Center 8,158,440,236. Total costs of selected services at Lali Hospital were 194,449, 83,800, 41,945, 691,464 and 71,457, respectively, and at Ghaleh Khajeh Center they were 188,577, 37,435, and 9,273, 597,831 and 49,327, respectively. According to the results, the total cost of all selected services at Ghaleh Khajeh Center was lower than that of Lali Hospital. Conclusion: The study can greatly help policymakers, planners and health system managers in cost analysis and control. It looks that developing and strengthening health centers in low-populated cities by providing more suitable and cheaper services on the one hand, and meet the expectations of the local people and political authorities on the other.

Keywords: Activity-Based Costing (ABC), total cost, hospital, health center

Introduction

In recent years, the technology progress at various levels like medical technologies and the increase in public expectations of the health systems, changes in people's lifestyles and thus the increase in the incidence of chronic diseases have increased health costs at all levels, especially hospital care and diagnostic services [1]. Hospitals account for more than 60% of total health care costs [2]. Due to this increase in the cost of health care facilities, the government ability has been restricted in other social and development issues [3].

Studies around the world show that about half of all health resources go for 4% of the population admitted to hospitals each year. Of the total indirect treatment credits, 37% is spent on hospitalization services and more than 70% of direct treatment resources are allocated to these patients [4]. In Iran, over 4.6% of Gross Domestic Product (GDP) is devoted to health sector expenditure, and about 40% of government health expenditure is related to hospital care. One of the most important issues in developed countries is the resources needed by the health and medical sector [5]. Here, as the largest and most expensive health and treatment units, hospitals are of great significance and have a large portion of the educated staff [6].

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Given the increase in competition, health care needs, and patients' expectations, health care institutes try to find new management strategies and reduce costs. One of these methods in the world is ABC, which identifies direct and indirect costs. This method provides managers with reliable and accurate cost information. Moreover, by identifying activities that have higher values, they can bring about performing activities more effectively [7]. There are many studies in total cost and cost of services, among which the study by Kalhor et al. (2015), where the cost of services provided in radiology wards was significantly higher than the tariffs approved by the Ministry of Health that canharm service quality [8]. Costing and its analysis can help managers of wards, departments, hospitals, and policymakers to determine how and to what extent these units and institutes will meet these general needs [9]. Indeed, ABC is an advanced method of calculating the total cost achieved by allocating overhead costs to the product unit based on each of the activities in its production process [10].

The studies conducted show that the increase in health costs can be because of inefficient use of resources to some extent [11]. Indeed, given the inclusiveness of health care delivery and the widespread dispersal of service delivery units across health bases and homes, urban and rural health centers and city health networks and the importance of the type of services provided, the resources spent on providing and delivering these services are usually more than what is supposed [12]. Moreover, the provision of health services by comprehensive health services to low-income and disadvantaged groups in low-populated areas has increased the concern of health professionals. Among the problems that severely affect these centers were lack of funding, specialist personnel, medical equipment, and ultimately the negative attitudes of the people towards these centers to hospitals [13]. Hence, by improving the performance of comprehensive health service centers, an important step will be taken to control and maintain health sector costs. Regarding this, designing an efficient system with proper management will be a major step towards the development of comprehensive health service centers to reduce a great part of health care costs [14, 15].

Considering that examination of the success of organizations in using existing facilities is by comparing their performance with each other, identifying inefficient organizations and determining the source of inefficiency, examining its strengths and weaknesses and analyzing it, and providing appropriate solutions to improve the situation are of the concern of the managers of the organizations. Considering the economic problems of Iran and avoiding frittering of resources, especially human resources and the need for a wide coverage of health services, the role of managers and planners should be emphasized [16]. Regarding this, ABC system has distinctive features, such as a thorough analysis of the activities performed in the service delivery process and the accurate identification of costs and non-financial information for the performance of the delivery units [17]. As the construction, commissioning and maintenance of a hospital incur heavy costs for the health system and it seems that some low-population cities (20,000 to 50,000 people) are not efficient enough, a 24-hour comprehensive healthcare center can prove effective in managing resources in these areas with services such as physician visit, pharmacy, laboratory, and radiology. As there are no studies conducted in the health sector of the country, the purpose of the study was to determine the difference between the total costs of selected healthcare services in 32-bed academic hospitals with first-rate 24-hour comprehensive services in the cities (20,000-50,000 people) of Ahvaz Jundishapur University of Medical Sciences.

Methods:

The study was descriptive-analytical conducted as cross-sectional in 2017 in a 32-bed hospital and a first-class 24-hour comprehensive health center affiliated to Jundishapur University of Medical Sciences. The most important criterion for selecting the units under study was the population covered by the units selected in the cities of 20,000 to 50,000 people. It was tried to consider the units that had approximately the same geographical, cultural and accessibility and distance from the provincial capital to select the hospital and the center. It has to be noted that another criterion for selecting a health center was the provision of paraclinical services (laboratory and radiology). Thus, Lali Hospital and Ghaleh Khajeh Center of Andika were selected for the study. It is important to note that to match and provide comparable conditions, 5 joint services (physician visit, injection, and dressing, and level-one laboratory items, level-one radiology items and level-one pharmacy items) were selected.

Data collection tool was a researcher-made checklist that included variables such as total cost of physician's visit, injections and dressings, and level-one laboratory, radiology, and pharmacy items). The validity of the checklist was evaluated and validated using the opinions of faculty members and experts. The researcher went to Lali Hospital and Ghaleh Khajeh Center after authorization of the study and the necessary information was extracted.

Six basic steps were taken to implement the ABC technique using Activity Based Costing (ABC):

1. Defining Activity Centers: Activity Centers are the places where activity happens. Activity Centers create direct costs at the center of the activity and attract non-direct costs from other activity centers.
2. Differentiating activity centers by operation: activity centers are divided into two general categories:
    1) Upstream Activity Centers: These activity centers provide general and support services for primary and intermediate activity centers and are not directly involved in providing services to patients, like logistics, accounting, administrative and contracting.
    2) Operational Centers: These are the centers directly involved in the process of providing medical services to patients (such as units of laboratories, radiology, pharmacy, injections and dressings, and physicians).

3) Determining the output of each activity unit: in other words, determine at what stage each Activity Center reaches its output.
4) Cost analysis at operations centers: At this step, total direct costs including human rights, labor, overtime, purchase of equipment and supplies and indirect costs including water, electricity, telephone, building maintenance and maintenance) of each Activity Center show the total cost of that Activity Center, which must be shared between the Activity Centers that somehow use the services of these Activity Centers.
5) Cost-sharing of upstream activity centers to intermediate and final activity centers (operations): At this step, the costs of the various centers are allocated to the center of the final cost. Bases of proportional service delivery were used for each of the above activity centers to share costs. In the present study, the direct distribution method was used. It should be noted that the cost of gas was not included in the present study as Andika lacks municipal gas pipelines.

Service type	Distribution base		
	Electricity	Water	Telephone
Physician visit	Area and consumables	Number of staff and facilities in need of water	Number of staff
Laboratory (Level-one items)	Area and consumables	Number of staff and facilities in need of water	Number of staff
Radiology (Level-one items)	Area and consumables	Number of staff and facilities in need of water	Number of staff
Pharmacy (436 level-one items)	Area and consumables	Number of staff and facilities in need of water	Number of staff
Injections and dressing	Area and consumables	Number of staff and facilities in need of water	Number of staff

6) Output-based total cost calculation: At this stage, the total cost is determined by each output. Hence, after identifying the costs of the final activity centers to calculate the cost incurred for each outlet, we divided the total costs allocated to each activity center by the number of patients for each activity center and thereby the total cost was obtained according to output.

Excel software was used to calculate the total cost of services.

Results:

The direct and indirect costs, total costs, the number of patients and the total cost of Lali Hospital are as follows (Table 1).

Table 1: Direct and indirect costs, total costs, number of patients, and total cost of Lali Hospital

Lali Hospital					
Service type	**Direct costs**	**Indirect costs**	**Total costs**	**Number of patients**	**Total cost**
Physician visit	5,324,061,650	314,954,000	5,639,015,650	29,000	194,449
Laboratory (Level-one items)	1,737,521,324	251,565,500	1,989,086,824	47,421	41,945
Radiology (Level-one items)	2,414,530,296	928,700,000	3,343,230,296	4,835	691,464
Pharmacy (436 level-one items)	2,226,000	1,998,557,000	2,000,783,000	28,000	71,457
Injections and dressing	1,383,408,630	304,234,500	1,687,643,130	20,139	83,800
Total cost (Riyals):	**10,861,747,900**	**3,798,011,000**	**14,659,758,900**	**129,395**	**113,295**

Table 1 showed that the highest and lowest direct costs of Lali Hospital are related to physician visit 5,324,061,650 and pharmacy 2,226,000, and indirect costs (pharmacy 1,998,557,000 and laboratory 251,565,500). Moreover, the highest and lowest costs were, respectively, for physician visit 5,639,015,650, injections, and dressing 1,687,643,130. Finally, the highest and lowest total costs were for services (Radiology 691,464 and Laboratory 41,945) and the total cost for Lali Hospital was 113,295.

The direct and indirect costs, total costs, the number of patients and the total cost of Ghaleh Khajeh Center are as follows (Table 2).

Table 2: Direct and indirect costs, total costs, the number of patients, and total costs of Andika Ghaleh Khajeh 24-hour first-level comprehensive health center

Ghaleh Khajeh Center					
Service type	**Direct costs**	**Indirect costs**	**Total costs**	**Number of patients**	**Total cost**
Physician visit	4,794,376,816	146,536,540	4,940,913,356	26,201	188,577
Laboratory (Level-one items)	180,000,000	174,739,610	354,739,610	38,254	9,273
Radiology (Level-one items)	90,000,000	866,530,000	956,530,000	1,600	597,831
Pharmacy (436 level-one items)	1,976,000	1,247,191,400	1,249,167,400	25,324	49,327
Injections and dressing	495,043,660	162,046,210	657,089,870	17,553	37,435
Total cost (Riyals):	**5,561,396,476**	**2,597,043,760**	**8,158,440,236**	**108,932**	**74,895**

Table 2 shows that the highest and lowest direct costs of Ghaleh Khajeh Center were, respectively, physician visit (4,794,376,816) and pharmacy (1,976,000), and indirect costs were related to pharmacy (1,247,191,400) and physician visit (146,536,540). Moreover, the highest and lowest costs were, respectively, physician visit (4,940,913,356) and laboratory (354,739,610). Finally, the highest and lowest prices were for services (radiology (691,464) and laboratories (41,945)) and the total cost of Ghaleh Khajeh Center was 74,895.

Discussion:

The total cost of the Lali Hospital was 14,659,758,900 and it was 8,158,440,236 for Ghaleh Khajeh Center. The total direct and indirect costs of Lali Hospital were 10,861,747,900 and 3,798,011,000, and the total costs of Comprehensive Health Services Center were 5,561,396,476 and 2,597,043,760, respectively. The results of the study show that most of the costs were related to direct costs especially human resources. The results of Mohtasham Amiri's et al. [18] and Amiri's et al. [19] studies showed that most of the expenditures in health centers were related to direct costs especially human resources. In a study conducted to analyze the cost of services provided in the ICU ward of German hospitals, personnel costs accounted for the highest share among other costs (42% of total ward costs) [20]. Another study in neurosurgery at Imam Khomeini Hospital in Tehran found that staff costs account for 49% of total costs [21]. The results of the above studies are consistent with the results of the present study (Ghaleh Khajeh Center and Lali Hospital) showing that control is the most important priority (direct costs especially human resources).

The results indicated that the total costs of selected services were physician visits, injections and dressings, and level-one laboratory, radiology and pharmacy services at Lali Hospital 113,295 Riyals. The total direct costs were 10,861,747,900 Riyals and indirect costs were 3,798,011,000 Riyals. In a study [22] in one of the Armed Forces hospitals entitled "The total cost of the final activity centers," Noori et al. concluded that the total cost of the final activity centers in 2013 was 244,416 million Riyals. The direct costs were 127,174 million Riyals and the indirect costs allocated were 117,242 million Riyals. Their results are not in line with those of the present study. The Armed Forces Hospital has more specialized services than Lali Hospital and it will incur higher costs.

In the present study, the total cost of a general practitioner visit was 4,940,913,356 Riyals and pharmacy 1,249,167,400 Riyals, which is not in line with those of Rabiean's et al. (2016) research results. They obtained a general practitioner cost of 399,229,326 Riyals and a pharmacy of 281,765,105 Riyals [23]. The reason for this inconsistency can be the location of the study (Rabiian at the 32-bed Health and Research Center) and the time of the study.

In the present study, the direct laboratory costs were 180,000,000 Riyals and the indirect costs were 174,739,610 Riyals, which is consistent with the study by Nasiripour et al. entitled "Total price estimation of clinical laboratory services based on activity-based activity costs in a developing country (Iran)." They showed that direct laboratory costs (78.3%) were more than indirect costs (21.7%) [24]. One of the main reasons for the increase in direct costs in two studies, particularly the study of Nasiripour et al. (44% of total costs) was the high salaries and benefits of human resources. In Cohen's study, the cost of dedicated activity had the greatest effect on increasing the cost of laboratory services [25]. Idowight's study has shown that the best way to determine the cost of the experiments is to separate the operations and operating costs alone [26]. The results of the studies show that laboratory services are highly specialized and diverse and cost separation and activity-based costing are essential in reducing the cost of services.

Radiology services had the highest and lowest prices at Lali hospital, with 691,464 Riyals and the laboratories 41,945 Riyals, respectively. Afshari et al. [27] studied the cost of services at an imaging center at Imam Khomeini Hospital of Tehran University of Medical Sciences in a study. The average total cost of services was 527962 Riyals. One of the reasons for the inconsistency with the present study is the high direct costs (2,414,530,296 Riyals). The studies by Nouri et al. [21] and Mahani et al. [28] are consistent with the present study. Their results showed that the direct costs of the radiology unit were higher than the indirect costs. In a study entitled, "Costing based on practical modeling activity for calculating the costs of radiotherapy in Belgium, Lievens et al. revealed that the best possible way to calculate the actual costs of using radiotherapy services was to use activity-based costing [29]. We conclude that the activity-based costing method is very accurate in obtaining radiotherapy costs and gives more credibility to the results.

The total cost of Ghaleh Khajeh Center was 8,158,440,236 Riyals and laboratory costs were 354,739,610. Moreover, radiology services had the highest and lowest total costs with 597,831 and 9,273, respectively. The results of the study by Rabiian et al. [23] are inconsistent with the present study. They conducted a case study on ABC cost at Abuzar Health Center, where the totaling was 3,391,632,607 Riyals. Moreover, the laboratory costs were 813,269,067 Riyals, which accounted for the highest cost of the services. The services of Ghaleh Khajeh Center and most of Abuzar Health Centers lacked services such as radiology.

The total cost of all selected services (physician's visits, injections and dressings, and level-one laboratory items, radiology and pharmacy) were lower than in Lali Hospital in Ghaleh Khajeh Center. The highest and lowest total cost of services in both were similarly related (radiology and laboratory), respectively. The final cost of Lali Hospital was 113,295 and the Khajeh Castle Center 74,895. The results show that the services of Khajeh Castle Center have been cheaper and more cost-effective. A study by Suthummanon et al. (2005) in Thailand's Nuclear Medicine Division showed that current costs for performing all processes were calculated based on the cost-based costing method. The current costs for all the processes in this ward are $ 236, which is significantly different

from the costs calculated by the activity-based costing method. The results indicated that the application of cost-based activity-based costing method has led to an increase in control and service quality [30].

One of the main limitations of the study was the weakness in recording the needed data in the studied cities, which was solved by the university staff; follow up as well as the health departments.

Conclusion:

The study can greatly assist policymakers, planners, and managers of health systems in cost analysis and control. According to the results, the total cost of all selected services (physician visit, injections, and dressing and level-one laboratory items, radiology and pharmacy) was lower in Ghaleh Khajeh Center compared to Lali hospital. This shows that providing services through 24-hour health centers in cities of 20,000 to 50,000 is more efficient and effective. Hence, it seems that developing and strengthening comprehensive health service centers in low-populated cities and areas with special conditions can realize health system goals by providing more suitable and cheaper services on the one hand, and meet the expectations of the local people and political authorities on the other. It is suggested that future studies be done on ways to reduce the cost of services and consider the differences in health, geographical and economic conditions of provinces and universities in the country.

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