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Prevalence and determinants of inappropriate admission and hospitalization in Iran: A systematic review and meta-analysis

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Abstract

Background: A huge portion of health expenditure is attributed to hospital services. Thus, it is important to use the resources appropriately. Many studies have measured inappropriate admissions and hospitalizations. The aim of this study was to review them systematically and determine the pooled quantity as well as the reasons behind such admissions and hospitalizations.

Methods: PubMed, Scopus, Web of Science, Google scholar, and internal databases such as Sid, Magiran, and Barkat were searched in January 2018. Moreover, the grey literature was also performed. All studies which had assessed the appropriateness and inappropriateness of services were included. Newcastle-Ottawa scale was used for quality appraisal. I2 test, subgroup analysis, meta-regression, and sensitivity analysis were performed. STATA was used for analysis. There was neither time limitation nor language limitation. The registration number in PROSPERO is CRD42019123401.

Results: Of 1576 studies, 15 met the inclusion criteria. The number of medical files ranged from 198 to 1815. Most of the studies (14) were performed in teaching hospitals. AEP was the most frequent tool for assessing inappropriateness of the services. The pooled inappropriate admission and hospitalization were 11% (95% CI= 8% - 14%)) and 13 % (95% CI= 10%-16%)), respectively. The most important determinants for inappropriate hospitalizations were attributed to physicians.

Conclusion: A huge portion of health care services is inappropriate. Thus, it is highly recommended to monitor physicians more than before, as the more they are monitored, the less inappropriate the delivered services will be.

Keywords: Inappropriateness of services, Admission, Hospitalization, Iran

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Introduction

Health and health care are 2 basic needs (2). Total health expenditure in Iran accounts for 7.59% of gross domestic product (GDP) (3). A huge fraction of total health expenditure is attributed to hospital services, which are known as the most expensive modern services worldwide (4, 5). Half of health sector expenditure is spent for hospital services; therefore, efficiency of the services is an important factor in reducing the costs and using the maximum capacity of hospitals (2, 5). Moreover, the health care system faces obstacles resulted from financial crisis (7). Appropriate use of hospital beds is frequently used as an indicator to measure

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↑What is "already known" in this topic:
Hospitals are the main health care providers. Thus, their services need to be used appropriately. Many studies have been conducted to investigate the prevalence of inappropriate admissions and hospitalization in Iran.

→What this article adds:
This systematic review and meta-analysis study aimed to assess the prevalence of inappropriate admission and hospitalization in Iran. According to the random effect, the pooled prevalence of inappropriate admission and hospitalization was 11% and 13%, respectively.

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efficiency of hospitals in terms of resource allocation, quality control, and hospital management (4). Moreover, other factors such as aging, high burden of chronic diseases, high cost technology, and bed scarcity impose a higher burden on the health system. Therefore, appropriate services should be addressed; otherwise, the health system costs will increase persistently (4, 9). However, if the patients do not benefit from hospital services and resources, they may be considered as inappropriate services and resources (4). Inappropriate admissions are defined as "admission of those patients for whom there might potentially be another choice with lower technology level than the hospital" (10). In addition, "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 health care setting other than a hospital, eg, an outpatient clinic or a day care center" (10). As a result, inappropriate use of services would increase the cost for health system and patients (7). Although appropriate resource allocation is a crucial step in health services, some services are delivered inappropriately (11, 12). For instance, there are some unplanned admissions in hospitals (13, 14). Inappropriate use of health and hospital resources is not a new problem as decision makers have always been concerned about it (15). Thus, continuous assessment of hospital services is crucial in improving the efficiency and quality of the service (9).

Many tools have been designed to assess the appropriateness of services, including Appropriateness Evaluation Protocol (AEP) (11). The prevalence of inappropriate admissions and hospitalizations vary globally. Published studies have reported inappropriate admissions to range from 6%, 8%, and 16% in Iran. In addition, inappropriate hospitalizations may vary between 9%, 14%, and 23%. International data have shown that inappropriate admissions range from 7% to 75.7% (16). Such admissions cost patients and insurance organizations almost US$47867.78 (7). There are many various risk factors for inappropriate use of services in hospitals. Results of a study showed that such risk factors include delay in performing laboratory tests, delay in making medical decisions, consultation and diagnostic tests, consultation or physician opinion, delay in performing surgery, unavailability of the physician, and temporary discharge (17). Another published study reported insurance and discharge problems, unavailability of physicians, waiting time, delay in performing surgery, delay in sending the results of medical tests, and conservative attitude of physicians as main risk factors for inappropriate use of health care services (18).

Many studies have been conducted in Iran to assess inappropriate admissions and hospitalizations. This was the first systematic review and meta-analysis in this area, and the population of this study was patients who had referred to the hospital, and the outcome was inappropriate usage of the services. Therefore, this study was conducted to collect all studies that had evaluated inappropriate admissions and hospitalizations and their determinants.

Methods

The main goal of this study was to estimate the pooled prevalence of inappropriate admissions and hospitalizations. The study protocol was registered in the international prospective register of systematic reviews database (PROSPERO), with the registration number of CRD42019123401.

This systematic review was conducted according to PRISMA (preferred reporting items for systematic review and meta-analysis) guideline (19). The guideline is broadly used for assessing, synthesizing, and reporting systematic review and meta-analysis studies.

Search strategy

Data were obtained through Persian and English papers and databases. PubMed, Scopus, Web of Science, and Persian databases such as Scientific Information Database (SID), Magiran, Barkat, and Google Scholar were searched by 2 reviewers (M.K and R.H) independently from inception of the databases to January 2018. Moreover, Google, the Ministry of Health webpage, and National Institute for Health Research (NIHR) were reviewed for grey literature. The references of retrieved studies were also reviewed to find possible relevant studies.

The search strategy was developed through relevant systematic reviews and keywords of original studies which were related to inappropriateness of the services. The search strategy was ((Appropriate* OR Inappropriate* AND Admission* OR Care OR Stay OR hospital admission* OR hospital use) OR (Hospital stay OR AEP OR Hospitalization OR Avoidable admission* OR Bed utilization OR Utilization OR Health services misuse OR Appropriateness Evaluation Protocol) AND Iran). The complete search strategy in PubMed is available in Appendix 1. According to the aforementioned search strategy, 456 records were found.

Inclusion and exclusion criteria

All studies that had assessed the appropriateness and inappropriateness of services in Iran until January 2018 were included. On the contrary, non-Iranian studies, letters to editor, congresses, and posters were excluded. There were neither time limitation nor language limitation.

Screening

After collecting the papers, duplicated articles were removed and 2 reviewers (B.R and D.Ch) screened all papers independently. Every discrepancy between them was solved through a discussion by the third author (R.H) to reach a census.

Data extraction

All studies that had evaluated both appropriateness and inappropriateness of admissions and hospitalizations in Iran from inception of the databases to January 2018 were included and the other irrelevant studies were excluded. After exclusion of the studies, data about type of study, population, tool, inappropriate admissions and hospital stay, and reasons for inappropriateness were extracted by 2 authors (M.K and B.R) independently. Also, any disagreements between the authors were solved through discussion or by consulting a third author (R.H). An electronic form was used for data collection.

[DOI: 10.47176/mjiri.34.2]

In case a study did not report the hospitalization days, the number of medical records were considered as a basis for pooled inappropriate hospitalization.

Quality assessment

The quality of identified papers was assessed by 2 authors (H.S and B.R) independently. Every discrepancy was solved through discussion or by a third author (R.H). Newcastle-Ottawa scale was used to assess the quality of studies (20). This tool includes 3 domains: selection, comparability, and outcome. This study aimed at evaluating the prevalence, selection, and outcome domains (21), and thus the maximum and minimum scores were 8 and zero, respectively.

Statistical analysis

Random effect with a 95% confidence interval was used to calculate the pooled inappropriate admissions and hospitalizations. In addition, I^2 test was used to assess heterogeneity. Moreover, subgroup analysis (22) was performed, and to find source of heterogeneity, meta-regression (23) was performed. Moreover, sensitivity analysis (24) was performed to assess robustness of the results. Also, Egger test (25) was used for checking the publication bias. In addition, Metaprop command in (26, 27) STATA version 13 (Stata Corporation, College Station, TX, USA) was used for data analysis (28).

Results

Figure 1 shows the selection process.

Search result

Overall, through searching English and Persian databases, 1576 studies were found; of which 15 were finally included in the review. Of the included studies, 13 had studied inappropriate admissions and 13 were related to inappropriate hospitalizations. Also, 11 publications reported both inappropriate admissions and hospitalizations, 2 did not report inappropriate admissions (29, 30), and 2 did not report inappropriate hospitalizations (7, 31). Figure 1 shows the preferred reporting items for systematic review and meta-analysis (PRISMA) of selected studies.

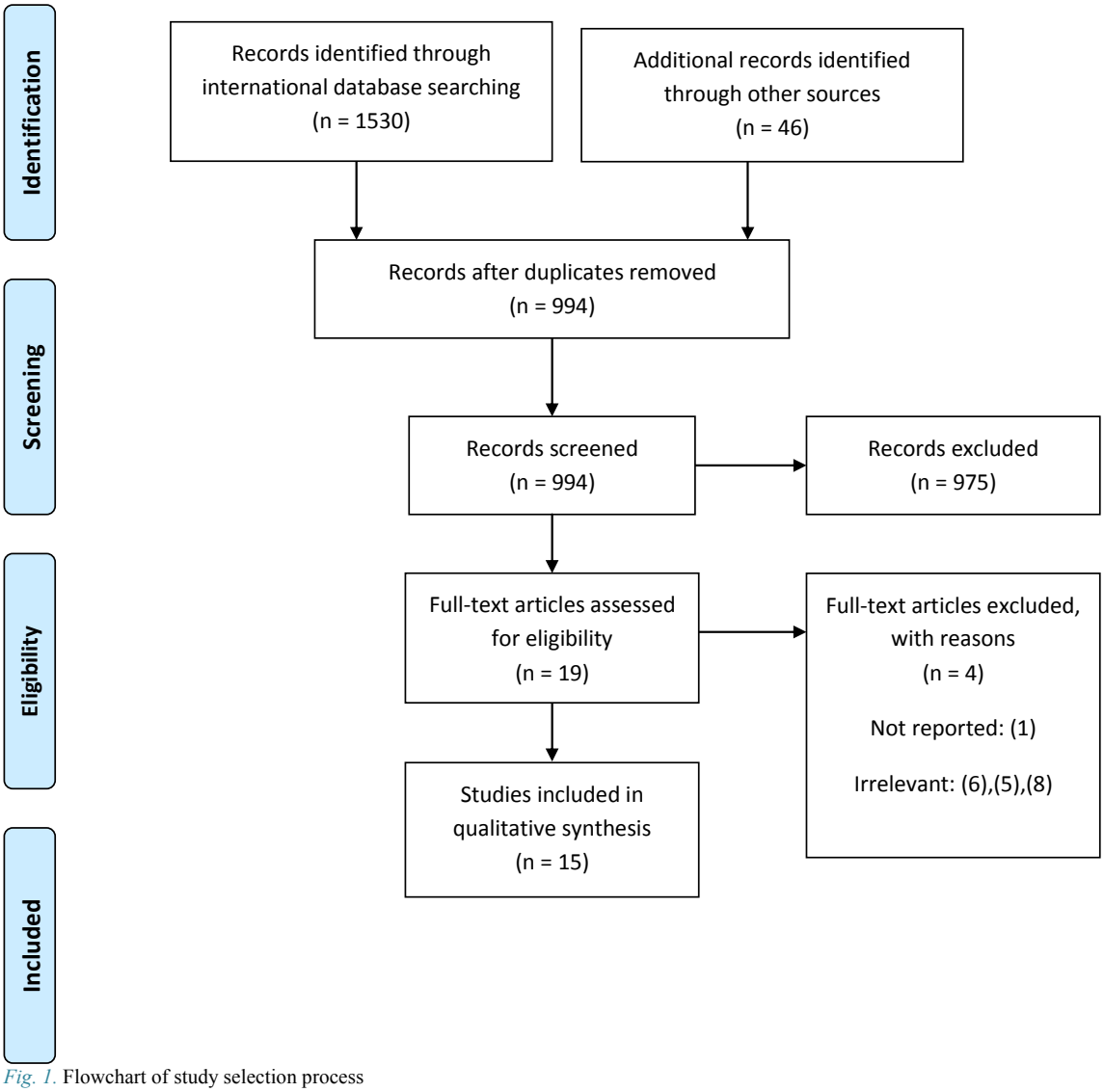

Fig. 1. Flowchart of study selection process

[DOI: 10.47176/mjiri.34.2]

Study characteristics

Table 1 demonstrates the characteristics of included studies. Year of publication ranged from 2006 to 2017. Most of the hospitals (n = 13) were teaching hospitals. One study had been done on a hospital affiliated to Social Security Organization (SSO) and one study had been done on both teaching and private hospitals. AEP had been used in most of the studies (n = 12). Two studies had used Iranian version of the tool and 1 study had used guidelines of American Critical Care Association. Number of medical files ranged from 198 to 1815, and in total, 7251 medical documents were included. Number of hospital days ranged from 268 to 12629 and in total, 29 247 days of hospitalization were included (Table 1).

Publication bias

Egger test was used to assess publication bias (Table 2).

Inappropriate admission

The random effect was used as heterogeneity was high among studies (I^2 = 93.69 %, p< 0.001). The highest and the lowest inappropriate admissions were 23% and 6%, respectively (Fig. 2). Also, the pooled inappropriate admission was 11% (95% CI = 8% - 14%) (Fig. 2).

Table 1. Characteristics of the studies included in the systematic review/meta-analysis

Author	Refference	Year	Number of medical files	Number of hospital days	Hospital	Tool	Quality score*
Barouni	(39)	2015	300	1835	Teaching	AEP	7
Ghods	(17)	2014	300	903	Teaching	Ir-AEP	7
Jeddian	(4)	2013	1815	12629	Teaching	AEP	6
Masoompour	(7)	2014	294	-	Teaching	ACCA	7
Nekoei Moghaddam	(2)	2015	400	2653	Teaching	Ir-AEP	7
Pourreza	(18)	2006	258	1732	Teaching	AEP	6
Tavakoli	(10)	2012	198	712	Teaching	AEP	6
Nabi Lou	(29)	2012	435	1536	Teaching	AEP	6
Fekari	(40)	2010	246	1450	SSO	AEP	7
Bakhtiari Aghdam	(41)	2006	268	268	Teaching	AEP	6
Yaghoubi far	(38)	2008	428	428	Teaching	AEP	7
Meydani	(30)	2013	335	1925	Teaching	AEP	6
Mahfoozpour	(42)	2014	310	1662	Teaching	AEP	6
Hatam	(31)	2007	1244	-	Teach&Pri	AEP	7
Tavakoli	(43)	2017	420	1514	Teaching	AEP	7

*The maximum score of the studies is 7 and the minimum score is 6.

Table 2. Results of Egger test for publication bias

Parameters	Coef.	Std.Err.	t	P.value	95% confidence interval	
					Lower	Upper
Slope	0.069	0.041	1.68	0.121	-0.021	0.159
Bias	2.347	3.116	0.75	0.467	-4.511	9.206

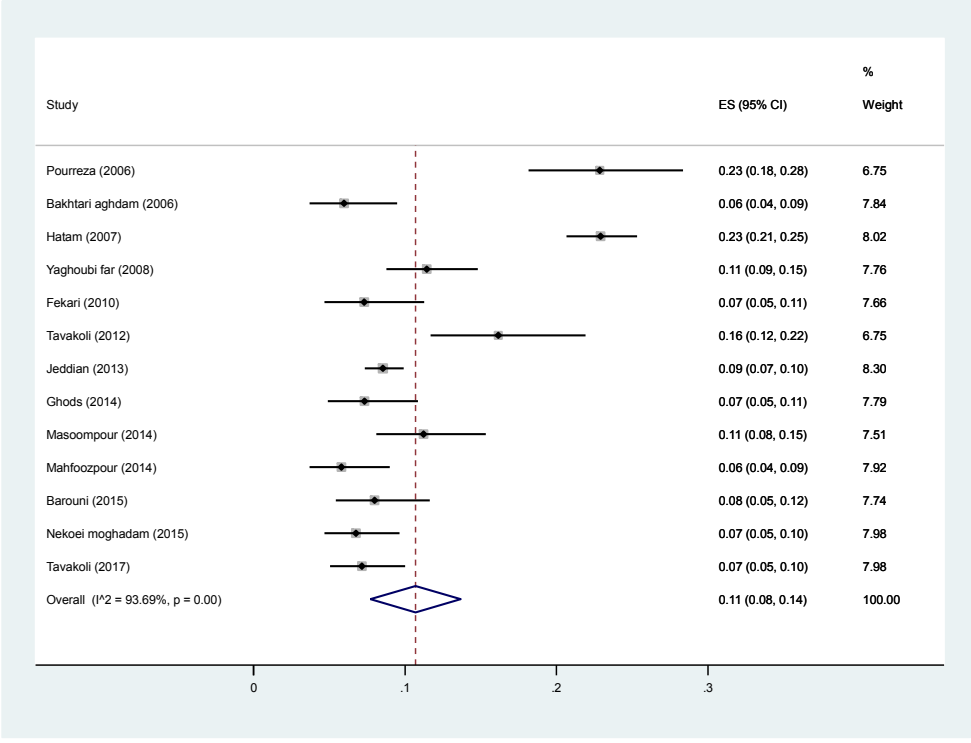

Fig. 2. Pooled inappropriate admissions

[DOI: 10.47176/mjiri.34.2]

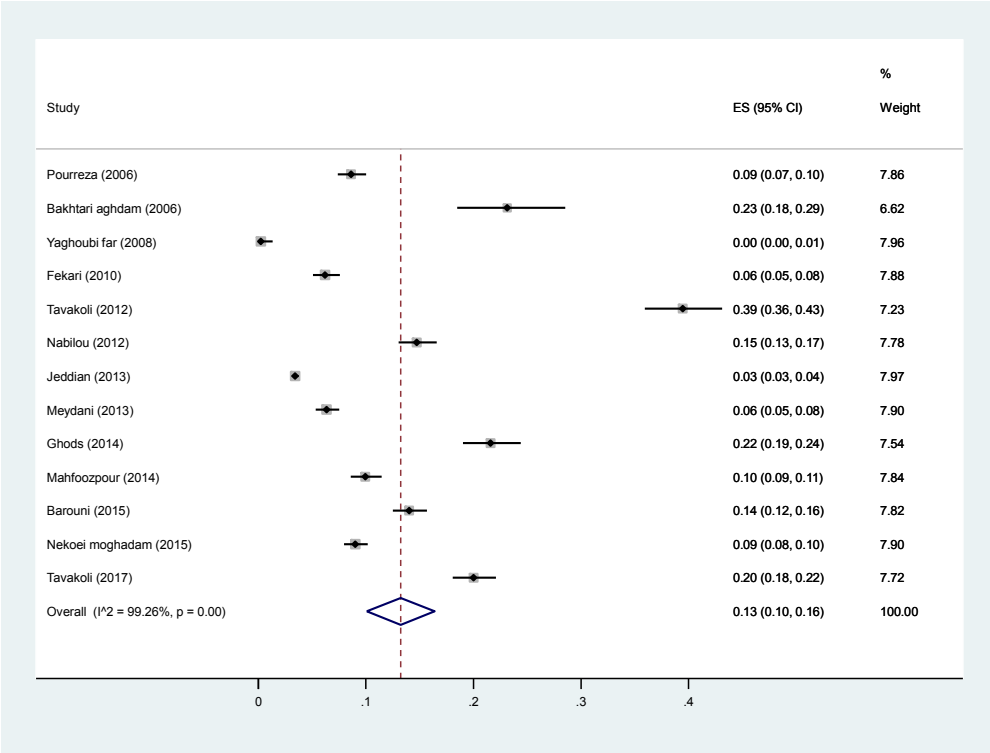

Fig. 3. Pooled inappropriate hospitalizations

Inappropriate hospitalization

There was a high heterogeneity in terms of inappropriate hospitalizations; thus, random effect was used ($I^2 = 99.26$, $p < 0.001$). The highest and the lowest inappropriate hospitalizations were 39% and 0%, respectively (Fig. 3). Also, the pooled inappropriate hospitalization was 13% (95% CI = 10%-16%) (Fig. 3).

The pooled inappropriate admission and hospitalization in subgroups

Subgroup analysis was done based on gender, insurance, tool, hospital, and length of stay. Although inappropriate admission in males was more than their female counterparts, inappropriate hospitalization in females was more than males. While inappropriate admission among uninsured people was more than insured individuals, inappropriate hospitalization among insured people was more than the uninsured. The most and the least prevalent inappropriate admissions were for AEP and IR-AEP tools, respectively. In contrast, the most and the least prevalent inappropriate hospitalizations were for IR-AEP and AEP tools, respectively. Moreover, the highest prevalence of inappropriate admission and hospitalization was for combination of both teaching and private hospitals. In general, the more the length of stay, the more the inappropriate admission and

Table 3. Subgroup analysis of inappropriate admissions and hospitalizations

Variables		Number of studies	Inappropriate admission	I^2	Number of studies	Inappropriate hospitalization	I^2
Gender	Male	8	12% (9%-16%)	88.7%	5	13% (2%-24%)	99.7%
	Female	8	12% (8%-16%)	93.1%	4	23% (6%-41%)	99.7%
Insurance	Yes	8	12% (8%-18%)	95.1%	5	13% (2%-25%)	99.7%
	No	8	13% (8%-18%)	93.4%	5	10% (0%-34%)	0%
Tool	AEP	10	10% (9%-11%)	94.9%	11	13% (9%-16%)	99.3%
	ACCA	1	11% (8%-15%)	-	-	-	-
	IR-AEP	2	7% (5%-9%)	0%	2	13% (10%-16%)	98.6%
Hospital	Teaching	11	9% (7%-11%)	91.8%	12	14% (10%-17%)	99.4%
	SSO	1	7% (4%-11%)	-	1	6% (5%-7%)	-
	Mixed	1	23% (21%-25%)	-	-	-	-
Length of stay	Less than 5	3	11% (7%-16%)	42.5%	3	16% (6%-27%)	99.3%
	6-10	3	6% (3%-8%)	67.4%	3	21% (4%-39%)	99.7%
	11-15	3	13% (7%-19%)	77.4%	3	20% (10%-31%)	99.1
	More than 15	3	33% (0%-68%)	99.5%	3	49% (26%-72%)	99.7
Marital status*	Single	1	92%		1	10.9%	
	Married	1	0.07%		1	16.1%	
Place of residence *	Urban	1	0.08%		1	21%	
	Rural	1	0.028		1	32.4%	

*Meta-analysis was not performed.

[DOI: 10.47176/mjiri.34.2]

hospitalization. Inappropriate hospitalization was more prevalent among married individuals than single ones, and inappropriate hospitalization was more prevalent in people living in rural areas than those living in urban areas. Meta-analysis was not performed for marital status and place of residence, as they were reported only in one study (17) (Table 3).

Meta-regression results

Meta-regression results are presented in Tables 4 and 5.

Admission: There was no significant association between variables and heterogeneity. Tool was the most important variable, whereas gender and insurance were the least important tools (Table 4).

Hospitalization: No significant association was found between variables and heterogeneity. The most important variable was tool and the least important were gender and insurance (Table 5).

Sensitivity analysis

Admission: Inappropriate admission results were found to be stable. The most important study was a study conducted by Hatam. If the study were omitted, the prevalence of inappropriate admission would had been 0.09. The least important study was Nabi Lou and if the study were withdrawn, the prevalence of inappropriate admission would had not been changed (Table 6).

Hospitalization: The results of sensitivity analysis showed stability of the results. The most important study was a study conducted by Tavakoli. If the study were omitted, the prevalence of inappropriate admission would had been 0.11. The least important studies were studies by Masoom Pour and Hatam and if they were withdrawn, the

Table 4. Results of univariate meta-regression for inappropriate admissions

Variable	Number of studies	Beta	P-value	95% CI	
				Down	Up
Hospital	13	0.101	0.738	-0.545	0.748
Tool	13	0.113	0.718	-0.555	0.782
Gender	8	0.095	0.791	-0.674	0.866
Insurance	8	0.096	0.791	-0.674	0.866

Table 5. Results of univariate meta-regression for inappropriate hospitalizations

Variable	Number of studies	Beta	P-value	95% CI	
				Down	Up
Hospital	13	0.141	0.627	-0.473	0.756
Tool	13	0.146	0.614	-0.464	0.757
Gender	8	0.128	0.723	-0.635	0.892
Insurance	8	0.128	0.723	-0.635	0.892

Table 6. Sensitivity analysis for studies included in meta-analysis for admission

Study omitted	Estimate	95% Confidence interval	
		Down	Up
Pourreza (2006)	%10.9	%7.7	%14.1
Bakhtari aghdam (2006)	%11	%7.9	%14.2
Hatam (2007)	%9	%7.7	%13.6
Yaghoubi far (2008)	%11.5	%7.72	%15.31
Fekari (2010)	%11	%7.7	%14.1
Nabilou (2012)	%10.6	%7.7	%13.6
Tavakoli (2012)	%10.3	%7.2	%13.4
Meydani (2013)	%10.6	%7.7	%13.6
Jeddian (2013)	%11	%7.3	%14.5
Masoompour (2014)	%10.6	%7.4	%13.8
Ghods (2014)	%11	%7.7	%14.1
Nekoei moghadam (2015)	%11	%7.8	%14.2
Barouni (2015)	%10.9	%7.7	%14.1
Combined	%10.67	%7.7	%13.6

Table 7. Sensitivity analysis for studies included in meta-analysis for hospitalization

Study omitted	Estimate	95% Confidence interval	
		Down	Up
Pourreza (2006)	%13.6	%10.2	%17
Bakhtari aghdam (2006)	%12.5	%9.2	%15.8
Hatam (2007)	%13.2	%10	%16.4
Yaghoubi far (2008)	%14.4	%10.7	%18.1
Fekari (2010)	%13.8	%10.4	%17.2
Nabilou (2012)	%13	%9.9	%16.2
Tavakoli (2012)	%11	%8	%14
Meydani (2013)	%13.8	%10.4	%17.3
Jeddian (2013)	%14.2	%9.7	%18.7
Masoompour (2014)	%13.2	%10	%16.4
Ghods (2014)	%12.5	%9.3	%15.7
Nekoei moghadam (2015)	%13.6	%10.2	%17
Barouni (2015)	%13.1	%9.9	%16.4
Combined	%13.2	%10	%16.4

[DOI: 10.47176/mjiri.34.2]

Table 8. The reasons for inappropriate hospitalizations

Author	Tool	Reasons
Ghods (2014)	IR.AEP	delay in performing laboratory tests (35%), delay in making medical decision (20%), consultation and diagnostic tests (12%), consultation or physician opinion (9.8%), delay in doing surgery (4.6%), unavailability of physician (3.6%), temporary discharge (3.1%), others (11.9%).
Jeddian (2013)	AEP	Unavailability of physician and no census among physicians (32.9%), patients waiting for all services (29.7%), patients being homeless, aged, and forlorn (18%), canceling the surgery (14.7%), drug preparation (4.7%).
Pourreza (2006)	AEP	Insurance and discharge problems (33.5%), unavailability of physicians (17.4%), waiting time (16.8%), delay in doing surgery (11.4%), delay in sending the results of medical tests (6.8%), a conservative attitude of physicians (6.8%), Others (7.3)
Tavakoli (2012)	AEP	Order of surgery (30.6), conservativeness of physician (21%), consultations (11%), delay in performing surgery (6.8%), lack of bed (1.8%), insurance and payment problems (1.4%), medical test follow up (0.4%), others (27%)
Meydani (2013)	AEP	Problems related to physicians (%44), hospitals (18.2%), patients and their family (37.8%)
Hatam (2007)	AEP	Conservativeness of the physician (27%), diagnostic test follow ups (22%), consultation (15%), insurance problems (13%), delay in doing surgery (11%), absence of physician (7%), others (5%)
Mahfoozpour (2014)	AEP	Waiting for the results of clinical diagnostic tests, delay in timely visits of the physicians, conservativeness of the physician, consultations with other physicians, insurance and discharge problems, delay in doing surgery
Tavakoli (2017)	AEP	Consultations (31.4%), delay in doing surgery (20.3%), conservativeness of the physician (11.8%), waiting for results of clinical diagnostic tests (9.2%), absence of physicians (1.3%), others (26.2%)

prevalence of inappropriate admission would had not been changed (Table 7).

The reasons: Factors associated with inappropriate hospitalization are presented in Table 7. As reported by the studies, inappropriate hospitalization was associated with a delay in performing laboratory tests (35%), absence of physician and lack of census among them (32.9%), insurance and discharge problems (3.5%), order of surgery (30.6%), problems related to physicians (44%) in another study, and conservativeness of the physician (27%) (Table 8).

Quality appraisal: The quality of all studies was high (It was 6 and 7.).

Discussion

Appropriate admissions and hospitalizations are good indications for assessing resource allocation and are regulatory instruments for hospitals. The present study aimed to examine the prevalence of and risk factors behind the inappropriate admission and hospitalization in Iranian hospitals. Systematic review and meta-analysis of 15 studies, including 7251 medical records and 29 247 hospitalization days, demonstrated that the percentage of inappropriate patient hospitalization ranged from 0 to 36% and the percentage of admissions was from 6% to 23% in the hospitals. Considerable differences in the rate of inappropriate days and admissions have been reported in the concerning literature.

The percentage of inappropriate hospital utilization in previous research through AEP in Italy was reported to be 44.6% and 27.69%, which does not support the findings of the present study. This discrepancy can be explained in part by the tool of European-AEP adapted for estimating the admission and length of stay in the Italian study. The findings seem to be consistent with another research conducted in Ireland which found that inappropriate admission was 36.9%. The results revealed that the percentage of inappropriate admission in males and females was 12% and 11%, respectively, while the magnitude of the inappropriate length of stay was 13% and 23%, respectively. Hence, the inappropriate admission rates for men and women are almost the same, whereas the percentage of inappropriate hospitalization in women is higher. The longer inappropriate hospitalization may be caused by the fact that women are more vulnerable than men.

Thijs Reyniers et al, who studied the inappropriate admissions at a university hospital in Belgium, found that the rate of inappropriate admission was 14.4% in men and 11.9% in women (32), which is in line with the findings of the present study. Similarly, a detailed study of an Italian teaching hospital by Gamper et al showed that inappropriate admission rates were 21.5% in men and 34% in women (33). These results are in contrast with those observed in the present study.

According to the results of this study, the more the length of stay in a hospital, the more the inappropriate use of hospital services. This finding is in agreement with the results of San Roman's study (34) which showed a direct correlation between length of stay and the rate of inappropriate utilization of hospitalization care. This is also in accordance with the findings of other studies conducted by Azzurra Massimi et al (35) and Joaquín F(36). A possible explanation for these results may lie in waiting for diagnostic tests which cause a higher length of stay and inappropriate hospitalization rates.

The present study also suggested that the percentage of inappropriate hospitalization is higher among married (16.1%) compared to single individuals (10.9%). Moreover, the results of this study corroborate the findings of a previous work in this field by Gudrun Gamper Wolfgang et al (33). The present findings seem to be consistent with those of another research by Roberta Siliquini who found that the rate of inappropriate admissions in the emergency department was 61.6% for married and 38.4% for single individuals (37). The possible reason is that the married are elder than single people. Therefore, the older the people, the more they use the services.

Based on the I2 test, a random effect model was used due to major differences within the results of the studies (heter-

[DOI: 10.47176/mjiri.34.2]

ogeneity). A meta-regression analysis was performed to detect the true cause of heterogeneity among the studies, and main variables were examined. The results of the analysis showed that no variable was statistically significant. It appears that other factors, such as data collection and data analysis methods, and heterogeneous departments in a hospital may have an effect on heterogeneity.

The results of the sensitivity analysis indicated that concluding findings on inappropriate admissions and hospitalizations were robust and confirmed by other studies. The study by Hatam had the greatest effect on admission results (31), and considering its higher sample size, these results are not unexpected. Similarly, the results of the study by Tavakoli (10) and Yaghoubifar (38) used considerable influence on length of stay.

Results of the present study showed that most of the inappropriate hospitalization days were related to physicians. For one thing, physician practices are not supervised and monitored enough. This issue has led to a fall in physician-related outcomes in the hospitals without paying attention to efficiency and quality of services. For example, a delay in surgical procedures or lack of access to physicians may surge hospitalization days and, as a result, increase the cost of hospitals and health care services. For another, excess hospitalization days are due to the delay in doing laboratory test results leading to extended length of stay. Since laboratory tests constitute a large part of the information on the medical records, delay in reporting them may lead to higher length of stay in the hospitals.

A few merits in this study are worth mentioning. This was the first systematic review and meta-analysis in this area which has been conducted for the first time using comprehensive analyzes such as subgroup analysis, sensitivity analysis, and meta-regression.

The most important limitation of the present study lies in the fact that there was a marked heterogeneity among the studies that may be due to differences in methodology, geographical features in the studies, and data collection methods.

Conclusion

A large number of admissions and hospitalizations are inappropriate; thus, some actions should be taken to reduce them. Although the reasons behind such inappropriateness are very different, it seems that the most important reason is the physicians. Therefore, it is highly suggested to monitor the physicians more than before by formulating some more restricting rules about their delay, absences, etc. They also can be inspected more regularly to ensure that they do their job efficiently, as more they are monitored, the less inappropriate the delivered services will be. Thus, some resources will be saved.

Conflict of Interests

The authors declare that they have no competing interests.

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Appendix 1.

1# Appropriate* [title/abstract]
2# Inappropriate* [title/abstract]
3# 1OR 2
4# Admission* [title/abstract]
5# Care [title/abstract]
6# Stay [title/abstract]
7# hospital admission* [title/abstract]
8# hospital use [title/abstract]
9# 4 OR 5 OR 6 OR 7 OR 8
10# 3 AND 9#
11# Hospital stay [title/abstract]
12# AEP [title/abstract]
13# Hospitalization [title/abstract]
14# Avoidable admission* [title/abstract]
15# Bed utilization [title/abstract]
16# Utilization [title/abstract]
17# Health services misuse [title/abstract]
18# Appropriateness Evaluation Protocol [title/abstract]
19# 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18
20# 10 OR 19
21# Iran [all field]
22# 21 AND 20

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