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Comparing the cost of joint replacement surgery in patients receiving social security insurance in Shahid Beheshti and Shahid Chamran hospitals in Shiraz

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ABSTRACT

This study examines the cost of joint replacement surgery services for the persons receiving Social Security insurance in Shahid (martyr) Beheshti hospital and compares it with Shahid Chamran hospital in Shiraz. In the study, it was intended to compare the cost of joint replacement services in two hospitals in Shiraz.In this study, the activity-based cost calculation method was used to calculate the costs. The data were analyzed by using the logistic regression model.The results showed that the costs in the Shahid Beheshti hospital affiliated with Social Security were more than the Shahid Chamran hospital in Shiraz. The cost of all the sub-items in the Shahid Beheshti hospital was more than the Shahid Chamran hospital, only in the sub-item of consumer goods cost, there was not a significant difference. The study's findings will introduce the cost factors of a hospital to the health managers and policy makers. The cost of services in many parts of the study was roughly equal to the tariff of health services in 2016. In some of the items of cost, the cost was less than the tariff, and in others was more than the announced tariff.

KEY WORDS: JOINT REPLACEMENT SURGERY, SHAHID BEHESHTI HOSPITAL, SHAHID CHAMRAN HOSPITAL, SHIRAZ

139

INTRODUCTION

The joint replacement or arthroplasty is a type of surgery in which the damaged joint surfaces are replaced with an artificial surface. The main goal of joint replacement is to relieve the pain caused by erosion, arthritis, rheumatism and destruction of the articular surface. Obtaining the optimal range of motion in joint and modifying the deformations created in the joint are considered as another factors to use the artificial joint(Bachmeier et al., 2001).

"Arthroplasty is a type of reconstructive surgery that is performed to reduce the pain and increase the range of motion in the joints with limitation of motion. The most common arthroplasty performed today is the total joint replacement which is also called the joint replacement(Nunley et al., 2012). Arthroplasty is a type of surgery in which the movable articular surfaces that have severely damaged and destroyed are resected so that the joint can move with less pain. Arthroplasty is usually used in the treatment of joints that have suffered severe damage. There are three types of arthroplasty: 1) Resection arthroplasty. 2) Interposition arthroplasty. 3) Prosthetic arthroplasty which is also called joint replacement. In this type of surgery, after removing the articular surfaces, they are replaced with the metal, ceramic or plastic pieces which are called artificial joint(Healy, Iorio, Ko, Appleby, & Lemos, 2002),(Koskinen, Eskelinen, Paavolainen, Pulkkinen, & Remes, 2008).

Shahid Beheshti hospital of Shiraz is one of the hospitals under the Social Security Organization. The Social Security insured persons do not pay the fee for the services done for them in the Social Security hospitals and all expenses will be paid by the indirect health sector of the Social Security Organization. It seems that this makes the necessary sensitivity that exists in the public and private sectors to monitor and calculate the cost of various services, does not exist.

Health in Social Security is divided into two sectors: direct and indirect health. Direct health includes the medical centers belonging to the social security organization in which the health care is offered free to the insured. Indirect health is another sector of the organization that is responsible for the purchase of service from the various diagnostic and therapeutic centers (public and private) by contracting with them that the Insured receive the health care by visiting the centers after payment of franchise(Arefnezhad et al., 2016; Kazemi Karyani, Homaie Rad, Pourreza, & Shaahmadi, 2015).

The first step towards the economic management of detailed planning about the future performance of the hospital is the accurate calculation of the cost of each part(Sefiddashti, Rad, Mohamad, & Bordbar, 2016). However, the lack of cost accounting in hospitals has made the correct amount of consumer spending does not exist in every hospital, in every sector and on every patient and lead to the budget bargain method, important hospital function, etc.(Kazemi Karyani et al., 2015),(Rad, Rezaei, & Fallah, 2015).

With regard to the implementation of the health reform plan and new tariff book in country's hospitals, there has been a sharp rise in prices of medical services. In this regard, controlling the medical costs that one of the most expensive is the surgery, is a priority. Analyzing and comparing the costs of surgery in the Social Security hospital to other hospitals is important in two aspects. The first aspect is to find the right solution to optimize the surgery costs including the costs related to the physicians, staff, equipment, daybed, para clinic, etc. and the second aspect that is considerable in this study is the determination of priority whether the direct investment to perform the surgery in the Social Security hospital benefits the organization or purchasing the service from other hospitals under the contract. The importance of this issue arises from this fact that by having the data and analyzing the costs carried out in the social security hospitals and centers under the Social Security Agreement, it can be improved the long-term care policies of organization(Samadi & Homaie Rad, 2013),(Bayati, Sarikhani, Rad, Heydari, & Lankarani, 2014).

For performing more hip and knee joint replacement surgery in these two hospitals and their high cost, these surgeries were selected. The cost of hip and knee joints replacement surgery in Shahid Chamran University Hospital was compared with this cost in the Organization's Shahid Beheshti Hospital according to the implementation of the health reform plan and increased costs resulting from it and it was determined as far as possible what the differences there are between the cost of arthroplasty in the two hospitals according to the hospital bills and which of the bill rows (premium, daybed, consumer goods, etc.) has created the differences. The basis for comparing the information contained in patients' bill was from early October 2015 to late September 2016. In this study, the total prosthetic Arthroplasty includes the total Knee Arthroplasty (TKA) and total hip Arthroplasty (THA). And the question is answered that what difference is there between the total costs of Shahid Chamran hospital and all the same costs calculated in the bill of Shahid Beheshti hospital?

METHOD

This is a descriptive-analytic study that will be conducted in a retrospective way. The method used is to view the available documents in the archive of the Social Security Organization and accounting records of the studied

hospitals. The study population will be comprised of two Shahid Beheshti and Shahid Chamran hospitals in Shiraz and the patients referred to them. In this study, all samples admitted to the two hospitals during the period April to September 2016, will be used. Thus, the sample size does not matter in this study. Sampling is done by viewing the documents in the archives of the Social Security and accounting records of the studied hospitals and the samples examined will be collected using the checklists.

The information can be retrieved and also accessed by data processing, administrative and financial units, statistics and economics of treatment, and clinical and laboratory departments of hospital. Given that the above-mentioned information is placed in the financial sector of hospital HIS system, access to the system is possible via the hospital's database. Excel software will be used to process and summarize the data. Moreover, SPSS software will be used for the report-statistical conclusion and analysis.

The variables of this study include the costs of different departments of joint replacement surgery including the cost of daybed, surgery, anesthesia, laboratory and prosthesis. Furthermore, other variables such as the number of hospital beds and staff are also collected and their impact on the cost of services is assessed. While using the paired t test and chi-square test, the costs of services in two hospitals will be compared.

FINDINGS

Table 1 shows the descriptive findings of the study on the gender of the subjects. As the above table shows, 67.8% of subjects were male with a frequency of 118 people and the rest was female. In addition, 58 men were related to the Chamran hospital and 40 were related to the Shahid Beheshti Hospital.

Table 2 shows the descriptive findings of the study on the cost of joint replacement services in the two studied hospitals as a whole. In addition to the average costs, the standard deviation and minimum and maximum values of costs are also included.

As can be seen from the above table, the average premium was equal to 71815177 IRR, average consumer goods 21757406 IRR, paraclinic average cost 13666891 IRR, average anesthesia 30248387 IRR, average cost of prosthesis 85208976 IRR and average total cost of joints replacement 222696838 IRR. The average length of stay for patients was also averaged 2.77 days. This amount was 2.95 days in the Shahid Beheshti Hospital (affiliated to Social Security) and was 2.59 days for the Chamran Hospital affiliated to Shiraz University of Medical Sciences. The maximum number of hospitalization days was equal to 7 days in the Shahid Beheshti hospital and 5 days in the Chamran hospital. The total cost of daybed for patients in two hospitals was equal to 109982800 IRR.

Table 1. the descriptive findings of the study on the gender of the subjects				
Variable	Frequency	Ratio	Chamran Hospital	Beheshti Hospital
Gender-male	118	67.8	58	40
Gender-female	56	32.2	30	46
Total	174	100	88	86

Table 2. Descriptive findings of the study on the cost of joint replacement services				
Total costs	Coefficient	SD	T–statistic	P–value
Gender-male	35600000	17000000	2.09	0.04
Beheshti Hospital	10100000	1600000	629	0.00
Length of stay	-1078129	5561830	-0.19	0.85
Constant coefficient	150000000	23000000	6.53	0.00

Table 3. Comparing the cost of joint replacement services				
Total costs	P–value	T–statistic	SD	Coefficient
Gender-male	35600000	17000000	2,09	0,04
Beheshti Hospital	10100000	1600000	6,29	0,00
Length of stay	-1078129	5561830	-0,19	0,85
Constant coefficient	150000000	23000000	6,53	0,00

Table 4. Comparing the brokerage cost of joint replacement services				
	P–value	T–statistic	SD	Coefficient
Gender-male	4653202	2961444	1,57	0,12
Beheshti Hospital	1770000	2783949	6,35	0,00
Length of stay	-73833	968150	-0,08	0,94
Constant coefficient	59800000	3999951	14,95	0,00

Table 3 shows the analytical results of the study on the cost of joint replacement services and the comparison between the two hospitals. As specified in the table, the Beheshti Hospital variable coefficient is significant and positive and indicates that the cost of services in Shahid Beheshti hospital affiliated to Social Security is more than Shahid Chamran hospital. Since the hospital type variable was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was as a number and related to the Shahid Chamran hospital variable. The cost in men was more than women and was not associated with the length of stay for patients in the hospital. The above variable coefficient is also equal to 10100000 IRR, indicating a difference of nearly one million Toman in the services cost between the two hospitals.

Table 4 shows the analytical findings of the study on the surgery premium cost of 1770000 joint replacement services and the comparison between the two hospitals. Since the hospital type variable was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Chamran hospital variable as a basic variable input into the model and consequently, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Beheshti Hospital variable coefficient is significant and positive and indicates that the cost of services in the Shahid Beheshti hospital affiliated to

Social Security is more than the Shahid Chamran hospital. Also, this cost was not associated with the gender of the subjects. The above variable coefficient is equal to 1770000 IRR. The cost of premiums was not associated with the length of stay.

Table 5 shows the analytical findings of the study on the consumer spending of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was dummy and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Chamran hospital variable input into the model as a basic variable and consequently, since the variable was for comparing between the two hospitals and understanding the differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient is not significant and indicates that the service brokerage cost in the Shahid Beheshti hospital affiliated to Social Security was similar to the Shahid Chamran hospital. Moreover, this cost was not associated with the gender of the subjects. The cost of premium was not related to the length of stay.

Table 6 shows the analytical findings of the study on the para clinic cost of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Shahid Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for comparing between the two hospitals and understanding the differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient

Table 5. Comparing the consumer spending of joint replacement services				
	P–value	T–statistic	SD	Coefficient
Gender-male	3898872	2620716	1,49	0,14
Beheshti Hospital	2053253	2468421	0,83	0,41
Length of stay	-754014	856759	-0,88	0,38
Constant coefficient	20200000	3539737	5,69	0,00

Table 6. The analytical findings of the study on the para clinic cost of joint replacement services				
	P-value	**T-statistic**	**SD**	**Coefficient**
Gender-male	1459314	1539868	0,95	0,35
Beheshti Hospital	454901	1450383	3,14	0,00
Length of stay	-137331	503411	-0,27	0,79
Constant coefficient	10700000	2079862	5,16	0,00

Table 7. The analytical findings of the study on the anesthesia cost of joint replacement services				
	P-value	**T-statistic**	**SD**	**Coefficient**
Gender-male	4234473	3719515	1,14	0,26
Beheshti Hospital	1230000	3503367	3,52	0,00
Length of stay	-1422506	1215976	-1,17	0,24
Constant coefficient	25000000	5023858	4,98	0,00

Table 8. The analytical findings of the study on the prosthesis cost of joint replacement services				
	P-value	**T-statistic**	**SD**	**Coefficient**
Gender-male	21300000	15400000	1,38	0,17
Beheshti Hospital	6410000	14500000	4,41	0,00
Length of stay	1309556	5038331	0,26	0,80
Constant coefficient	34300000	20800000	1,65	0,10

is significant and positive and indicates that the service brokerage cost in the Shahid Beheshti hospital affiliated to Social Security is higher than the Shahid Chamran hospital. Also, this cost was not associated with the gender of the subjects. The finished consumer cost was not related to the length of stay. The difference in the above amount also was equal to 459901 IRR.

Table 7 shows the analytical findings of the study regarding the anesthesia cost of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Shahid Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient is significant and positive and indicates that the anesthesia cost in the Shahid Beheshti hospital affiliated to Social Security is higher than the Shahid Chamran hospital. Also, the cost was not associated with the gender of the subjects. The cost of anesthesia was not related to the length of stay. The difference in the above amount also was equal to 1230000 IRR.

Table 8 shows the analytical findings of the study on the prosthesis cost of joint replacement services and its comparison between the two hospitals. Since the variable of hospital type was imaginary and for the Shahid Beheshti hospital was 1 and for the Shahid Chamran hospital was zero, the Shahid Chamran hospital variable as a basic variable input into the model and as a result, since the variable was for the comparison between the two hospitals and recognition of differences, the variable coefficient was a number and related to the Shahid Chamran hospital variable. As specified in the table, the Shahid Beheshti Hospital variable coefficient is significant and positive and indicates that the prosthesis cost in the Shahid Beheshti hospital affiliated to Social Security is more than the Shahid Chamran hospital. Furthermore, the cost was not associated with the gender of the subjects. The finished cost of the prosthesis was not related to the length of stay. The difference in the above amount also was equal to 6410000 IRR.

Table 9 shows the analytical findings of the study on the joint replacement services' daybed cost and the comparison between the two hospitals. As specified in the table, the Shahid Beheshti Hospital variable coefficient is significant and positive and indicates that the cost of the daybed in the Shahid Beheshti hospital affiliated to Social Security is more than the Shahid Chamran hos-

Table 9. The analytical findings of the study on the daybed cost of joint replacement services

	P-value	T-statistic	SD	Coefficient
Gender-male	16978730	12699077	1,35	0,18
Beheshti Hospital	39736799	11897033	3,37	0,001
Constant coefficient	77989360	11908779	6,46	0

pital. The cost also was not associated with the gender of the subjects.

DISCUSSION

In this study, it was tried to compare the cost of knee replacement surgery services in two large hospitals in Shiraz. The results showed that the cost of services at the hospital affiliated to the Social Security was more than the University Hospital. Chakubz et al found that the intensive care services are the most expensive hospital services in Canada(Jacobs & Noseworthy, 1990). Dornyg et al also found that the patients with joint problems impose the highest costs to the health system (Buchmueller, Couffinhal, Grignon, & Perronnin, 2004). Many studies have demonstrated that the use of a standard costing system can be effective in calculating the cost of goods and services and cause the standardization of the costs in hospitals(Rezaei, Bazyar, Fallah, Chavehpour, & Rad, 2015). In this case, a study was done by Crowe et al in the field of activity-based costing in the pediatric radiology department of Oulu teaching hospital in Finland in 2007 that 7452 radiology procedures were studied in this study. The information in this study was collected through the radiology information system as well as personnel and accounting units of the hospital. The results showed that the overhead costs have decreased from 57 percent to 16 percent with the implementation of activity-based costing system and the unit cost change in various procedures of radiology department has changed from 42 percent to 85 percent(Crow & Willis, 2009).

The hospitals and other health care organizations are increasingly faced with a competitive and challenging environment. The strong focus on the quality of patient care, the high cost of service delivery and the fierce competition are among the factors that force these organizations to revise the methods of service delivery and the services cost(Losina et al., 2009),(Hatam, Tourani, Rad, & Bastani, 2016),(Rad, Kavosi, & Arefnezhad, 2016). In the meantime, increasing the accuracy and precision and linking the information of costs are the main challenges of hospitals for the proper spending and management decisions. The aim of any costing and cost management system is to provide the accurate and useful information for helping the organizations so that they can provide the quality products and services in a competitive environment(Homaie Rad, Ghaisi, Arefnezhad, & Bayati, 2015; Tuominen & Eriksson, 2011). Costing can be defined as the estimated cost of the final product. In recent years, there have been much progress in the costing methods that is hoped to be able to more precisely calculate the health costs.

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