

The Financial Burden of Inappropriate Admissions to Intensive Care Units of Shahid Faghihi and Nemazee Hospitals of Shiraz, Iran, 2014

Seyed Masoom Masoompour,¹ Mehrdad Askarian,² Maryam Najibi,³ and Nahid Hatam^{4,*}

¹Non-Communicable Diseases Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

²Professor, Department of Community Medicine, Shiraz Nephro-Urology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

³Students Research Committee, School of Management and Information Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

⁴Professor, Department of Health Service Administration, School of Management and Information Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

*Corresponding author: Nahid Hatam, Professor, Department of Health Service Administration, School of Management and Information Sciences, Shiraz University of Medical Sciences, Shiraz, Iran. Tel: +98-7132340871, Fax: +98-7132340039, E-mail: hatamn@sums.ac.ir

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Abstract

Background: Investigating the conditions and the appropriateness of admission of patients in hospitals is an important issue which can improve the efficiency of health care delivery. Intensive care unit (ICU) is important due to applying expensive financial sources; therefore, its efficient application is of great priority. In this regard, the current study aimed to determine the financial burden of inappropriate admissions in internal intensive care units (IICUs).

Methods: It was a cross-sectional study conducted in 2014. A total of 294 patients admitted to IICUs of Shahid Faghihi and Nemazee hospitals of Shiraz, Iran, in 2012 were enrolled into this retrospective study. The study was conducted in two phases, using the guidelines of American critical care association (ACCA) and experts' opinion to investigate the financial burden of inappropriate admissions in IICUs of the above-mentioned hospitals.

Results: The results showed no statistically significant relationships among insurance status, insurance type, age, gender and inappropriate admission by applying Chi-square. Among 294 admitted patients under the study, the inappropriate admissions were 11.2% based on the guidelines and 13.6% based on the experts' opinion. The level of agreement of the guidelines and experts' opinion for the inappropriate admissions was 0.076 based on Kappa coefficient. The total financial burden imposed on the insurance agencies and the patients by inappropriate admissions was US\$ 47867.78 based on the guidelines and US\$ 83241.68 based on the experts' opinion.

Conclusions: Inappropriate admissions to ICUs may impose additional costs to the health system and the patients on one hand, and deprives other patients from receiving health services. Therefore, it is crucial to effectively plan for the application of ICU beds.

Keywords: Financial Burden, Inappropriate Admission, Intensive Care Unit

1. Background

In recent years, health care development faced new obstacles due to the financial crisis (1). Special attention should be paid to evaluating the efficiency and appropriate application of the facilities in health care systems to achieve the highest efficiency (2, 3).

Limiting the number of hospital beds, increasing the waiting list of medical cares, applying some solutions such as using the beds with the maximum efficiency and decreasing the inappropriate admissions can lead to lowering the costs and also improving the quality and access in an effective way. Decreasing the inappropriate admissions can affect the quality of the healthcare services, improve the efficiency of the hospitals and decrease the waiting lists (4, 5).

Unnecessary hospitalization increases the costs for the patients, reduces the available sources for critically ill patients and increases the risk of nosocomial infections in

the admitted patients as well (2). Hence, investigating the admission conditions in hospitals and its appropriateness is one of the important issues which can improve the efficiency of the hospitals.

In previous research studies, appropriate admission was defined as the admission of the patients with no other choices except admitting them in hospital by considering this advanced level of the technology, and their admission is essential even by the existence of other choices with lower technology in the health system (6). In contrast to this definition, Soria-Aledo defined inappropriate admissions of the patients as an admission which could occur in a less complicated health center with lower costs (7).

Among different hospital wards, intensive care unit (ICU) is of great importance due to its sophisticated equipment and expensive financial sources in a way that efficient application of the ward facilities is prior to saving these sources in possible cases (8). On the other hand, different people are admitted in these wards. Moreover, the

hospitals policies can influence the patients' admissions to give more appropriate care to the patients in the wards (9). However, some patients who do not benefit or benefit a little from intensive care, and intensive or usual care does not make a difference to them (10) are in lower priority for admission in ICU; in other words, the intensive care is more efficient for the patients who are completely healthy or very sick (8).

In this regard, a few studies are conducted on ICUs worldwide. Some studies report the percentage of inappropriate admission to ICUs ranges from 18% to 42% (11-13).

In General, conducting research studies which directly investigate inappropriate hospital admission can lead to better planning for health services, introduce criteria to evaluate requests of increasing the financial sources, building new health centers, delivering new services such as identifying patients at high risk of inappropriate use, and finally identifying the proportion of each health level in developing inappropriate use of facilities in the health system (7).

Thus, applying a reliable index to evaluate the necessity of patients' admission in ICUs seems essential (14).

Considering the shortage of ICU beds in Iran which is a big problem in the state hospitals, it is possible to decrease the costs and help the patients who really need ICU admissions by determining the rate of inappropriate admissions, the reasons and also the costs imposed on the health system and the patients.

There are some comprehensive research studies in Iran conducted on appropriate use of hospital beds in hospitalization wards; however, to the best of authors knowledge, there is no study on the appropriate use of ICUs which use expensive equipment and limited financial sources (4, 15, 16).

In Fars province, South of Iran, the number of IICU beds in the teaching state hospitals is 16, which almost covers the South of Iran. Therefore, appropriate admissions are crucial considering this limitation.

2. Objectives

Consequently, regarding the importance of suitable evaluation in healthcare system and to investigate the appropriate method of using hospital facilities, the current study aimed to investigate the admissions in internal ICUs (IICUs) of Nemazee and Shahid Faghihi hospitals of Shiraz, Iran; also, there was an attempt to estimate the direct costs related to inappropriate admissions, based on guidelines for ICU admission, discharge and triage issued by the American society of critical care medicine (ASCCM).

3. Methods

The current cross-sectional descriptive-analytical study was conducted in 2014 to investigate the financial burden of inappropriate admissions in IICUs of Shahid Faghihi and Nemazee hospitals in Shiraz, Iran. The research population included all the patients admitted to IICUs of Nemazee and Shahid Faghihi hospitals in Shiraz, Iran in 2014. In this cross sectional study, 295 out of 600 patients were selected by simple random sampling applied by the random number table. According to the percentage of inappropriate admissions in ICUs, mentioned in the previous studies and the opinion of a statistical consultant, the inappropriate rate of 0.26 and the accuracy rate of 5% were used and the number of patients was estimated 295, by the sample size Formula 1 ($p = 0.26, q = 0.074$).

$$n = \left(\frac{Z_{1-\frac{\alpha}{2}}}{d} \right)^2 \times pq \quad (1)$$

One patient was missed due to incomplete information. Based on the number of admissions to ICUs, 187 patients were selected from Shahid Faghihi and 108 from Namazi hospitals. Hospitals were visited directly by the researchers and the patients' medical records and financial documents were collected.

Data were collected retrospectively in three stages. First, a data collection form was applied containing the following parts:

- a) Demographic information including age, gender, and the hospital name;
- b) Information about the patients' admissions date in IICUs, hospitalization time, history of previous admissions, discharge date from IICU and discharge date from hospital;
- c) Special information related to lab results and diagnosis.

The collected data from the patients' files under the study were sent to five intensivists (intensivists are responsible for treating patients in the intensive care units) who make decisions about IICUs to investigate the appropriateness of their admissions. The intensivists had the average of 15.2 years of working experience in ICUs (SD = 8.58, minimum six years and maximum 25 years). Therefore, they determined the appropriateness and inappropriateness of the patients' admissions by their own experience. The patients with the level of agreement, among the intensivists, higher than 60% were considered as appropriate admission and the ones with agreement lower than 40% were considered as inappropriate admissions.

In the next stage, the guidelines were applied to determine the inappropriate admissions of the patients. Since there was no standard guidelines to identify inappropriate

admissions to ICUs in Iran, guidelines for ICU admission, discharge and triage issued by ASCCM were applied after reviewing previous related studies (10). The current study applied the above mentioned guidelines for the first time in Iran. To pilot these guidelines on the population, it was given to four internists and intensivists responsible for admitting patients in IICUs of Shahid Faghihi and Nemazee hospitals. The guidelines consisted of 74 criteria and all the expert physicians gave their opinions about it.

To localize the guidelines, important criteria about the appropriateness of the patients' admissions in ICUs were determined based on the guidelines and the experts' opinions and the data collection form was prepared. The criteria which were more important based on the experts' opinions were selected as the final criteria. Data were obtained from the patients' records and given to the experts to obtain their opinions. Based on the methods of the previous studies, the experts mentioned their opinions about the criteria in two rounds based on the Likert scale (agree, vague or disagree).

In this stage:

- The criteria for which the agreement percentage was lower than 50% were excluded.
- The criteria for which the agreement percentage was 50% were given to the experts for the second round.
- The criteria for which the agreement percentage was higher than 50% were included.

The total number of the criteria was 74, of which 41 were accepted in the first round and 13 criteria were excluded including four criteria of cardiac system, one criterion of pulmonary system, three criteria of miscellaneous, one criterion of surgical and four criteria of vital signs. A number of 20 criteria were given to the experts for the second round which were accepted; finally, 61 criteria were included in the research.

After preparing the final list of the criteria based on the guidelines for ICU admission, discharge and triage issued by ASCCM, they were compared with the patients' records and matched; appropriateness and inappropriateness of the patients' admissions were determined by the researchers and an expert physician. Then, the results of these two methods, applying the guidelines for ICU admission, discharge and triage issued by ASCCM and the experts' opinions were compared and the overlapping percentage of these two methods about the appropriateness of the admissions were determined.

In the last stage, direct costs for each patient admitted inappropriately were estimated in his/her hospitalization period in IICU to determine the financial burden from the patients' point of view. Direct costs include the daily fees for medicines, diagnosis, visit, nursing and the cost of bed. The intensive care unit different costs include the daily cost

of bed, monitoring and nursing services.

Financial data were obtained from electronic patient records in Nemazee and Shahid Faghihi hospital. Finally, all costs including costs covered by insurance and the insurer were added up and the financial burden was estimated.

SPSS software version 18 was used to analyze the data. Fisher's exact test was performed to investigate the relationship between the appropriateness of the admissions based on the guidelines and the experts' opinions and the insurance type, gender and age; also, to determine the agreement between the experts' opinions and the guidelines about the appropriateness of the admissions in IICUs of the two hospitals, Kappa test was run ($P < 0.05$ was considered significant).

After transferring the data into SPSS, first they were finalized based on the experts' opinions that were five internists and pulmonologists and then based on the guidelines for ICU admission, discharge, and triage issued by ASCCM.

4. Results

The findings of the current study showed that out of 294 patients under the study, 5.8% were not covered by insurance. Iran health insurance organization was the most frequent insurance type (52%) and armed forces insurance was the least frequent one (5.4%). From a total of 294 patients, 53.7% were male and 46.3 female. Analysis of different age groups revealed that 93 patients were about 18 - 30 years old; this was the most frequent age group among the patients. Patients aged above 75 years old were the least frequent ones (10.2%).

Investigating the relationship between demographic and inappropriateness variables indicated no statistically significant relationships between having insurance and insurance type on one hand and inappropriate admissions on the other hand.

Among 294 admissions, the inappropriateness percentage was 11.2% based on the guidelines and 13.6% based on the experts' opinions. To assess the agreement between the guidelines and the experts' opinions about inappropriate admissions Kappa index was employed and the result was 0.076 (Table 1).

According to tables 2 and 3, the total financial burden imposed on insurance companies and patients' out of pocket for the inappropriate admissions based on the guidelines and the experts' opinion were US\$ 47867.78 and US\$ 83241.68, respectively. On the other hand the financial burden imposed on the insurance companies based on the guidelines and the experts' opinion was US\$ 36554.76 and

Table 1. Appropriateness of Admissions in Intensive Care Units of Shahid Faghihi and Nemazee Hospitals of Shiraz Based on the Guidelines and Experts' Opinions^a

Appropriateness	By	
	Guidelines	Experts' Opinions
Appropriate	256 (87.1)	254 (86.4)
Inappropriate	33 (11.2)	40 (13.6)
Uncertain	5 (1.7)	0
Total	294 (100)	294 (100)

^aValues are expressed as No. (%).

Table 2. Calculation of the Financial Burden Imposed on Insurers and Patients Admitted to ICUs Based on the Guidelines in Shahid Faghihi and Nemazee Hospitals of Shiraz

The cost of Inappropriate Admission for 33 Patients Based on US\$ ^a	Mean (SD)	Range(Max-Min)	Total
Insurance payment	1107.72 (1208.95)	0 - 50305.3	36554.76
Out of pocket	131.85 (188.74)	0 - 5030.5	4351.12
Total cost	1450.53 (1842.43)	1596.9 - 55894.8	47867.78

Abbreviation: ICUs, intensive care units.

^aFinancial burden was calculated based on US\$.

Table 3. Calculation of the Financial Burden Imposed on Insurers and Patients Admitted to Internal ICUs Based on the Experts' Opinions in Shahid Faghihi and Nemazee Hospitals of Shiraz

The cost of Inappropriate Admission for 40 Patients Based on US\$ ^a	Mean (SD)	Range (Max-Min)	Total
Insurance payment	1705.12 (2231.51)	0 - 112109.1	66500.06
Out of pocket	250.46 (492.45)	0 - 24411.06	9768.14
Total cost	2134.40 (2813.82)	198.2 - 1365202.3	83241.68

Abbreviation: ICUs, intensive care units.

^aFinancial burden was calculated based on US\$; 1\$ = 12260 Rials in purchasing power parity.

US\$ 66500.06, respectively. Patients paid US\$ 4351.12 and US\$ 9768.14, respectively, for inappropriate admissions.

5. Discussion

In hospitals, ICUs impose huge costs on the health system due to using lots of resources, special facilities, and the expert medical teams they need. It is clear that due to the limited number of ICU beds, patients' admissions should be based on classic indications (17).

The results of the current study showed no statistically significant relationship between having insurance, type of insurance, patients' gender and age with inappropriate admissions. Y. U. Bing-Hua's (18) study revealed no statistically significant relationship between the patients' age, gender and inappropriate admission. The reason is that it is closely related to the patients' disease, clinical condition and diagnostics tests.

Jaclyn Le Blance et al. (19) conducted a study based on a questionnaire on application of a protocol in ICUs and concluded that the physicians agreed to apply the protocol to accelerate their tasks and control the costs, time, and the quality of the patients' care. Based on the results of the current study, the guidelines were prepared as the standard and valid guidelines for clinical investigations and evaluating the physicians' performance in admitting patients in medical ICUs. The data showed very low agreement between the guidelines and the experts' opinions about inappropriate admissions which indicated a need for more discussions between physicians to be convinced obeying the guidelines.

Song-Hee Kim et al.'s study (20) concluded that to manage the admission in ICUs, clinical guidelines should be applied. In the same way, Charles EP worked on the common methods of investigating the appropriateness and necessity of the admission and introduced main methods as the basis of all methods, explaining and introducing the in-

volved factors, investigating scientific texts and determining related scenarios, holding panel of specialists and determining their role in different scenarios, comparing the results of the panel by the records of the patients who received the services, and finally determining the appropriateness and necessity of the performed services (21). The current study followed the same methodology.

Joseph Antonio Molina et al. (22) mentioned that applying guidelines can somehow prevent inappropriate admissions of the patients to ICUs. However, the final decision depends on the physician's diagnosis based on his/her knowledge and experience.

The results of the present study showed that inappropriate admission to ICU was 11.2% based on the guidelines and 13.6% on the experts' opinions. Basem A. EL-Nabulsi et al. (11) concluded that only 54.2% of the admissions in medical and surgical ICUs were appropriate. Rosi et al. (13) in a study entitled "evaluating inappropriate admissions in ICUs", showed that 18% of the admissions were inappropriate and the reason was lack of intermediate care units in Italy's health care system.

Limited number of ICU beds is a common problem worldwide. Increasing the capacity of ICUs is not possible due to the limited space and limited personnel in hospitals and governmental regulations as well. Therefore, preventing the transfer of the patients who do not benefit from admittance to ICUs and availability of beds for the patients who could be helped by admittance to ICUs is essential; however, deciding on the patients' admissions is a very hard task (18). The challenging issue is that it is not ethically accepted to stop caring due to hopeless condition of the patient. On the other hand, there are eligible patients for admission in ICUs (23).

Nowadays, there are few guidelines for ICUs which consider all the indications of the patients' admissions and some of them are not useful in practice. In some hospitals, especially in the developing countries that have limited sources, it is not possible to follow the guidelines. Thus, deciding to admit patients in ICUs mostly depends on the physicians' diagnosis compared to the standard guidelines (24).

As a result, it is necessary to apply both standard guidelines and experts' opinions to decide on patients' admission to ICUs in Iran; actually, the combination of these two is essential.

The results of the current study also showed high levels of agreement between the guidelines and the experts' opinions about the appropriate and inappropriate admissions.

According to the previous studies, it seems that the appropriateness of the admissions in ICUs of the hospitals was acceptable and the admissions were well-managed.

However, the point is that all the previous studies investigated all ICUs such as medical and surgical ICUs; therefore, if the present study investigated all types of ICUs in Shiraz, Iran, the results may show higher inappropriate admissions.

To the best of authors' knowledge, it was the first study that prepared and presented the specific guidelines to investigate the appropriateness of the admissions in ICUs. The admissions of the patients were investigated by these guidelines and the expert's opinion and the agreement between them were studied.

Joseph Antonio Molina et al. (22) mentioned that although ICUs make up to 1.2% - 6.3% of the total beds of hospitals, their costs are 15% - 20% of the total hospital costs.

Totally, ICUs impose huge costs on the healthcare system due to high costs of establishing and also instructing expert personnel. Daily costs of the patients' care in ICUs are three to four times higher than those of non ICUs (22).

In the present study, as the costs of medications, diagnostic procedures and visit fees exist in other wards, only the costs related to bed and health services were calculated in the study as the financial burden of the inappropriate admissions. The total cost for 33 patients with inappropriate admissions was US\$ 47867.78 based on the guidelines and that of 40 patients with inappropriate admissions was US\$ 83241.68 based on the experts' opinions.

The current study results indicated that the financial burden imposed on the patients and insurance companies for 294 patients in medical ICUs during a year was not high. However, this amount is still important and should be decreased.

The results also showed differences between the costs of 33 patients with inappropriate admissions based on the guidelines and the total costs of 40 patients with inappropriate admissions based on experts' opinions; the inappropriate admissions were 11.2% based on the guidelines and 13.6% based on the experts' opinion; but the difference between financial burden based on guidelines and expert opinions is really high, US\$ 47867.78 vs. US\$ 83241.68, respectively. The reason of these differences was the length of hospitalization for different patients in a way that the average of hospitalization for 33 patients was seven days and it was 13 days for the 40 patients based on the experts' opinions.

Soria-Aledo et al. (7) mentioned that 24% of the admissions were inappropriate; hence, decreasing the number of inappropriate admissions lessened the costs from € 147044 to € 66642.

Eriksen et al. (25) mentioned that 27% of the inappropriate admissions can lead to 9% of the total costs related to the patients' admissions. Moreover, he believed that administering different plans to decrease inappropriate ad-

missions should be based on the clinical consequences for the patients. Therefore, the policy makers should be careful about financial projects.

5.1. Conclusion

In conclusion, the present study showed that by preparing clinical guidelines to admit patients to medical ICUs, it is possible to decrease the number of inappropriate admissions, thereby diminish the related costs. According to the results of the study, it was concluded that applying clinical guidelines in other hospital wards can yield positive consequences.

5.2. Limitations of the Study

- Lack of time of the intensivists colleague in the project;
- Lack of time of the staff to extract financial information;
- Lack of standard clinical guidelines in Iran and the problems related to localization of international guidelines;
- Since the patients stayed in hospital and then referred to the ICU, one of the most important problems of the project was to extract the patient's financial information from the bills for the period of stay in the ICU.

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