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RESEARCH ARTICLE

THE RATIO AND PREDICTOR FACTORS OF THE INAPPROPRIATE AND UNNECESSARY USE OF EMERGENCY DEPARTMENT SERVICES

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ABSTRACT

INTRODUCTION:

Provision of unnecessary medical services is one of the problems that have driven up health care budgets. The crowding of emergency departments (ED) and sometimes patients 'unreasonable expectations, may lead to ED staff burnout and increase the provision of unnecessary services.

METHODS:

In this study, the Hospital Urgencies Appropriateness Protocol (HUAP) was used to assess the appropriateness of services provided in the ED. The sample size of this study consisted of 445 patients who were selected among the patients admitted in Rasoul Akram and Firouzgar hospitals in Iran by stratified sampling. Chi-square and logistic regression tests were used to analyze the data.

RESULTS:

The rate of inappropriate admissions in the ED of the studied hospitals was measured at about 13%. Patients admitted to the Firouzgar ED showed a higher probability of inappropriate admission. Among the considered factors, gender and the interval between the onset of symptoms and ED admission are factors affecting inappropriate admission.

CONCLUSION:

The rate of inappropriate admission is seen as high in this study. Gender and the interval between the onset of symptoms and an ED admission can be considered as predictors of the provision of unnecessary services. Outcomes from this study are that it is significant to provide operational and evidence-based solutions regarding the issues related to the provision of identified unnecessary services in the ED.

KEYWORDS

Inappropriate treatment, HUAP, emergency department.

INTRODUCTION

One of the problems that has driven up health care costs is the provision of unnecessary medical services. [1-4] Unnecessary medical services are defined as the services that in regard to a patient's conditions are not necessary to be provided. These services do not bring about any positive changes in the patient's life longevity and quality and the patients would not choose them if they had enough information about them. [5] An Emergency Department (ED) is one ward in the hospital that is seen as the entrance to the hospital due to its special conditions in comparison with other wards. The special services and functions of ED have developed this service as the entrance gate of the hospital. The need for immediate responses, which may require more resources than what is currently available in the ED, the emergency conditions, limited time for decision-making, and sometimes patients 'unreasonable expectations may lead to ED staff burnout and increase the provision of unnecessary services in ED. [6-8] In a survey conducted in 2015, over 85% of emergency physicians (EP) believed that too many diagnostic tests were ordered in their own EDs, and 97% said at least 22% of the advanced imaging they ordered were medically unnecessary. [9]. Unnecessary emergency services also raise medical costs. Out of 100 million physician's visits that are made in the United States every year, two-thirds of the 27 million visits of insured patients are unnecessary and can be delivered in primary care centers at a much lower cost ($US1,800 less per patient). [6]

ED generally provides urgent care services and do not include non-urgent cases; however, many patients consider it necessary to receive regular services in this ward as well. [7, 10,11] The patients' high expectations and demands can be one reason for the provision of unnecessary service in the ED and it can affect the quality of services and the patients' and staff's dissatisfaction in the ED [6]. Financial motivations, fear of missing cases in diagnoses, fear of complaints, risk aversion, impatience in cases with uncertainty, high risk of making decisions in limited time and the need for an urgent decision, lack of continuous relationship between doctor and patient, inadequate access to the patient's record at the time of making a decision, incomplete and sometimes inconsistent access to the patient's records, unreasonable expectations of patients or their companions and families, local care standards, overcrowding of the ED and congestion of services, are some reasons which may lead to the provision of unnecessary services in the ED. [9] The risk of harm to patients, additional costs which are not rationally cost-justified, wrong care in the wrong place and at the wrong time and worries about limiting the capacity of the ED for people who need emergency services are the consequences of unnecessary services which reduce ED service quality. [12, 13] Although various studies on unnecessary and inappropriate services have been conducted in Iran and there have sought solutions to reduce these problems [8, 14, 15] it should be noted that there is insufficient information in the research literature about the provision of unnecessary services in the ED. [16] Therefore, this study was conducted to determine the conditions and predictor for inappropriate and unnecessary use of the ED services in Iran University of Medical Sciences based on the HUAP protocol. [17]

METHOD

A cross-sectional and retrospective study design was employed. The study was completed in May to August 2022 (a three-month period was used given the large number of patient presentations that occur at these facilities). In this study, the Hospital Urgencies Appropriateness Protocol was used to assess the appropriateness of services provided in the ED which is a previously developed standardized and validated set of assessment criteria [17].

Patient histories were reviewed through medical records by an emergency medicine specialist who had no professional dependence on the investigated hospitals. This assessment determined whether the patient's admission was appropriate or not. If patient conditions were in accordance with at least one of the standards of HUAP, the patient's admission was considered to be appropriate. The sample size of this study consisted of 445 patients (based of Cochran formula (Cochran, 1977)) [40] from an estimated 60,000 population size who were selected among the patients admitted in Rasoul Akram and Firouzgar hospitals (which are general and teaching hospitals affiliated to the Iran University of Medical Sciences) by a stratified sampling method. Inclusion criteria were patients discharged with less than 6 hours in the ED and the patients discharged with more than 6 hours in the ED were excluded from the study. Patient background information such as gender, insurance status, marital status, address (city of residence), previous admission record, age, and type of the admission day (workday or weekend/holiday), education, age, and admission shift were collected and registered. In addition, some

demographic information was incomplete in some of the medical records. Incomplete demographic information caused missing data in our study, although we tried to survey medical records, which were generally fully completed. Chi-square and logistic regression tests were analyzed in the data to identify affecting variables that affects inappropriate use of services.

This study was not a trial clinical study; therefore, it is not necessary to get informed consent. However, confidentiality of the information was considered. This study was also approved by Ethical Committee of the Iran University of Medical Sciences. This study received an ethics code with IR. IUMS.REC1396.31194 number from the Iran University of Medical Sciences.

RESULTS

According to the data analysis of the obtained results, 41.1% of the patients were female and 58.9% of them were male. Also, 54.6% of patients were married and 45.4% were single. The mean age of the patients in this study was about 41 years with a standard deviation of 20. [Table 1] Other demographic information of the patients is included in Table 1.

TABLE1. FREQUENCY DISTRIBUTION OF DEMOGRAPHIC INFORMATION OF PATIENTS

Variable	Subcategory	Frequency	Frequency percentage
Gender	Male	262	58.9%
	Female	183	41.1%
Marital status	Single	202	45.4%
	Married	243	54.6%
The interval between the onset of symptoms and ED admission	Less than one day	382	85.8%
	More than one day	63	14.2%
Previous admission record	Yes	132	42.2%
	No	181	57.8%
Insurance status	Insured	327	74%
	Not insured	115	26%
Place of residence	Tehran	414	93%
	Other cities	31	7%
Admission day	Weekdays	69	15.5%
	Days off	375	84.5%
Education	High school degree or lower	226	72.9%
	College degree and BA	74	23.9%
	Master degree and higher	10	3.2%
Age	18 years≤	42	9.4%
	18-36 years	184	41.3%
	37-55 years	111	24.9%
	56-74 years	81	18.2%
	≥ 75 years	27	6.1%
Admission shift	Night	71	16%
	Morning	135	30.5%
	Evening	237	53.5%

TABLE2. FREQUENCY DISTRIBUTION OF INAPPROPRIATE ADMISSION IN HOSPITAL EDS

Hospital	Status	Frequency	Frequency percentage
Rasoul Akram	Appropriate	247	91.1%
	Inappropriate	24	8.9%
Firouzgar	Appropriate	141	81%
	Inappropriate	33	19%
Total	Appropriate	388	87.2%
	Inappropriate	57	12.8%

A total of 445 patients admitted to the ED were studied. However, about 57 patients did not meet the conditions of admission in the ED and were highlighted as inappropriate admissions in the ED. Therefore, the rate of inappropriate admission in the ED of the study hospitals was measured at about 13%. The rate of inappropriate admission in the ED of Firouzgar Hospital was higher than the rate in Rasoul Akram Hospital.

To investigate and determine the predictor factors inappropriate admission, variables such as gender, marital status, insurance status, the studied hospital, place of residence, admission time, day of the week, admission status in terms of being a weekday or a day off, patient age, admission record in the ED, the patient's education and the interval between the onset of symptoms and ED admission were included as predictor variables. Lemeshow statistics showed a good fit of the model [Chi-square = 6.1, P-value = 0.639]. Also, the Nagelkerke R Square was obtained at 0.3, which represents a good level of prediction of the regression model.

Considering the P-value of the variables in Table 2, it was revealed that among the 12 variables included in the regression equation, 3 variables have a significant effect in predicting the amount of inappropriate admission. (Table 3)

In regard to the result obtained, patients admitted to the Firouzgar ED showed a higher probability for inappropriate admission. Thus, the risk of inappropriate admission in patients referred to Firouzgar ED was about 5 times higher than that in Rasoul Akram ED patients. [OR: 4.92; 95% CI: 2.11–11.51, p≤0.001] Also, female patients showed more inappropriate admissions in the ED than male patients. Female patients revealed 3 times more risk of inappropriate admission in the ED. (OR: 3.38; 95% CI: 1.47–7.76, p = 0.004) Another predictor factor on the rate of inappropriate admission in the ED of the studied hospitals was the "Interval between the onset of symptoms and ED admission". Accordingly, patients who for one day after the onset of symptoms referred to the ED showed a higher risk than patients who before one day referred to the ED. According to our results, the amount of this risk is about 12 times. In other words, the patients who after one day from the onset of their first illness symptoms referred to the ED showed a 12 times higher risk of non-appropriate admission rather than other patients (OR: 12.47; 95% CI: 4.66–33.4, p≤0.001) Table 3 shows the statistics of the other variables and it is taken into account in the next section.

TABLE3. RESULTS OF LOGISTIC REGRESSION TEST TO DETERMINE VARIABLES AFFECTING NON-APPROPRIATE ADMISSION IN ED

Category	Group	SE	Wald	P-value	OR†	OR Confidence interval	
						low	high
Hospital	Rasool Akram *						
	Firouzgar	0.43	13.55	0.001≥	4.92	2.11	11.51
Gender	Man*						
	Female	0.42	8.2	0.004	3.38	1.47	7.76

Insurance status	Insured *						
	Not insured	0.49	0.52	0.473	0.7	0.27	1.84
Marital status	Single*						
	Married	0.5	0	0.974	0.98	0.37	263
Place of residence	Tehran*						
	Other cities	0.71	0	0.989	1.09	0.25	4.04
Previous admission record	Yes*						
	No	0.48	0.76	0.387	1.51	0.59	3.85
Admission time	Night *		0.49	0.782			
	Morning	0.61	0.16	0.687	0.78	0.24	2.58
	Evening	0.58	0.48	0.49	0.67	0.22	2.08
Education	High school degree or lower*		0.28	0.87			
	College degree and BA	0.5	0.02	0.895	1.07	0.4	2.82
	Master degree and higher	1.07	0.28	0.597	1.76	0.22	14.33
The interval between the onset of symptoms and ED admission	Less than one day*						
	More than one day	0.5	25.19	0.001≥	12.47	466	33.4
Day of the week	Day off*						
	Weekdays	1.04	0.28	0.596	0.58	0.08	4.39
Age	*18 years≥		4.78	0.31			
	18-36 years	0.78	0.12	0.727	1.31	0.29	5.99
	37-55 years	0.93	0.04	0.848	1.2	0.19	7.43
	56-74 years	0.97	1.26	0.261	0.33	0.05	2.26
	≥75 years	1.2	0.27	0.601	0.53	0.05	5.6

*, reference † Odds ratio.

DISCUSSION

The present study aimed to determine the extent and reasons of inappropriate admissions in the ED. For this purpose, the HUAP was used. This protocol is a valid tool to assess the appropriateness of hospital admissions and hospitalization in the ED. [18, 19] Today, unnecessary and inappropriate services beyond those needed from a medical centre have turned into a major problem in health systems all around the world, and the medical centers in developed countries have been seriously suffering from this problem as well. [2-4, 20-23] The overcrowding and complexity of providing ED services have made this department a place where prescription and the provision of unnecessary and inappropriate services are possible. [6-9] Unnecessary and inappropriate services in the ED are services that, in addition to not being needed and a waste of resources, may harm the patients and reduce the quality of ED services. [12, 13] Therefore, it seems necessary to determine its extent and reasons.

Based on this study's evaluation criteria, about 13% of the ED admissions have been determined inappropriate which were identified as about 9% for one hospital and 19% for the other. There is a relatively large difference in unnecessary use of ED services in one hospital compared to another, indicating poor management in that hospital. Although in Singapore the rate of inappropriate hospitalization was obtained at generally 9.6% [24] and close to the results of the present study, the results of a study conducted in Greek public hospitals by using the HUAP tool, the rate was reported more than 38% [25]. In two other

studies conducted in prior years using HUAP, the percentages of inappropriate services in the ED were obtained at 29.6% and 24.2% .[10, 26] Although the obtained results are fairly consistent (about 8%), the percentage of unnecessary and inappropriate services in the ED in various studies is not highly consistent .[27, 28] Perhaps the reason for this difference can be related to the different places, times, tools, and evaluation methods that have been used. It was reported that in a military training hospital in Iran, more than 64% of patients who received ED services had unnecessary conditions.[15] However, in a similar study in Iran, this rate was estimated at 20% .[29] Meanwhile, in a systematic review and meta-analysis conducted in Iran, the number of provided services that did not meet the appropriateness criteria was on average 12.3% for admission and about 12% for hospitalization. These percentages were close to the total percentage of ED inappropriate services estimated in the present study. [14]

Patients' gender is one factor that can affect the inappropriate use of ED services. [10] The study of the effect of patients' gender on the rate of inappropriate admissions showed that females were admitted to the ED and received inappropriate admissions 3 times more than males. This significant difference could be due to the weaker physical condition of females and their sensitivity to health. In the same study, gender was considered as an important factor, so the rate of inappropriate use of services was higher in females [10] This result has been confirmed in the results of other studies.[12, 29] In another study in Singapore, the results showed that gender was effective in using inappropriate services in the ED, but males were more at risk of using ED inappropriate services than females .[24] However, there is also evidence of no effect of gender on the use of ED inappropriate services. [30] Therefore, the difference of more than 3 times shows that the gender factor has affected the rate of inappropriate admissions in the ED.

According to the obtained results, one of the effective factors in the rate of ED inappropriate admissions was the interval between the onset of symptoms and ED admission. Reasons for providing unnecessary services in the ED include almost similar factors such as distance to the hospital, delay in treatment, use of personal transport, and referral from other hospitals. [26, 28, 31] Similarly, longer stays in the waiting room, longer distances, and the interval between the onset of symptoms and ED admission have been associated with the ED's inappropriate services. [10] Based on the results, the interval between the onset of symptoms and admission to the ED had a significant effect on inappropriate admission. In other words, more than one day from the time of the first symptoms to the patient's arrival in the ED has increased the risk of inappropriate admission by 12 times.

Although in several studies a relationship was found between insurance status and the use of inappropriate services. [12, 32, 33] there is evidence that these two issues are not correlated.[34] Despite the numerical difference, the effect of insurance status on inappropriate use of ED services was not statistically significant. Perhaps if the effect of the type of insurance on the use of inappropriate services were also examined, the results would be different. [28, 35] However, no significant difference was found between people who had health insurance and people who did not in the amount of use of ED inappropriate services. Also based on regression analysis of demographic variables such as age, education, place of residence, marital status, time and day of admission, if the day of admission was off or not and previous admission record in the ED, although no numerical difference was found in the use of ED inappropriate services, it was not statistically significant. However, some studies have shown that age, education, time, and day of admission and if the day of admission was off or not [10, 28, 35-37] have affected the rate of ED inappropriate admission. However, the results of some studies in the case of the insignificance of the effect of some of the mentioned variables on the rate of ED inappropriate admissions were consistent with the results of the present study. [12, 38, 39] The reason for the lack of significant effect of age, education, place of residence, etc. can be found in the very low elasticity of the ED services. In other words, when the patients feel an urgent need for hospital services, regardless of their conditions, they refer to the ED to receive services that might be inappropriate.

CONCLUSION

A significant percentage of all ED admissions with conditions that vary in both complexity and cost, depending on the criteria used, are inappropriate. It shows that hospital services as the most expensive part of the modern health care system, especially in the ED, are still evolving and in need of special attention. Based on the results of regression analysis, gender and the time interval between the onset of symptoms and admission to the ED

were the factors that significantly affected the use of ED inappropriate services. This difference revealed that it was not random and the two variables can be considered as predictors of the provision of unnecessary services. Since inappropriate and unnecessary services are a waste of resources and reduce the quality of services and decline the capacity to provide services to those who need them, it may also lead to overcrowding of the ED and even harm the patients. Therefore, to alleviate the problems of ED, it is significant to provide operational and evidence-based solutions regarding the issues related to the provision of unnecessary services in the ED.

LIMITITION OF THE STUDY:

This study was done in general and educational hospitals and the condition in non-general and non-educational and even private hospitals maybe different.

ABREVIATION:

ED Emergency Department

HUAP Hospital Urgencies Appropriateness Protocol

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CONFLICT OF INTEREST:

The authors declared no conflict of interest.

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