Research Article

The Rate of Unnecessary Admissions and Hospitalizations in Hospitals in Southwestern Iran

Hojjat Rahmani [ID] [1], Nader Markazi Moghaddam [2,3], Sara Ghahremani [2], Kourosh Abbasiyan [2], Zahra Kavosi [4], Sanaz Zargar Balaye Jame [ID] [2,*]

[1] Department of Health Management and Health Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[2] Department of Health Management and Economics, School of Medicine, AjA University of Medical Sciences, Tehran, Iran
[3] Critical Care Quality Improvement Research Center, Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[4] Health Human Resources Research Center, School of Management and Information Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

[*]*Corresponding Author:* Department of Health Management and Economics, School of Medicine, AjA University of Medical Sciences, Tehran, Iran. Email: sanazzargar@gmail.com

Abstract

Background: Hospitals face challenges such as an increased number of patients, limited bed availability, and nursing shortages. They contend with numerous limited resources that lead to rising costs and work pressure across various hospital sectors. Increasing the length of stay (LOS) of patient is one of the main factors driving up costs.

Objectives: Due to the importance of this issue, this study aimed to determine the rate of unnecessary admissions and hospitalizations in selected hospitals in the city of Shiraz in 2023.

Methods: This is a cross-sectional study conducted in a retrospective and non-interventional manner. In this study, the relationship between the variables of age groups, hospitalization cost coverage, and place of residence with the variables of unnecessary admission and hospitalization was investigated. The data collection tool was the appropriateness evaluation protocol (AEP). The data were analyzed using SPSS version 18 and the *t*-test.

Results: The findings showed that in the hospitals surveyed, out of a total of 245 patients, 38.37% had unnecessary admissions. Also, 39.29% had unnecessary hospitalizations. Unnecessary admission was associated with gender, ward type, treatment type, hospitalization cost coverage, reason for hospitalization, hospitalization history, admission type, day of admission, admission time, and companion status ($P \leq 0.05$). Also, unnecessary hospitalization was associated with the type of ward, type of treatment, place of residence, reason for hospitalization, hospitalization history, type of admission, day of admission, time of admission, and companion status ($P \leq 0.05$).

Conclusions: The high rate of unnecessary hospital resource utilization is primarily a systemic issue addressable through strategic interventions. A combined approach of process re-engineering, primary care reinforcement, and comprehensive health information technology (HIT) integration is essential for optimizing hospital efficiency, reducing inpatient days, and improving overall healthcare delivery.

Keywords: Induced Demand, Health Care Costs, Hospital Admission, Service Utilization, Iran

1. Background

Hospital efficiency and productivity are critical components of a sustainable healthcare system, directly impacting both national economies and patient outcomes (1). A significant body of research has highlighted widespread issues of resource misuse and inefficiency within the health sector, with hospitals being a primary focus of these concerns (2).

Unnecessary hospital admission is defined as a service provided to a patient that yields no significant clinical benefit or one that could have been effectively delivered at a lower level of care (3). Similarly, an unnecessary hospital stay refers to days of hospitalization where the required medical, nursing, or

patient condition criteria for acute inpatient care are not met (4). The factors influencing these phenomena are multifactorial and can be categorized into several domains: Hospital-related factors (e.g., bed availability, workload, organizational complexity) (5), patient-related factors (e.g., age, gender, insurance status, socioeconomic class, place of residence) (6, 7), and clinical process factors (e.g., delays in diagnostics, consultations, and scheduling of procedures) (8, 9).

Prolonged length of stay (LOS) is a key driver of increased healthcare costs (10). Identifying patients at risk of extended hospitalization early in their admission allows for targeted interventions to expedite care and mitigate future capacity problems (11). Both excessively short and long LOS present challenges; a short stay may indicate inadequate care leading to premature discharge, while a long stay can increase waiting lists and disrupt patient flow, underscoring the need for optimal management of this indicator (12).

Globally, healthcare costs are rising relentlessly, and a substantial portion of this financial burden is attributed to hospital inefficiencies, including the provision of unnecessary services (13-19). Research within Iran shows that inappropriate hospital admissions and stays range from 7% to 22% across different regions and timeframes, signaling a critical need for policy changes (20). Inappropriate admissions and hospitalizations represent a weakness in healthcare systems worldwide, including in developed nations and Iran (21, 22). Addressing this issue requires comprehensive information to identify and correct the underlying barriers within hospital management, economic constraints, and cultural contexts (23).

The measurement of unnecessary utilization is often conducted using standardized tools like the appropriateness evaluation protocol (AEP). Unnecessary admission is determined by a checklist of clinical criteria, where the absence of all criteria renders the admission unnecessary (10). For unnecessary hospitalizations, each day of hospitalization is assessed against a separate checklist; a day is deemed unnecessary if no criteria for medical services, nursing services, or patient condition are met (4).

Key indicators of hospital performance, such as urgent admission rates, bed occupancy, and bed turnover, are affected by these practices. Unnecessary admissions signal deficiencies in primary care, discharge planning, and the availability of alternative, lower-technology treatment options (24). Beyond pure clinical need, admissions are influenced by factors such as physician knowledge and skill, patient socioeconomic status, access to diagnostics, and even hospital economic motivations (25, 26). Studies have shown that unnecessary admissions are more prevalent among younger patients, those living near the hospital, and individuals from lower socioeconomic backgrounds (27).

The consequences of unnecessary hospital use are far-reaching, leading to increased costs, hospital-acquired infections, reduced service quality and patient satisfaction, higher mortality rates, and ultimately, decreased overall hospital productivity (28). Therefore, measuring the rate of inappropriate admissions, identifying their root causes, and implementing strategies to avoid them are essential steps toward reducing wasteful expenditure, improving service quality, and enhancing access for those in genuine need (29).

A synthesis of existing literature identifies several core factors affecting the LOS, which can be grouped into: Human resources (e.g., skill mix of doctors and nurses), clinical processes (e.g., discharge procedure timing, emergency department throughput), organizational and regulatory factors (e.g., nurse-to-patient ratios, inter-departmental coordination), and service availability (e.g., access to para-clinical and diagnostic services) (30-44).

Integrating and consolidating the evidence from these studies provides a robust foundation for evidence-based decision-making by health policymakers and hospital managers. While the issue of unnecessary hospitalization is global, localized data is crucial for effective intervention. Conducting this study in Shiraz is particularly necessary for several reasons. As a major metropolitan hub and the capital of Fars province, Shiraz is a primary referral center for specialized medical care in southern Iran, attracting a large and diverse patient population. This high patient load places immense pressure on its healthcare resources, making efficiency a critical concern. Furthermore, previous studies on hospital efficiency in Iran have often focused on Tehran or other regions, and there is a scarcity of recent, comprehensive data specific to Shiraz's hospitals.

2. Objectives

This study aims to investigate the rate of inappropriate admission and hospital hospitalization in Shiraz hospitals based on the criteria established by the AEP.

3. Methods

This was a cross-sectional study conducted in a retrospective and non-interventional manner. The measurement tool in this study was the AEP, whose validity and reliability have been confirmed in several studies. Given the retrospective nature of the study, the patient history was reviewed by an emergency medicine resident who was not professionally affiliated with the hospital.

After reviewing each patient's file, it was determined whether or not their admission was necessary, and all of their days of hospitalization were also assessed using the appropriateness and necessity assessment protocol. In addition, some background information about the patient, such as age group, gender, type of ward, type of treatment, admission method, hospitalization cost coverage, place of residence, reason for hospitalization, hospitalization history, type of admission, day of admission, time of admission, and companion status, was collected and recorded. After collecting information, the data were analyzed using SPSS version 18 software at two levels of descriptive and analytical statistics.

Data were collected in 2023 from admissions and inpatients of two selected 64-bed general hospitals in Shiraz. Both hospitals are governmental and non-teaching. The sample size of the study was determined using the Cochran formula for an unlimited population and considering the variables, which were a combination of qualitative and quantitative variables, as follows. In this study, there were 245 participants, which was calculated using the following formula:

$$n = \frac{Z^2_{1-a/2} \times p \times (1-p)}{d^2} \tag{1}$$

Considering p = 20% (according to previous studies), d = 0.05, and α = 0.05, this resulted in a sample size of 245 participants. The sampling method was a multi-stage stratified random sampling method, in which two hospitals in Shiraz were considered, and from each hospital, three days per week, two wards from each hospital, and two patients in each ward were randomly selected. In the sample selection method, first, by visiting the emergency and internal-surgical departments of the first hospital and the emergency and women's departments of the second hospital, a list of admitted patients was obtained, and a demographic characteristics table and Table 1 were completed for them. After that, the table of unnecessary hospitalization was completed in the same way as Table 1, but the criteria for hospitalization of patients were examined from three perspectives: Medical services,

nursing services, and criteria related to the patient's condition. Regarding patients whose admission was considered necessary according to the criteria, Table 2 was completed. If the patient's hospitalization was deemed unnecessary, the reason for the patient's stay was determined to be outside the criteria of the AEP, which was identified by answering the open-ended question at the end of the protocol.

In this study, the relationship between independent variables, including age group, gender, type of ward, type of treatment, admission method, hospitalization cost coverage, and place of residence, was examined with the dependent variables of unnecessary admission and unnecessary hospitalization. The data collection tool was the AEP, whose validity and reliability have been proven repeatedly in European and American countries, as well as within the country. This protocol uses a set of objective and targeted criteria to assess the necessity of admission and subsequent days of stay. The AEP can justify the level of care provided to the patient and the severity of the illness, regardless of the diagnosis, based on the presence or absence of these criteria. This protocol includes two checklists. Checklist No. 1 comprises 18 criteria of clinical status, regardless of the diagnosis, to assess whether admission is necessary or unnecessary, with the presence of at least one criterion making admission necessary. Checklist No. 2, which is used to evaluate essential hospitalization days, includes three categories of criteria (medical services, nursing services, patient condition), which encompass a total of 24 criteria, and the presence of at least one criterion for each hospitalization day makes that day essential.

The validity and reliability of the AEP in the study by Eivazi et al. were 92% and 88%, respectively (23). After completing the administrative procedures and observing the principle of confidentiality of the patient's file, the demographic information of the patients, along with the variables under study and checklists No. 1 and 2, were recorded in the form for each patient by accessing the files of the hospitalized patients who were part of the sample. The inclusion criteria for the study were a hospital stay of at least 24 hours, and the exclusion criteria included outpatients.

3.1. Data Analysis Method

After collecting the information, the data were analyzed using SPSS version 18 software at two levels of descriptive and analytical statistics. In the field of descriptive statistics, measures such as frequency, frequency percentage, mean, and standard deviation were used. In the analytical section, the chi-square test was employed in agreement tables to examine the

Table 1. Frequency and Percentage of Necessary and Unnecessary Admissions and Hospitalizations of Patients According to the Mentioned Variables in Selected Hospitals [a]

Variables	Admission	Hospitalization	Type of Admission		Type of Hospitalization	
			Necessary	Unnecessary	Necessary	Unnecessary
Hospital						
No. 1	141 (57.55)	138 (56.43)	93 (65.95)	48 (34.05)	100 (72.46)	38 (54.27)
No. 2	104 (42.45)	107 (43.67)	58 (55.76)	46 (44.24)	73 (68.22)	34 (31.73)
Total	245 (100)	245 (100)	151 (61.63)	94 (38.37)	173 (70.61)	72 (29.39)
Age (y)						
1 - 20	49	20	30 (19.86)	19 (20.21)	32 (18.50)	17 (23.61)
21 - 40	98	40	65 (43.04)	33 (35.10)	59 (34.10)	39 (54.17)
41 - 60	69	28.16	40 (26.49)	29 (30.85)	41 (23.70)	28 (38.89)
61 - 80	17	6.93	9 (5.96)	8 (8.51)	12 (6.94)	5 (6.94)
81 - 100	12	4.91	7 (4.65)	5 (5.33)	10 (5.78)	2 (2.78)
Gender						
Male	89	36.32	60 (39.73)	29 (30.85)	58 (33.53)	31 (43.06)
Female	156	63.68	91 (60.27)	65 (69.15)	95 (54.91)	64 (88.89)
Department type						
Emergency	90	36/73	72 (68.47)	18 (19.14)	79 (45.66)	11 (15.28)
Internal	76	31.02	68 (45.03)	8 (8.51)	65 (37.57)	11 (15.28)
Women	79	32.25	41 (27.15)	8 (8.51)	39 (22.54)	10 (13.89)
Type of treatment						
Internal	154	62.85	84 (55.63)	70 (74.47)	81 (46.82)	73 (10.39)
Surgical	91	37.15	67 (44.37)	24 (25.53)	62 (35.84)	29 (40.28)
How to admit						
Emergency conditions	137	55.91	82 (54.30)	55 (58.51)	79 (45.66)	58 (80.56)
Non-emergency conditions	108	45/09	69 (45.70)	39 (41.49)	67 (37.83)	41 (56.94)
Insurance type						
Relief committee	26	10.61	17 (11.26)	9 (9.57)	14 (8.09)	12 (16.67)
Health insurance	37	15.10	27 (17.88)	10 (10.64)	28 (16.18)	9 (12.50)
Armed forces	133	54.28	78 (51.66)	55 (58.51)	75 (43.35)	58 (80.56)
Social security	49	20.01	29 (19.21)	20 (21.28)	21 (14.12)	28 (38.89)
Location						
Resident	197	80.40	118 (78.15)	79 (84.04)	130 (69.36)	67 (93.05)
Non-resident	48	19.6	33 (21.85)	15 (15.96)	35 (20.23)	13 (18.06)
The cause of admission/hospitalization						
Neoplasms	14	5.71	8 (5.30)	6 (6.38)	10 (5.78)	4 (5.56)
Diseases of the circulatory system	25	20.10	17 (11.26)	8 (8.51)	18 (10.40)	7 (9.72)
Respiratory system diseases	32	13.06	22 (14.57)	10 (10.64)	25 (14.45)	7 (9.72)
Gastrointestinal diseases	70	28.57	39 (25.83)	31 (32.98)	43 (24.86)	27 (37.50)
Musculoskeletal and connective tissue diseases	43	17.55	28 (18.54)	15 (15.96)	30 (17.34)	13 (18.06)
Diseases of the genitourinary system	20	16.8	14 (9.27)	6 (6.38)	15 (8.67)	5 (6.94)
Pregnancy, childbirth, and postpartum period	31	12.65	17 (11.26)	14 (14.89)	20 (11.56)	11 (15.28)
Other injuries and symptoms	10	4.1	6 (3.97)	4 (4.26)	8 (4.62)	2 (2.78)
Hospitalization history						
Yes	170	69.38	97 (64.24)	73 (77.66)	120 (69.36)	50 (69.44)
No	75	30.62	54 (35.67)	21 (22.34)	50 (28.90)	25 (34.72)
Type of admission						
Hospitalization	144	58.77	90 (59.60)	54 (57.45)	97 (56.07)	47 (65.28)
Temporary hospitalization	101	41.23	61 (40.40)	40 (42.55)	65 (37.57)	36 (50)
Admission day						
Holiday	144	58.77	53 (35.10)	34 (36.17)	55 (31.79)	32 (44.44)
Non-holiday	101	41.23	98 (64.90)	60 (63.83)	115 (66.47)	43 (59.72)
Admission time						
Morning (12 midnight to 12 noon)	149	60.89	98 (64.90)	51 (54.26)	108 (62.43)	41 (56.94)
Afternoon (12 noon to 12 midnight)	96	39.18	53 (53.10)	43 (45.74)	80 (46.24)	16 (22.22)
Does the patient have a companion?						
Yes	107	43.68	87 (57.62)	20 (21.28)	97 (56.07)	10 (13.89)
No	138	56.32	64 (42.38)	74 (78.72)	75 (43.35)	63 (87.50)

[a] Values are expressed as No. (%).

relationship between the discrete variables (nominal and ordinal) of the study and unnecessary admissions.

Given the non-normality of the distribution of unnecessary hospitalization days, non-parametric tests (Mann-Whitney and Kruskal-Wallis) were used to examine the relationship between this variable and the study variables.

This study is under the supervision of the Ethics Committee of AJA University of Medical Sciences, No. IR.AJAUMS.REC.1402.004 dated 20/06/1402.

4. Results

The study findings show that in the hospitals studied, out of a total of 245 patients, 61.63% had necessary admissions and 38.37% had unnecessary admissions. This was 34.05% in the first hospital and 44.24% in the second hospital. The highest rate of unnecessary admissions was in the emergency department of the second hospital with 42%, and the lowest rate of unnecessary admissions was in the internal medicine department of the first hospital with 28%. In the hospitals studied, 70.61% had necessary hospitalizations and 29.39% had unnecessary hospitalizations, which was 54.27% in the first hospital and 31.73% in the second hospital.

Table 2. Frequency and Percentage of Unnecessary Hospitalizations by Department [a]

Hospital Names	Total Number of Days Hospitalized	Necessary Hospitalization (d)	Unnecessary Hospitalization (d)
No. 1			
Emergency	410	194 (47.31)	216 (52.69)
Internal	309	273 (88.34)	36 (11.66)
No. 2			
Women	360	227 (63.05)	133 (36.95)
Emergency	270	165 (61.10)	105 (38.9)
Total	1349	859 (63.67)	490 (36.33)

[a] Values are expressed as No. (%).

Table 3. Factors Associated with Unnecessary Hospitalization

Main and Sub-factors	No. (%)
Physician-related factors	
Postponement of surgery by the doctor	15 (12.1)
Absence of a doctor	22 (17)
Postponement of surgery by the hospital	3 (2.4)
Hospital-related factors	
Delays in performing and receiving test and imaging results	16 (12.5)
Delay in consultation	15 (12)
Shortage, breakage and breakdown of devices and equipment	1 (8)
Insurance, discharge and financial settlement problems	1 (8)
Delays and procrastination in referring patients to other centers	6 (4.6)
Factors related to the patient and his family	
The patient and his family insist	5 (4)
The patient's financial inability	20 (15.7)
Absence of the patient's family	2 (1.6)
Uncertain causes	21 (16.5)

As shown in Table 1, the majority of patients were between 21 and 40 years old and were female. Most were admitted to the emergency department for non-surgical reasons and were ultimately classified as non-surgical inpatients. The largest proportion of patients were residents of Shiraz, and gastrointestinal diseases were the most common reason for hospitalization. A significant number had a previous history of hospitalization. Most admissions occurred on weekdays and during morning hours. Notably, most patients did not have a companion present.

Of the total 1,349 days of hospitalization in the two hospitals, 859 days (63.67%) were necessary, and 490 days (36.33%) were unnecessary. The highest number of unnecessary days of hospitalization was in the emergency department of the first hospital, with 216 unnecessary days of hospitalization (52.69%), and the lowest number of unnecessary days of hospitalization was in the internal medicine department of the first hospital, with 36 days (11.66%).

The findings in Table 3 show that among the factors related to the doctor, hospital, and patient, hospital-related factors had the greatest impact (42%) on unnecessary patient stays. Physician-related factors accounted for 37%, patient-related factors contributed 27%, and other causes were responsible for 21%.

The results of the study in the area of sub-factors indicated that the most important factor in unnecessary patient stays in the area of "doctor-related factors" was the absence of a doctor, accounting for 22 cases (17%). In the area of "hospital-related factors", the delay in performing tests and imaging was significant, with 16 cases (12.5%). In the area of "patient and family-related factors", the patient's financial inability was a major factor, with 20 cases (15.7%).

4.1. Reviewing Research Hypotheses

4.1.1. First Hypothesis

There is a relationship between the patient's background characteristics (such as age group, gender, type of ward, type of treatment, admission method, hospitalization cost coverage, place of residence, reason for hospitalization, hospitalization history, type of admission, day of admission, time of admission, and comorbid condition) and the rate of unnecessary admissions in hospitals in Shiraz.

Table 4. Investigating the Relationship Between Unnecessary Admissions and Mentioned Variables in Shiraz Hospitals (Chi-square Test) [a]

Variables	Unnecessary Admission	P-Value
Age (y)		0.036
1 - 20	19 (20.21)	
21 - 40	33 (35.10)	
41 - 60	29 (30.85)	
61 - 80	8 (8.51)	
81 - 100	5 (5.33)	
Gender		0.005
Male	29 (30.85)	
Female	65 (69.15)	
Department type		0.001
Emergency	18 (19.14)	
Internal	8 (8.51)	
Women	8 (8.51)	
Type of treatment		0.001
Internal	70 (74.47)	
Surgical	24 (25.53)	
How to admit		0.63
Emergency conditions	55 (58.51)	
Non-emergency conditions	39 (41.49)	
Insurance type		0.001
Relief committee	9 (9.57)	
Health insurance	10 (10.64)	
Armed forces	55 (58.51)	
Social security	20 (21.28)	
Location		0.86
Resident	79 (84.04)	
Non-resident	15 (15.96)	
The cause of admission		0.001
Neoplasms	6 (6.38)	
Diseases of the circulatory system	8 (8.51)	
Respiratory system diseases	10 (10.64)	
Gastrointestinal diseases	31 (32.98)	
Musculoskeletal and connective tissue diseases	15 (15.96)	
Diseases of the genitourinary system	6 (6.38)	
Pregnancy, childbirth, and postpartum period	14 (14.89)	
Other injuries and symptoms	4 (4.26)	
Hospitalization history		0.001
Yes	73 (77.66)	
No	21 (2.34)	
Type of admission		0.001
Hospitalization	54 (57.45)	
Temporary hospitalization	40 (42.55)	
Admission day		0.001
Holiday	34 (36.17)	
Non-holiday	60 (63.83)	
Admission time		0.001
Morning (12 midnight to 12 noon)	51 (54.26)	
Afternoon (12 noon to 12 midnight)	43 (45.74)	
Does the patient have a companion?		0.001
Yes	20 (21.28)	
No	74 (78.72)	

[a] Values are expressed as No. (%).

4.1.2. Second Hypothesis

There is a relationship between the patient's background characteristics (such as age group, gender, type of ward, type of treatment, admission method, hospitalization cost coverage, place of residence, reason for hospitalization, hospitalization history, type of admission, day of admission, time of admission, and companion status) and the rate of unnecessary stays in hospitals in Shiraz.

5. Discussion

In the hospitals surveyed, out of a total of 245 patients, 38.37% had unnecessary admissions, and 39.29% had unnecessary hospitalizations. In some studies, the rate of unnecessary admissions was higher than that of unnecessary hospitalizations. This finding is consistent with our results. Additionally, the rate of unnecessary admissions and its associated factors were completely different from those in the present study (10, 14). There is no significant association between patient age and unnecessary admissions or unnecessary hospital stays. Similar studies have shown that age is not a significant factor in the rate of hospitalization and hospital stays (18, 20-23). Studies conducted around the world also show that age has no effect on unnecessary admissions and unnecessary hospital stays (4, 6, 9). The findings of this study show that there is a significant relationship between gender and unnecessary hospital stays. In this study, the majority of hospitalized patients were women. The results of several studies indicate that

Table 5. Investigating the Relationship Between Unnecessary Hospitalization and Mentioned Variables in Shiraz Hospitals (Mann-Whitney and Kruskal-Wallis Tests) [a]

Variables	Unnecessary Hospitalization	P-Value
Age		0.052
1 - 20	17 (23.61)	
21 - 40	39 (54.17)	
41 - 60	28 (38.89)	
61 - 80	5 (6.94)	
81 - 100	2 (2.78)	
Gender		0.21
Male	31 (43.06)	
Female	64 (88.89)	
Department type		0.001
Emergency	11 (15.28)	
Internal	11 (15.28)	
Women	10 (13.89)	
Type of treatment		0.001
Internal	73 (101.39)	
Surgical	29 (40.28)	
How to admit		0.76
Emergency conditions	58 (80.56)	
Non-emergency conditions	41 (56.94)	
Insurance type		0.48
Relief committee	12 (16.67)	
Health insurance	9 (12.50)	
Armed forces	58 (80.56)	
Social security	28 (38.89)	
Location		0.001
Resident	67 (93.05)	
Non-resident	13 (18.06)	
The cause of hospitalization		0.001
Neoplasms	4 (5.56)	
Diseases of the circulatory system	7 (9.72)	
Respiratory system diseases	7 (9.72)	
Gastrointestinal diseases	27 (37.50)	
Musculoskeletal and connective tissue diseases	13 (18.06)	
Diseases of the genitourinary system	5 (6.94)	
Pregnancy, childbirth, and postpartum period	11 (15.28)	
Other injuries and symptoms	2 (2.78)	
Hospitalization history		0.001
Yes	50 (69.44)	
No	25 (34.72)	
Type of admission		0.001
Hospitalization	47 (65.28)	
Temporary hospitalization	36 (50)	
Admission day		0.001
Holiday	32 (44.44)	
Non-holiday	43 (59.72)	
Admission time		0.001
Morning (12 midnight to 12 noon)	41 (56.94)	
Afternoon (12 noon to 12 midnight)	16 (22.22)	
Does the patient have a companion?		0.001
Yes	10 (13.89)	
No	63 (87.50)	

[a] Values are expressed as No. (%).

women consume more health services than men (17). In the National Health Service Utilization Study in the country, it was also found that women are more likely than men to seek health care services (18). Similar studies also found that women accounted for the majority of hospitalizations (19, 20). Regarding the relationship between inappropriate admission and gender, the results showed that inappropriate admission was significantly higher in women than in men. This can be analyzed by considering that, due to the physical and psychological differences in women compared to men, women have a greater sense of dependence, need, and attention to health. This increases the likelihood of inappropriate admission in women. To address this problem, the establishment and expansion of family physicians and referral systems can

provide reassurance to this segment of society and reduce costs.

Insurance coverage is significantly associated with unnecessary hospital admissions. Most patients admitted to the hospital had insurance coverage, and patients without insurance coverage had a longer average stay than patients with insurance. It can be inferred that people without insurance coverage are likely to have more severe illnesses due to delays in seeking medical attention and therefore have longer hospital stays. In general, the source of payment is an important determinant of healthcare utilization. A study by Nabi Lu shows that insured people have higher rates of health service utilization compared to uninsured people (26).

Before conducting the present study, it was hypothesized that high hospitalization coverage by the insurance organization (especially social security insurance with zero deductible) would increase demand and consequently increase unnecessary hospitalizations. This led to the hypothesis that "insurance coverage is associated with unnecessary hospitalizations", but the opposite was proven.

The type of ward and the type of treatment (non-surgical or surgical inpatient) were two variables that influenced unnecessary hospitalizations. Inappropriate admissions were significantly higher in patients who received non-surgical inpatient treatment. Regarding the variable of ward type, the emergency department had the highest number of inappropriate admissions. Concerning the days of inappropriate hospitalizations, the effect of the two variables of treatment type and ward type on the days of inappropriate hospitalizations was significant.

Regarding the factor of residence, it was also found that this factor is related to hospital stay. A higher percentage of hospitalized patients were city residents. The reasons for hospitalization are also significantly associated with unnecessary admissions and unnecessary hospitalizations. The results of various studies show that the severity and type of illness affect the length of a patient's stay in the hospital (17-25, 31).

The results of this study show that patients hospitalized due to gastrointestinal diseases have more unnecessary admissions and hospitalizations than other patients, which is attributed to the long duration of treatment for these diseases. In this study, there was a significant relationship between admission days on holidays and weekdays with unnecessary admissions and unnecessary hospitalizations. This finding is consistent with the results of several studies. In a national study, 37.3% of unnecessary hospitalizations occurred on Thursdays and Fridays, and 2.09% on other days of the week, indicating a significant relationship between unnecessary hospitalizations on holidays and weekdays (24).

Companion status is another factor affecting unnecessary admission and unnecessary hospital stay, with the LOS for patients with companions being shorter than for those without companions. The negative effect of having a companion on the length of hospital stay is likely due to the fact that patients with companions require fewer days of hospital stay than unaccompanied patients, owing to family support and care in the home environment (26, 27).

The findings of the present study show that one of the main reasons for inappropriate patient hospitalization is "delays for laboratory and radiology tests". Pourreza et al. also mention the follow-up of clinical test results as the fifth most important factor in inappropriate patient stays (1). In fact, physicians believe that in more than 50% of cases, test results delay patient treatment and increase the LOS (21).

Since 60 - 70% of the objective information in patient records is related to laboratory data, delays in reporting laboratory results will subsequently lead to delays in the diagnosis and treatment of patients (34). According to previous studies, there is a significant relationship between laboratory services and laboratory turnaround time (33-35). Many studies have identified mechanisms such as workflow automation, electronic medical record systems, process redesign and reengineering, and point-of-care testing as tools to reduce test cycle times (38-43). Some studies show that redesigning the laboratory workstation and eliminating unnecessary staff turnover can increase laboratory throughput (39, 40). Laboratory workstation redesign and the elimination of unnecessary staff turnover are other approaches that contribute to expediting access to laboratory results and reducing patient LOS. Studies show that turnaround time has been reduced by an average of 87% after implementing laboratory workstation redesign and eliminating unnecessary staff turnover (38-40). The use of process automation tools is suggested as another solution to reduce turnaround time.

The results of this study, in confirmation of other studies, showed that accelerating access to imaging and radiology results and reducing the turnaround time for radiology procedures are other effective factors in reducing the LOS of patients (41). In this area, the use of image archiving and transfer systems and voice recognition technology are additional tools that can reduce the turnaround time for radiology reports and, consequently, the number of unnecessary days of patient stay (42, 43).

The present study showed that hospital postponement of surgery is another factor affecting inappropriate patient stays. Any inappropriate use of the operating room can cause delays in providing care to the patient and, as a result, impose costs on healthcare institutions (44-46). Improving surgical and non-surgical turnaround time is a major consideration for healthcare institutions (44-49). In this context, improving inefficient surgical time through the use of technology, preoperative assessment of high-risk patients and identification of comorbidities, appropriate scheduling and planning of educational, research, and executive activities of surgeons to reduce surgical cancellations, and educating and informing

them about the financial losses resulting from surgical cancellations, as well as redesigning, reviewing, and improving workflows, are effective measures to improve surgical turnaround times (50-53).

In this context, it is recommended that centers or units be designed in hospitals for appropriate preoperative visits and screening of high-risk patients. Additionally, some studies have found that most of the reasons for surgical cancellations were related to surgeons. Setting up a preoperative assessment clinic is one of the mechanisms for reducing surgical cancellations (54, 55). The absence of the surgeon, lack of proper planning regarding the number and sequence of surgeries, prolonged previous surgery, change in the diagnosis of the disease, or transfer of the patient to another department are considered to be the main reasons for surgery cancellation in the hospital (55). Therefore, it is recommended that the possibility of surgical cancellations be reduced as much as possible through appropriate scheduling and planning of educational, research, and executive activities of physicians, as well as training and awareness-raising for them. Here, it may be helpful to remember that the perceptions of healthcare recipients about the service determine their behavior, not its actual effects (56-59).

Finally, the review of studies and the results of this study showed that unnecessary hospital stays are a significant issue driven less by patient demographics like age and more by gender, access factors (insurance, residence), and critical inefficiencies within the hospital system itself. The primary causes are operational bottlenecks, particularly delays in diagnostic services and surgical scheduling. Therefore, the focus for reducing unnecessary hospitalizations should shift from patient characteristics to improving internal hospital processes. Implementing strategic interventions such as workflow automation, pre-operative patient assessment, and better resource planning is essential to enhance efficiency, reduce costs, and optimize the use of hospital beds.

5.1. Conclusions

The study reveals alarmingly high rates of unnecessary hospital admissions and inpatient days, primarily driven by systemic inefficiencies rather than patient demographics. To address this, practical interventions are essential: Implementing automated systems and process redesign to expedite laboratory and radiology results, establishing pre-operative assessment clinics to reduce surgery cancellations, and strengthening primary care networks like the family physician program to manage demand appropriately.

In addition, interventions based on health information technologies, such as the use of hospital information systems (with an increased focus on clinical data recording) integrated with medical image storage and exchange systems, remote consultation, electronic tools for discharge planning and management of specialized consultations, and smart management dashboards, also help reduce LOS by optimizing processes related to patient admission, hospitalization, transfer, and discharge. Collectively, these interventions can improve hospital efficiency, reduce unnecessary utilization, and enhance the overall quality of healthcare delivery.

5.2. Limitations

This study was conducted in two governmental non-teaching hospitals in Shiraz, which may limit the generalizability of the findings to other types of hospitals (e.g., teaching or private hospitals) or other regions of Iran. The retrospective design, which relied on the accuracy and completeness of medical records, is another limitation of this study.

Footnotes

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