

## Original Article

# Evaluation of Appropriate and Inappropriate Admission and Hospitalization Days According to Appropriateness Evaluation Protocol (AEP)

Nader Tavakoli MD<sup>1</sup>, Seyed Mohammad Hosseini Kasnavieh MD<sup>1</sup>, Mohamadreza Yasinzadeh MD<sup>1</sup>, Milad Amini BSc<sup>2</sup>, Mahsa Mahmoudi Nejad MD<sup>•1</sup>

## Abstract

**Background:** Inappropriate admission and hospitalization days are the factors that impose more costs to hospitals. By considering current condition of hospitals, it is vital to have an insight into the data on inappropriate admission and hospitalization days in order to eliminate obstacles to the proper and appropriate hospitalization.

**Methods:** In this study, 198 patients who were admitted to receive surgical or non-surgical treatment in Sina public hospital were selected. An appropriateness Evaluation Protocol (AEP) was used for data collection. The validity of AEP is well established by the preceding studies. In order to achieve the study objectives, binary logistic regression test was used.

**Results:** According to our findings, 39.4% of hospitalization days and 16.2% of admissions are inappropriate. In this study, inappropriate admission was observed among married patients eight times more than among single ones. Inappropriate hospitalization days were 12 times more prevalent among patients from provinces than among those from Tehran. With increasing age of the patient the probability of inappropriate admission decreases slightly, i.e. the probability of inappropriate admission decreases 10% as the age increases one year. The number of hospitalization days was significantly correlated to the following parameters: type of admission, patient's city of residence, type of treatment, and length of stay ( $P < 0.05$ ).

**Conclusion:** Regarding the results of this study, a large number of admissions and specially hospitalization days are inappropriate. According to other studies, with suitable programming many inappropriate admissions and hospitalization days are preventable.

**Keywords:** Admission, appropriate, appropriateness evaluation protocol (AEP), hospitalization, inappropriate

**Cite this article as:** Tavakoli N, Hoseini Kasnaviyeh M, Yasinzadeh MR, Amini M, Mahmoudi Nejad M. Evaluation of appropriate and inappropriate admission and hospitalization days according to appropriateness evaluation protocol (AEP). *Arch Iran Med.* 2015; **18**(7): 430 – 434.

## Introduction

Concerns about rising healthcare costs have led to an increasing interest in the efficient utilization of healthcare services for sustainable healthcare systems worldwide. Inappropriate use of healthcare services not only represents an inefficient use of limited healthcare resources, but also incurs an additional cost burden.<sup>1-5</sup> Hospitals represent the highest proportion of healthcare expenditure.<sup>6</sup> Thus, efforts to reduce inappropriate and unnecessary resource use in acute-care hospitals are essential.<sup>7</sup>

The studies conducted in different countries suggest that hospital care can be either appropriate or inappropriate under different circumstances. A number of studies in the field point out 'over-hospitalization' and 'under-hospitalization' are currently occurring in the hospitals.<sup>8,9</sup> Also, inappropriate hospitalization stays are recognized as an important indication of the misuse of healthcare services.<sup>10</sup>

In the research programs, appropriate admission has been defined as: 'admission of patients for whom there is no choice other

than admission to the hospital with such an advanced technology level and their admission is necessary even if there are choices with a lower level of technology in the healthcare system'. In contrast, inappropriate admission is defined as: 'admission of those patients for whom there might potentially be another choice with lower technology level than the hospital'. It means that their admission is not necessary at that time.<sup>9</sup>

Appropriate hospitalization involves the hospitalization of patients who need constant and active medical, nursing, or paramedical care and patients whose care is not possible in a healthcare setting other than a hospital, e.g. an outpatient clinic or a day care center.<sup>11</sup> The decrease in inappropriate hospitalization will improve the hospital efficiency, shorten the waiting lists, and decrease the healthcare costs without any reduction in the quality of services.<sup>12,13</sup> On the other hand, inappropriate hospitalization days increase the hospitalization cost, decrease the accessibility of the resources for the patients with critical conditions, and exposes the patients to the hospital infections.<sup>14</sup>

Considering special conditions, current problems in the field of hospital management, and socio-cultural problems in Iran; it is vital to have an insight into the data on inappropriate admission and hospitalization to eliminate obstacles to the proper and appropriate hospitalization.<sup>14</sup>

The annual costs of hospital beds, without considering the avoidable costs, are increased by inappropriate costs imposed on the healthcare system, e.g. by inappropriate occupation of the hospital beds. The value of inappropriate cost is about \$1.3 per patient

**Authors' affiliations:** <sup>1</sup>Department of Emergency Care, Iran University of Medical Sciences, Tehran, Iran, <sup>2</sup>Department of Quality Improvement, Nikan Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

**•Corresponding author and reprints:** Mahsa Mahmoudi Nejad MD, Department of Emergency Care, Iran University of Medical Sciences, Tehran, Iran. Tel: +98-9163410635, Fax: +98-21-64352630, E-mail: mahsa.mahmodinejad@yahoo.com.

Accepted for publication: 27 May 2015

in Shiraz, Iran.<sup>14</sup>

Due to aforementioned conditions, the present study has been conducted to determine the inappropriate hospitalization rate in training, research and treatment centers affiliated to Tehran University of Medical Sciences from January to March 2012.

## Materials and Methods

A cross-sectional and retrospective study design was employed. The study was done in December 2012 to May 2013. Study population consisted of patients who were admitted to receive surgical or non-surgical treatment in Sina public hospital (an affiliated center to Tehran University of Medical Sciences). The main criterion of patient participation in the study was hospitalization for at least one day. Overall, 1360 patients were defined as the statistic population, from which 198 patients were chosen as the subjects of the study. Stratified sampling method was used in this study and the strata were created based on the medical specialties. Criteria for choosing sampling were medical specialty, which was based on the ratio of each specialty in statistical population. Pediatric, psychiatric and gynecological patients were excluded from this study.

An Appropriateness Evaluation Protocol (AEP) was used as the measurement tool of appropriateness and inappropriateness of admission and hospitalization days in this study. The validity of AEP is well established by the previous studies.<sup>15-18</sup> AEP also includes clinical standards. If patient conditions were in accordance with at least one of the standards, his or her hospitalization was considered to be appropriate. The patient history was reviewed through medical records by a resident of emergency medicine who had no professional dependence on the investigated hospital. It would determine whether admission of a patient was appropriate or not. The total number of hospitalization days as well as background information such as type of admission (routine or emergency), gender, insurance status, marital status, address (city of residence), hospitalization center (whether located in the capital or the provinces), type of treatment (surgical or non-surgical), age, and type of the admission day (workday or weekend/holiday) were collected and registered. In addition, some demographic information was uncompleted in some of the medical records. Uncompleted demographic information caused data missing in our study, although we tried to survey medical records, which are generally complete.

This study was not a trial clinical study; therefore it is not necessary to get informed consent from patients, however confidentiality of the information was considered. This study was also approved by the local institutional board of the hospital.

The collected data were analyzed by SPSS v18 software at descriptive and analytical levels. At the descriptive level, we used frequency, percent, mean and standard deviation (SD). In order to achieve the study objectives, binary logistic regression test, Mann-Whitney and Kruskal-Wallis test, were used. The significance level of 0.05 was adopted in all analytical tests.

## Results

The average age of patients was about 45 years old (SD = 21) and the average hospitalization period was 3.5 days (SD = 3.5). Males and females constitute 70.4% and 29.6% of the patients, respectively. Frequency distributions and relative frequencies of patients' information are summarized in Table 1. Out of a total of 198 recorded admissions, 166 were appropriate and 32 were inappropriate, which results in 16.2% of inappropriate admissions. Nine probable parameters were inserted into the regression function. Marital status, patient's city of residence, and the age were proved to be statically important (Table 2). Married patients were at risk of inappropriate admission more than single ones. In the other words, inappropriate admission was observed among married patients eight times more than among single ones (OR: 7.8, 95% CI: 1.13 – 53.5). According to our findings, the risk of inappropriate hospitalization among patients who were hospitalized in Tehran was 0.08 of that of hospitalized patients in the provinces. In the other words, the inappropriate hospitalization was 12 times more prevalent among patients from provinces than among those from Tehran. (OR: 0.08, 95% CI: 0.01 – 0.82). With increasing age of the patient the probability of inappropriate admission decreases slightly. As data analysis shown the probability of inappropriate admission decreases 10% as age increases one year (OR: 0.9, 95% CI: 0.89 – 0.99). Other investigated parameters were not statistically important ( $P$ -value > 0.05).

Overall, 712 days of hospitalization were investigated of which 281 days were inappropriate and 431 days were appropriate, meaning 39.4% of the hospitalization days were inappropriate and unnecessary. Comprehensive review of the medical records and available evidence signifies that most important cause

**Table 1.** Frequency distributions and background characteristics of patients in admissions

Variables	Numbers	Frequency	95% CI for percentage	
			Low rate	High rate
<b>Type of admission</b>				
Emergency	101	53.4%	46%	60%
Routine	88	46.6%	39%	54%
<b>Sex</b>				
Male	138	70.4%	64%	76%
Female	58	29.6%	24%	36%
<b>Insurance coverage</b>				
Yes	114	62%	55%	69%
No	70	38%	31%	45%
<b>Marital status</b>				
Married	66	45.5%	38%	54%
Single	79	54.5%	46%	62%
<b>City of residency</b>				
Tehran	151	86.3%	80%	91%
Other cities	24	13.7%	9%	20%
<b>Type of treatment</b>				
Surgery	92	55.4%	48%	63%
Internal	74	44.6%	37%	52%

**Table 2.** Logistics regression analysis for determining effective factors of inappropriate admissions

Variables	Group	P-value	Or†	95% CI for or	
				Low rate	High rate
Type of admission	Routine *	---	---	---	---
	Emergency	0.49	2.30	0.22	24.52
Sex	Female*	---	---	---	---
	Male	0.467	0.55	0.11	2.74
Insurance coverage	No*	---	---	---	---
	Yes	0.278	0.44	0.1	1.92
Marital status	Single *	---	---	---	---
	Married	0.037	7.8	1.13	53.53
City of residency	Other cities *	---	---	---	---
	Tehran	0.033	0.08	0.01	0.82
Type of treatment	Internal *	---	---	---	---
	Surgery	0.259	0.41	0.09	1.93
Type of the admission day	Holiday*	---	---	---	---
	Workday	0.601	1.85	0.18	18.71
Age	---	0.013	0.9	0.89	0.99
Length of stay	---	0.158	0.56	0.25	1.25

\*reference group; † odds ratio.

**Table 3.** Frequency distributions of reasons for Inappropriateness for hospitalization days

Inappropriateness reason	Number of day	Percentage
Insurance and payment problem	4	1.4%
Medical consultation	31	11%
Surgery delay	19	6.8%
Medical test follow up	1	0.4%
Physician conservativeness	59	21%
Other (Unidentifiable)	76	27%
In order of surgery	86	30.6%
Lack of bed	5	1.8%
<b>Total</b>	<b>281</b>	<b>100%</b>

**Table 4.** Relationship between inappropriate hospitalizations days with background characteristics of patients

Variables	Group	Average day of inappropriate hospitalizations days	SD	P-value
admission Type of	Emergency	0.59	1.23	≤ 0.001
	Routine	2.48	2.78	
Sex	Female	1.33	2.29	0.089
	Male	1.76	2.29	
Insurance coverage	No	1.53	2.37	0.809
	Yes	1.3	2.23	
Marital status	Single	1.5	2.44	0.759
	Married	1.1	1.52	
City of residency	Other cities	1.26	2.16	0.04
	Tehran	2.29	2.58	
Type of treatment	Internal	1.91	2.48	0.002
	Surgery	0.59	1.01	
Length of stay	7 day <	0.7	1.13	≤ 0.001
	7 day ≥	4.94	2.97	
Age <sup>1</sup>	45 old <	1.54	2.22	0.143
	45 – 65 old	1.49	2.54	
	65 old >	1.25	2.19	

<sup>1</sup>Kruskal–Wallis test

of inappropriate hospitalization was the operation waiting time (30.6%), followed by the physician’s conservative attitude (21%) and the waiting time for receiving medical consultation (11%). Other causes are summarized in the Table 3.

The number of hospitalization days was significantly correlated to the following parameters: type of admission, patient’s city of residence, type of treatment, and length of stay ( $P < 0.05$ ). The Inappropriate hospitalization days were observed to be more in case

of routine admissions than emergency ones ( $P$ -value  $\leq 0.001$ ). The patients from the provinces had less inappropriate days than those who were hospitalized in Tehran ( $P$ -value = 0.04). Furthermore, the operated patients in comparison with non-operated ones ( $P$ -value = 0.002), and patients hospitalized for more than six days in comparison with those hospitalized for less than seven days ( $P$ -value  $\leq 0.001$ ) had more numbers of days of inappropriate hospitalization (Table 4).

## Discussion

Comprehensive studies on inappropriate admission and hospitalization days are annually conducted in developed countries.<sup>19</sup> However, healthcare policy makers are not well aware of the importance of such measures in the developing countries such as Iran. Thus, it is necessary to thoroughly investigate factors contributing to inappropriate hospitalization in Iran.<sup>20</sup>

Inappropriate admission rate was estimated to be 16.2% in this study. Poureza estimated inappropriate admission 22.8% in two training hospitals in Tehran,<sup>21</sup> Castaldi estimated it 31.5%,<sup>22</sup> and Hatam estimated it 22% in four hospitals in Shiraz.<sup>23</sup> Inappropriate admission rate is reported to be 55% in a pediatric hospital in Swedish,<sup>24</sup> and 23% in another study in that country.<sup>25</sup> The least percent of Inappropriate admission was 4% reported in case of a military hospital in Turkey.<sup>26</sup> The difference in inappropriate admission rates in these studies is significant which may be attributed to different admission procedures, geographical locations, or bed occupation rates of the medical centers. Fakari, et al. did not detect any significant correlation between the inappropriate admissions and the investigated parameters.<sup>27</sup> In the studies carried out by Poureza and Hatam, no significant correlation between age of admitted patient and the inappropriate admission rate was observed.<sup>21,23</sup> In contrast, the correlation was found to be significant in studies by Carnessale and Attena and our study.<sup>28,29</sup>

Additionally, relationships between gender and inappropriate admission were investigated. No significant correlation was observed between the two factors. The same result was obtained in studies conducted by Poureza, Bakhtari, and Hatam whereas the correlation was found to be significant by Carnissale. In the current study, inappropriate admission was found to be significantly correlated to the patient's marital status and city of residence. These correlations were found to be insignificant in studies performed by Poureza, Bakhtari, Hatam, Carnessale, and Attena.

Inappropriate hospitalization days were measured 39.4% in the current study. The same parameter was measured 8.6% by Poureza, et al.<sup>21</sup> 18.1% by Carnessale, et al.<sup>29</sup> 35.5% by Attena, et al.<sup>28</sup> and 37% by Castaldi.<sup>22</sup> The last two results were close to that of the current study. In the studies by Attena, et al. and Villatla, et al. the main cause factor for the inappropriate hospitalization days was the physician's conservative attitude.<sup>28,30</sup> This finding is similar to that of a current study where physician's conservativeness was found to be the second most important factor. Conversely, medical procedures and discharge processes by Paniss, et al.<sup>31</sup> and the waiting time for clinical examination by Carnessale, et al.<sup>29</sup> were found to be the main factors responsible for inappropriate hospitalization days. Carnessale, et al. also identified the waiting time for operation as a significant factor contributing to the inappropriate hospitalization days.

A major part of inappropriate hospitalization was pertained to the diagnostic delay and processes of operation room. Many surgical admissions are preprogrammed. Likewise, diagnostic processes could be performed in an outpatient clinic without the need for hospitalization. Consequently, surgeries can be performed in the same day as the admission, which resulted in omission of one of the main causes of inappropriate hospitalization.<sup>32</sup> Physician's conservative attitude has been referred to in the literature as another pivotal factor affecting the inappropriate hospitalization. It is postulated that this problem is mainly related to the lack of sufficient trainings and appropriate diagnostic tools, which could be

ameliorated by supplementary training courses and the provision of proper equipment.

## References

- McDonagh M, Smith D, Goddard M. Erratum to Measuring appropriate use of acute beds: A systematic review of methods and results. *Health Policy*. 2000; **54**(2): 163.
- Vetter N. Inappropriately delayed discharge from hospital: What do we know? *BMJ*. 2003; **326**(7395): 927 – 928.
- Mould–Quevedo J, García–Peña C, Contreras–Hernández I, Juárez–Cedillo T, Espinel–Bermúdez C, Morales–Cisneros G, et al. Direct costs associated with the appropriateness of hospital stay in elderly population. *BMC Health Services Research*. 2009; **9**(1): 151.
- Soria–Aledo V, Carrillo–Alcaraz A, Campillo–Soto A, Flores–Pastor B, Leal–Llopis J, Fernandez–Martin M, et al. Associated factors and cost of inappropriate hospital admissions and stays in a second–level hospital. *American Journal of Medical Quality*. 2009; **24**(4): 321 – 332.
- Paille–Ricolleau C, Leux C, Guile R, Abbey H, Lombraill P, Moret L. Causes of inappropriate hospital days: development and validation of a French assessment tool for rehabilitation centers. *International Journal for Quality in Health Care*. 2012; **24**(2): 121 – 128.
- Organization for Economic Cooperation and Development (OECD). *Health at a Glance*. Paris: OECD Publishing; 2009.
- Hwang J, Kim J, Jang W, Park J. Inappropriate hospitalization days in Korean Oriental Medicine hospitals. *International Journal for Quality in Health Care*. 2011; **23**(4): 437 – 444.
- Mawajdeh S, Hayajneh Y, Al–Qutob R. The effect of type of hospital and health insurance on hospital length of stay in Irbid, North Jordan. *Health Policy and Planning*. 1997; **12**(2): 166 – 172.
- Hartz A, Bade P, Sigmann P, Guse C, Eppl P, Goldberg K. The evaluation of screening methods to identify medically unnecessary hospital stay for patients with pneumonia. *Int J Qual Health Care*. 1996; **8**(1): 3 – 11.
- Panis LJ, Gooskens M, Verheggen FW, Pop P, Prins MH. Predictors of inappropriate hospital stay: a clinical case study. *Int J Qual Health Care*. 2003; **15**(1): 57 – 66.
- Kossoovsky M., Chopard P. and Boola F. Evaluation of quality improvement intervention to reduce inappropriate hospital use. *International Journal for Quality in Health Care*. 2002; **14**(3): 227 – 232.
- Castaldi S, Bevilacqua L, Arcari G, Cantù AP, Visconti U, Auxilia F. How appropriate is the use of rehabilitation facilities? Assessment by an evaluation tool based on the AEP protocol. *Prev Med Hyg*. 2010; **51**(3): 116 – 120.
- Jalali E, Hoseini M. Assessment of days of patient stay in university affiliated hospitals and comparison to a hospital with insurance contract. *Health Economic Conference, Tehran, Iran*; 2001.
- Eghbalkhah A, Salamati P, Sotoudeh K, Khashayar P. Evaluation and comparison of admission and discharge criteria in admitted patients' of pediatric intensive care unit of bahrami children's hospital with the criteria of american academy of pediatrics. *Iran J Pediatr*. 2006; **16**(4): 399 – 406.
- Gertman PM, Restuccia JD. The appropriateness evaluation protocol: A technique for assessing unnecessary days of hospital care. *Med Care*. 1981; **19**(8): 855 – 871.
- Sánchez–García S, Juárez–Cedillo T, Mould–Quevedo JF, García–González JJ, Contreras–Hernández I, Espinel–Bermudez MC, et al. The hospital appropriateness evaluation protocol in elderly patients: a technique to evaluate admission and hospital stay. *Scand J Caring Sci*. 2008; **22**(2): 306 – 313.
- Soria–Aledo V, Carrillo–Alcaraz A, Flores–Pastor B, Moreno–Egea A, Carrasco–Prats M, Aguayo–Albasini JL. Reduction in inappropriate hospital use based on analysis of the causes. *BMC Health Serv Res*. 2012; **12**: 361.
- Kaya S, Erdem Y, Doğrusöz S, Halici N. Reliability of a hospital utilization review method in Turkey. *Int J Qual Health Care*. 1998; **10**(1): 53 – 58.
- Jalali E. Assessment of days of patient stay in university affiliated hospitals and comparison to a hospital with insurance contract. *Health Economic Conference*, 2001.
- Kavousi Z. Management and Economic Analysis of Admission and Hospitalization by using AEP in University Affiliated Hospitals of Tehran University [PhD thesis]. *Tehran: Tehran University*; 2003.
- Poureza A, Kavousi Z, Khabiri R, Salimzadeh H. Inappropriate Ad-

- mission and Hospitalization in Teaching Hospitals of Tehran University of Medical Sciences, Iran. *Pak J Med Sci.* 2008; **24(2)**: 301 – 305.
22. Castaldi S, Ferrari MR, Sabatino G, Trisolini R, Auxilia F. Evaluation of the appropriateness of hospital use: the case of IRCCS Ospedale Maggiore di Milano, Italy. *Ann Ig.* 2002; **14(5)**: e399 – e408.
  23. Hatam N, Askarian M, Sarikhani Y, Ghaem H. Necessity of admissions in selected teaching university affiliated and private hospitals in Shiraz, Iran. *Arch Iran Med.* 2007; **13**: 230 – 234.
  24. Bianco A, Trani F, Angelillo IF. Appropriate and inappropriate use of day-hospital care in Italy. *Public Health.* 2002; **116(6)**: 368 – 373.
  25. Thollander J, Gertow O, Hansen S, Carlsson B, Hallert C. To assess inappropriate acute admissions to hospital; a study of 566 consecutive acute admissions to three departments of internal medicine. *Lakartidningen.* 2004; **101**: 888 – 892.
  26. Neumann A, Schultz-Coulon HJ. Use of the Appropriateness Evaluation Protocol in inpatient ENT practice. *HNO.* 2001; **49(1)**: 12 – 20.
  27. Fekari J, Ghiasi A, Ezzati M, Pakdaman M, Khalafi A. The assessing of inappropriate admissions and hospitalization based on appropriate evaluation protocol in Alinasab Hospital in Tabriz- 2009. *JHOSP.* 2011; **9**: 39 – 44.
  28. Attena F, Agozzino E, Troisi MR, Granito C, Del Prete U. Appropriateness of admission and hospitalization days in a specialist hospital. *Ann Ig.* 2001; **13**: 121 – 127.
  29. Carnesale G, Staniscia T, Matarrese D, Seccia G, Schioppa F, Di Giovanni P, et al. Appropriateness of hospitalization in the teaching hospital of Chieti using the PRUO approach. *Ann Ig.* 2003; **15**: 117 – 122.
  30. Villalta J, Sisó A, Cereijo AC, Sequeira E, De La Sierra A. Appropriateness of hospitalization in a short stay unit of teaching hospital. A controlled study. *Medicina Clinica Spagna.* 2004; **122(12)**: 454 – 456.
  31. Panis LJ, Kolbach DN, Hamulyak K, Prins MH. Identifying inappropriate hospital stay in patients with venous thromboembolism. *Eur J Intern Med.* 2004; **15**: 39 – 44.
  32. Gabr H. Factors affecting inappropriate hospital patient stay in the general surgical units at Mansoura university hospital, Egypt. *Journal of Biology, Agriculture and Healthcare.* 2012; **10(2)**: 40 – 51.