

Survey Management of Residents' Awareness of the Cost of Hospital Paraclinical Measures

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ABSTRACT

Physicians' role in reducing health care costs is obvious and undeniable. Therefore, the current study seeks to survey management of residents' awareness of the cost of hospital paraclinical measures. This study used a valid and reliable questionnaire to evaluate the residents' awareness regarding the cost of tests, including CBC, ESR, UA, troponin, chest radiography, ultrasound of abdomen and pelvis, CT scan of head. Any estimate in the range of 25% of actual price was considered as the correct estimate. Data was analyzed using t-test, chi-square and drawing Box Plot. Significance level was determined $p < 0.05$. 90 residents (54.4% male) were studied. With the exception of chest radiography ($48/0 = p$), average costs estimated by residents in the diagnostic tests of CBC ($p < 0.0001$), ESR ($p < 0.0001$), UA ($p < 0.0001$), troponin ($p = 0.004$), ultrasound ($p = 0.01$) and CT scan of head ($p < 0.0001$) differed from the actual price. Also, the average error in estimating the costs of CBC, ESR, UA, troponin, chest radiography, ultrasound and CT scan of head was 243.6%, 798.2%, 229.8%, 22.3%, 5.7%, 35.1% and 56.1%, respectively. On average, only 24.3% of residents were aware of the real cost of laboratory fees. The results showed that the management level information of assistants of internal medicine, surgery, pediatrics, obstetrics and emergency medicine about the cost of paraclinical measures is low and the level of education regarding awareness of these costs is inadequate.

Key words: Medical Expenses, Diagnostic Tests, Residents' Estimates.

INTRODUCTION

Costs of health systems around the world are increasingly on the rise and have allocated a significant share of countries' Gross National Product to itself¹⁻³. Rising costs has led to the increase in financial burden imposed on people, so that families, particularly vulnerable groups, are forced to cut other essential expenses in order to meet their medical expenses⁴. This matter has led to a decline in the terms of household welfare and quality of life⁵. Health costs, due to the reduced

savings and less allocation of household income to other uses, especially items like proper food education, which is as human capital accumulation⁶, reduces household productivity power as the key factor in national production process. In the mean time, doctors who are undoubtedly one of the important elements of the health system play a significant role in cost control and largely determine the patient's health care costs⁷⁻⁸. In developed countries, the importance of this matter was realized long ago and physicians were educated about the medical expenses, to the

extent that these trainings have been mandatory in some cases and a part of the curriculum. However, studies conducted in these countries indicate that physicians have low knowledge about the diagnostic and therapeutic costs^{1, 9-13}. Our country is not excluded from facing the high cost of health care and despite certain economic and political conditions and financial constraints at present, optimizing the use of health budgets is needed more than ever. So, the physicians' awareness regarding the cost of diagnosis and treatment measures applied for their patients is undoubtedly an important step in achieving this goal. The aim of this study is to assess the level of awareness of limited community of doctors to the cost of paraclinical procedures that are commonly performed. Because resident has a prominent role in the treatment of patients in university hospitals, and also are future physicians, the population studied in this research was considered residents of internal medicine, surgery, obstetrics, pediatrics and emergency medicine.

METHODOLOGY

This study is a cross-sectional one which aims to investigate the awareness of all residents in internal medicine, surgery, obstetrics and gynecology, pediatrics and emergency medicine of Imam Hussain (AS). In order to achieve the objectives of this research, questionnaire used by June A. Lee et al.¹⁴ was translated under the supervision of two specialists in emergency medicine and an epidemiologist and its validity was verified by making some changes and its reliability was proven by using Cronbach's alpha coefficient ($\alpha=0.705$). The questionnaire was designed in three parts. The first part contains basic demographic data of residents, such as age, sex, field of study, work experience before starting the residency, education level, history of prior education and source of awareness of test costs. The second part consists of questions about the cost of 4 cases of laboratory tests (CBC, ESR, U/A, troponin) 3 cases of imaging measures (chest radiography, ultrasound of abdomen and pelvis, CT scan of head). Residents recorded their estimated prices in each case quantitatively. The third part includes 4 qualitative questions to assess the residents' attitudes toward the need for awareness of expenses. In the present

study, the awareness of residents in internal medicine, surgery, obstetrics and gynecology, and pediatrics were measured, because these specialties use routine paraclinical measures more than others. We went to residents' classrooms in different days to access them and gave them questionnaires in quiet and favorable conditions and 30 minutes to complete. List of prices was also provided from laboratory and radiology department. The prices are as follows: CBC: 12,000 Rials/ U/A: 8,500 Rials/ ESR: 4,000 Rials/ troponin: 17,850 Rials/ chest radiography: 87,800 Rials/ ultrasound of abdomen and pelvis: 168,600 Rials/ CT scan of head: 300,000 Rials. Data from the questionnaires were entered into SPSS 21.0 and then examined descriptively and analytically using STATA 11.0 program. The possible differences in average costs estimated by residents with real costs were examined using the t-test. In present study, any estimate in the range of 25% of actual price was considered as the correct estimate. Upper and lower estimates were defined as underestimate and overestimate, respectively. Residents' attitudes were divided into proper (correct answer to at least three questions) and improper (correct answer at least two questions) groups. Then, the relationship between residents' attitudes and demographic factors were examined using chi-square tests. Box Plot was drawn to portray the residents' awareness about the cost of tests. P-Value less than 0.05 was set as significance level.

RESULTS

In this study, 90 residents (54.4% male) were studied including 50 (55.5%) emergency medicine residents, 12 (13.3%) internal medicine residents, 16 (17.8%), surgery residents, 6 (6.7%), 6 (6.7%) obstetric residents and 6 (6.7%) pediatric residents. Their mean and standard deviation of age was estimated 32.7 ± 3.9 . Of these individuals, only five residents (5.6%) have been trained in diagnostic and therapeutic costs and the mean and standard deviation of training time was equal to 6.8 ± 3.8 h. It is worth noting that none of the participating residents was evaluated during the residency period about the rate of information on health care costs (Table 1).

46 (51.1%) residents stated that no questions have been exchanged on health care costs in their previous 20 visits by Attend, patients, resident him/herself or other people (nurses, auxiliary nurses, etc.). Mean and standard deviation of the number of times that Attend, patients, resident him/herself and others have spoken regarding their treatment costs was 5.4 ± 6.4 , 8.3 ± 5.8 , 6.8 ± 6.3 and 6.7 ± 5.3 , respectively that had no significant difference with each other ($p=0.18$). The most important awareness sources of residents about health care costs are other physicians (30.3%), other people (15.6%), physicians and pharmacists (5.6%), Internet (4.4%), pharmacists (3.3%) and articles (1.1%), respectively (Figure 1).

The mean and standard deviation of costs estimated by residents in diagnostic CBC ($p<0.0001$), ESR ($p<0.0001$), UA ($p<0.0001$), troponin ($p=0.004$), chest radiography ($p=0.48$) ultrasound of abdomen and pelvis ($p=0.01$) and CT scan of head ($p<0.0001$) was 4136.1 ± 3145.1 , 3592.7 ± 3600 , 2803.4 ± 1742.3 , 14028.9 ± 11718.1 , 9280.7 ± 6542.6 , 22880.9 ± 21872.8 and 47000.0 ± 25822.4 , respectively, that had a significant difference between the actual price. As Fig2 shows, except

residents' estimates for chestradiography which were close to actual price and the price of troponin which was under estimated, the prices of remaining laboratory tests were over estimated. Star symbol in figure represents the actual cost of diagnostic tests

According to the study, the estimated cost of diagnostic tests within 25 percent of actual costs was considered as the correct estimate. Accordingly, the average errors in estimating the prices of CBC, ESR, UA, troponin, chest radiography, ultrasound of abdomen and pelvis and CT scan of head were observed 243.6%, 798.2%, 229.8%, 22.3%, 5.7%, 35.1% and 56.1%, respectively. As can be seen, the prices of ESR, CBC and UA estimated by residents are very different from the actual price. Table 2 shows the response of physicians. Most residents were unaware of the true price of CBC, so that 80 (88.8%) residents over estimated its price. Similar results were also obtained in the prices of ESR and UA; meaning that 88 (98.8%) and 77 (85.6%) residents over estimated their prices. But it was different about troponin. Most residents (46.7%) under estimated its price. While 34 (37.8%) residents estimated the cost of radiography equal and 62.2% over estimated

Table. 1: Demographic characteristics of participants in current study

Variable		Frequency	Percentage
Age	29-35	69	81.2%
	36-45	16	18.8%
Sex	Male	49	54.4%
	Female	41	45.7%
Specialty	Emergency Medicine	50	55.5%
	Internal	12	13.3%
	Surgery	16	17.8%
	Obstetrics	6	6.7%
	Pediatrics	6	6.7%
Level of Education	Year 1	32	35.6%
	Year 2	28	31.1%
	Year 3	27	30.0%
	Year 4	3	3.3%
Work Experience	2 years e"	51	59.3%
	3-10 years	27	31.4%
	< 10 years	3	9.3%
History of education in the field of healthcare costs	No	585	94.4%
	Yes	5	5.6%

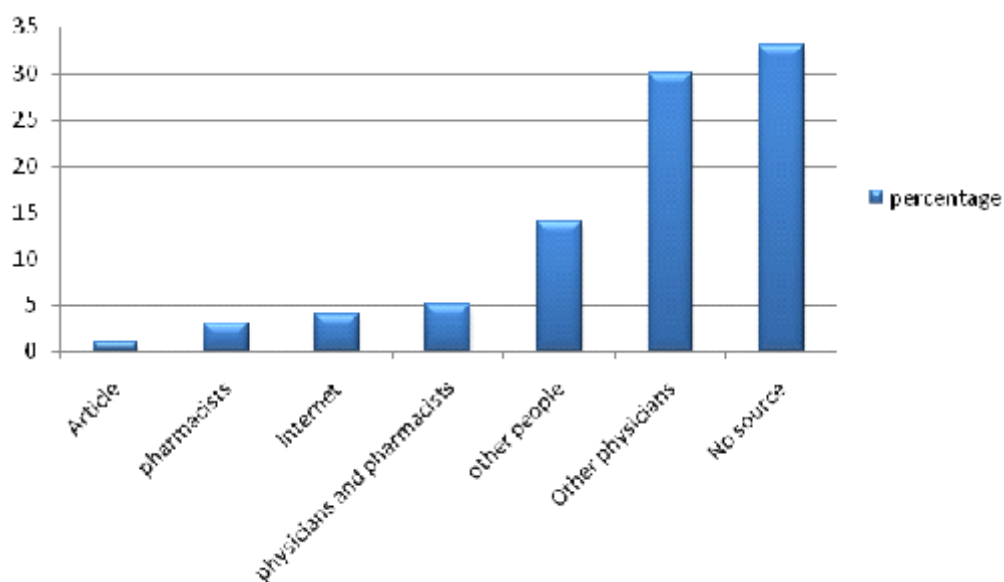


Fig. 1: Awareness sources of residents about health care costs

Table. 2: Distribution of physicians' awareness of the cost of laboratory tests and imaging tests

Variable	Estimate	Frequency	Percentage
CBC	Underestimated	2	2.2%
	Equal to actual price	8	8.9%
	Overestimated	80	88.8%
ESR	Underestimated	1	1.1%
	Equal to actual price	1	1.1%
	Overestimated	88	98.8%
UA	Underestimated	1	1.1%
	Equal to actual price	12	13.3%
	Overestimated	77	85.6%
Troponin	Underestimated	42	46.7%
	Equal to actual price	32	35.6%
	Overestimated	16	17.8%
CXR	Underestimated	29	32.2%
	Equal to actual price	34	37.8%
	Overestimated	27	30.0%
Ultrasound of the abdomen and pelvis	Underestimated	15	16.7%
	Equal to actual price	42	46.7%
	Overestimated	33	36.6%
Head CT	Underestimated	11	12.2%
	Equal to actual price	23	25.6%
	Overestimated	56	62.2%

the cost of CT scan. Based on the analyses, on average, only 24.3% of residents were aware of the real cost of laboratory fees.

Investigating the responses of research unit indicated that more residents possessed a proper perspective on the necessity of promoting physicians' awareness of health care costs and knowing the costs involved in their clinical decisions. Of 4 questions, 83 (92.2%) residents answered at least three questions correctly (mean and standard deviation 3.5 ± 0.9), indicating that the attitude of residents is desirable. But their attitude didn't affect their awareness of the price of any diagnostic tests of CBC ($p=0.99$), ESR ($p=0.99$), UA ($p=0.62$), troponin ($p=0.89$), chest radiograph ($p=0.25$), ultrasound of abdomen and pelvic ($p=0.22$) and CT scan of head ($p=0.6$) (table 3).

DISCUSSION

Survey of residents' awareness of financial burden imposed on the patient's clinical by

paraclinical measures had a big difference with the actual rate. On average, prices estimated by medical residents were 176% greater than the actual costs. On the other hand, only estimating 24.3% of research units in current study were closer to the real prices. Although residents in the study had a proper attitude toward the knowledge of fees, this proper attitude has not caused them to improve

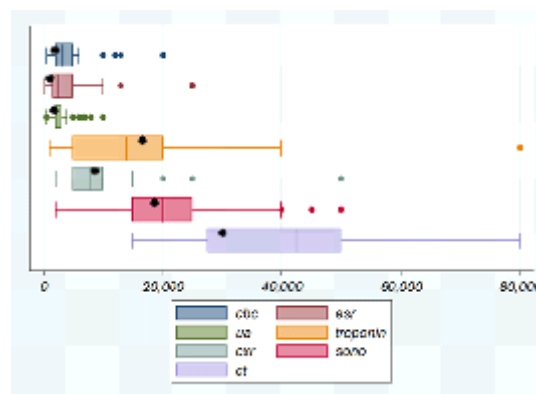


Fig. 2: Estimated costs by volunteer residents, * denotes the actual cost of diagnostic test

Table. 3: Estimated costs based on residents' attitudes on health care costs

Variable	Estimate	Improper attitude	Proper attitude	P
CBC	Overestimated	(0.0%) 0	(100%) 2	99.0
	Equal to actual price	(0.0%) 0	(100%) 8	
	Underestimated	(8.8%) 7	(2.91%) 73	
ESR	Overestimated	(0.0%) 0	(100%) 1	99.0
	Equal to actual price	(0.0%) 0	(100%) 1	
	Underestimated	(0.8%) 7	(0.92%) 81	
UA	Overestimated	(0.0%) 0	(100%) 1	62.0
	Equal to actual price	(0.0%) 0	(100%) 12	
	Underestimated	(1.9%) 7	(9.90%) 70	
Troponin	Overestimated	(5.9%) 4	(5.90%) 38	88.0
	Equal to actual price	(2.6%) 2	(8.93%) 30	
	Underestimated	(2.6%) 1	(8.93%) 15	
CXR	Overestimated	(9.6%) 2	(1.93%) 27	25.0
	Equal to actual price	(9.2%) 1	(1.97%) 33	
	Underestimated	(8.14%) 4	(2.85%) 23	
Ultrasound of the abdomen and pelvis	Overestimated	(0.20%) 3	(0.80%) 12	22.0
	Equal to actual price	(8.4%) 2	(2.95%) 40	
	Underestimated	(1.6%) 2	(9.93%) 31	
Head CT	Overestimated	(0.0%) 0	(100%) 11	6.0
	Equal to actual price	(4.4%) 1	(6.95%) 22	
	Underestimated	(7.10%) 6	(3.89%) 50	

their knowledge. One of the main causes of lack of awareness in residents is their source of information. The main source of data for residents participating in the study is their colleagues, namely, other physicians. Because physicians, like residents, have a low awareness in this field. So a vicious cycle has been created that not only does not improve residents' awareness, but also increases the chance to confuse them.

The comparison of present paper with the findings of other studies reflects the high consistency of our findings with each other. This means that most researchers believe that physicians' awareness of health care costs is low (13-19). For example, Allan and his colleagues showed in a systematic review that on average; only 31 % of doctors are able to estimate the prices in the range of 25-20 percent of real rates (19). The same policy is true in other studies, so that the frequency of accurate estimate of health care costs is assessed between 24-33% (14, 20). These findings together with the results of this study indicate the poor awareness of physicians around the world about diagnosis and treatment costs.

In a systematic review of Allen *et al.* (19) it was found that nationality, country, level of education, expertise, and physicians' other demographic and basic factors have a little impact on their knowledge and the only factor affecting accurate estimates of the prices of drugs and paraclinical tests is their real prices. This means that expensive drugs are under estimated and in expensive ones are over estimated. This issue has been confirmed in other studies (16, 20-21). The prices of cheap laboratory tests, such as CBC, UA and ESR, have been also overestimated in our study, but the status of expensive tests was variable. So that the cost of troponin was underestimated and the costs of ultrasound and CT scan were overestimated. The cause of this difference can be attributed to the fact that Imam Hussain hospital is a public one and its costs are lower than private and semi-private sectors. If the cost of imaging measures were calculated based on non-public tariffs, the difference between this study and previous studies was not created. As can be seen, percentage of physicians' errors in estimating the costs of expensive diagnostic tests is less than cheaper

tests which is consistent with the findings of other studies (21). This issue should be attributed to the method of calculating the exact price, not to the physicians' awareness, because expensive diagnostic tests have a larger 25 percent range than cheaper ones.

Physicians' attitude towards the need for awareness of the costs and to apply them in clinical practice has been studied in previous studies (1, 13, 22). For example, in the study of Tek Sehgal *et al.* physicians have known their awareness of health care costs, but they have shown a strong desire to gain this knowledge (20). In the study of Bovier *et al.*, conducted in Switzerland, 90% of physicians believed that awareness of the costs is their responsibility (23). In our study, the attitude towards residents' awareness of health care costs was positive. But it is clear that physicians, despite the interest in having more awareness of health care costs, have a limited access to these resources (9, 24). In the present study, the majority of residents (30.3%) receive the information from other doctors, indicating the lack of official informing. However, the previous studies showed the effective and useful role of teaching health care expenses in reducing health system costs and reduces costs 30-10 percent (25-26). Therefore, it seems essential to plan training programs in order to improve physicians' awareness at all levels in our country.

One limitation of the present study is the low frequency of obstetric and pediatric residents. Due to the low frequency of them, it is impossible to make decisions regarding the impact of major on residents' awareness of health care costs. Therefore, it is recommended this point to be considered in subsequent research and acceptable volume of different specialties to be evaluated. Another weakness of this study is the lack of examining the residents' awareness of drug costs. Since drug therapy is an important part of hospital costs, the necessity to pay attention to this issue is obvious. But since the purpose of the present study was to assess the residents' awareness of diagnostic tests, their awareness of drug costs was not investigated. Also, due to the higher cost of laboratory measures in the private centers, if the awareness of physicians' working in these centers could also be checked, more comprehensive and

more accurate results would be obtained from the study. Unfortunately, it was not possible to study the awareness of physicians' working in private centers.

CONCLUSION

The resultsshowed that the management level information of residents of internal medicine, surgery, pediatrics, obstetrics and emergency

medicine about the cost of clinical measures is low and the level of education regarding awareness of these costs is inadequate. Accordingly, it can be said that educational system has poorly trained medical residents in the field of medical expenses. Yet, residents acknowledged the need to be aware of the costs and to apply this information when treating patients and expressed a strong desire to have more information on this subject.

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