

**Factors affecting length of stay in teaching hospitals of a middle-income country**

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**Abstract**

**Introduction:** The length of stay (LOS) in hospitals is a widely used and important criteria for evaluating hospital performance. The aim of this study was to determine factors affecting LOS in teaching hospitals of Qazvin Providence.

**Methods:** In this cross-sectional study, patients' health records were randomly selected from archives in teaching hospitals of Qazvin in 2013. Data were collected through a data entry form and were analyzed using Kolmogorov-Smirnov, Kruskal-Wallis, and Mann-Whitney U tests at the significant level of 0.05.

**Results:** The mean of hospital LOS was  $5.45 \pm 6.14$  days. Age, employment, marital status, history of previous admission, patient condition at discharge, method of payment, and type of treatment had an impact on LOS ( $p < 0.05$ ). Other factors, including gender, place of residence, and type of admission, did not affect LOS.

**Conclusion:** Because hospitals consume a perceptible part of resources in a health system, controlled and optimized use of its resources help to save a lot. Therefore, this study showed many clinical and nonclinical factors affect LOS in evaluating these factors, which may reduce inappropriate hospital stays and decrease costs.

**Keywords:** Length of stay, Clinical and nonclinical factors, Hospital performance, Teaching hospital

**1. Introduction**

Hospitals are an important part of a health system that, in coordination with other parts, provide health to the community. In fact, hospitals have a key role in providing health services; therefore, they have a major impact on the efficiency of a health system (1). The most important tool for evaluating hospital performance is hospital indicators. Among these indicators, length of stay (LOS) in a hospital is one of the most important and simplest indicators that is widely used today. This indicator is used for different goals, including management of hospital care, quality control, appropriateness of using hospital services, and hospital planning (2). LOS in a hospital is the time interval between admission and discharge from the hospital and evaluates bed occupancy and efficiency of hospital wards (3). With little attention to annual cost of hospital beds without considering unavoidable costs, the amount of ineffective and imposed costs, which are forced into a health system because of inappropriate stay of

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patients, will be determined (4). To reduce hospital costs, different parts of health systems vigorously try to reduce unnecessary LOS of patients (5). However, it must be considered that overstaying of patients or staying less than what is really required affects the cost and quality of provided care. Excessive hospitalization increases use of limited resources and cost, while under-hospitalization causes unsatisfactory outcomes in treatment (6). Thus reducing the inappropriate stay of patients in a hospital not only decreases cost and improves hospital performance but also reduces false bed occupancy rate and increases hospital productivity (7). In this regard, Iranian evidence indicates that the highest rate of ALS belongs to the educational hospitals in rich areas with more than 300 beds (4.33 days); in contrast, those non-educational hospitals with 51–300 beds located in poor areas had the lowest ALS with 1.29 days, which is higher than Iranian Ministry of Health and Medical Education's standards (8). These evidences indicate the importance of LOS and its related determinant factors in an Iranian health system. Research showed that LOS is a variable dependent on provided health services and demands for it. Provided health services consist of hospital beds, method of payment and hospital discharge policy; demand for health services include severity of disease, direct and indirect cost of patients, and patient comorbid diseases (9). Tiessen conducted a study in two countries of Japan and Canada, which evaluated factors affecting LOS showed that different factors, including age, gender, type of intervention, type of disease, and many clinical and nonclinical factors, even culture, cause huge difference in LOS between these two countries (10). The result of Yin study indicated that a significant relation existed between level of hospital financial support dependent on patient activity and LOS in elderly people suffering from ischemic heart disease (11). One study in an Arabic county determined that nationality and race had an impact on LOS in hospitals (12). Finally, many studies have assessed clinical and nonclinical factors that are related to patients' LOS, which determine the importance of this topic (13-15). The present study evaluated some of clinical and nonclinical factors having an impact on LOS in teaching hospitals of Qazvin, with the aim of determining these factors and optimizing LOS, which could improve clinical performance and effective utilization of hospital resources.

## 2. Material and Methods

A cross-sectional study was conducted with the aim of evaluating factors that affect patients' LOS in teaching hospitals of Qazvin in the first six months of 2013. The study population was all the hospitalized patients in teaching centers of Velayat, Bo-Alisina, Ghods, and Shahid Rajaie. At first, each of the selected centers were determined as a class, then 640 study samples, which were taken from health records of hospitalized patients, were randomly selected from each hospital in proportion to their active bed. The required data for descriptive and analytical goals of study were extracted from health records using a data entry form. This form had two parts for registering demographic data such as age, gender, marital status, occupation, and place of residence, along with information related to hospitalization, including history of admission to hospital, type of admission, type of treatment, patient condition at discharge, and type of payment for hospital costs. The data entry form was filled at hospital archive with direct surveillance of the researcher. The hospital admission form in the above centers includes a part asking patients if their health records could be used for research purposes with keeping their personal information confidential. The health records of patients who agreed were used in this study; therefore, a separate consent form was not taken for the matter of this study. The study protocol was approved by Regional Committee of Research Ethics at Qazvin University of Medical Sciences. Also in publishing results, the patient's personal information was kept confidential. The data were analyzed using SPSS software version 18 (SPSS Inc. Chicago, Illinois, USA) and Kolmogorov–Smirnov test, but since the dependent variable of LOS did not follow normal distribution, Mann–Whitney U and Kruskal–Wallis tests were used to analyze data. The significant level was considered at 0.05.

## 3. Results

More than half of patients were male (56.6%). The mean of total hospital stay in Qazvin teaching hospitals was  $5.45 \pm 6.13$  days. Among demographic factors gender ( $p = 0.737$ ,  $z = -0.33$ ) and residence ( $z = -0.571$ ,  $p = 0.568$ ) did not affect LOS. The distribution of LOS in Qazvin hospitals based on demographic variables is demonstrated in Table 1. The study results showed that patients with history of previous hospital admission had longer stay (mean LOS = 6.385 days) compared with others (mean LOS = 5.001 days). In regards to patient condition at discharge, those patients who passed away had the longest LOS (7.738 days) and those who were discharged based on personal wishes had the shortest LOS (3.553 days); therefore, patient condition at discharge has an effect on LOS. The type of admission did not affect LOS; there were no significant difference in LOS between those who had elective or emergency admissions. The method of payment for hospital expenses had an influence on LOS in a way that patients who were under Relief Committee insurance (a charity committee that pays for poor people's health expenses) had the longest stay (8.833 days) and patients with no insurance had the shortest stay (2.769 days), so variable methods of payment influences length of stay. In respect to the type of treatment, the mean of LOS in

patients who received medical treatment (5.842 days) was longer than those who received surgical intervention (4.868 days), so the variable type of treatment affected LOS. The distribution of LOS based on clinical and nonclinical variables is demonstrated in Table 2.

**Table 1.** Distribution of LOS in Qazvin hospitals based on demographic variables

Demographic Variables	<i>n</i>	%	Mean	SD	<i>p</i> -value	
Gender	Male	362	56.6	5.51	6.48	0.737
	Female	278	43.4	5.375	5.68	
Marital status	Bachelor	177	27.7	3.875	4.17	<0.001
	Married	463	72.3	6.056	6.64	
Age group (year)	<20	129	20.2	3.938	4.34	<0.01
	21-30	76	11.9	3.664	4.06	
	31-40	56	8.77	4.571	7.25	
	>40	377	56.09	6.465	6.62	
Occupation group	Self employed	107	16.7	5.355	6.32	<0.01
	Employee	26	4.1	6.2	8.16	
	Worker	44	6.9	4.534	4.71	
	Student	66	10.3	3.553	5.53	
	Home maker	223	34.8	5.538	5.89	
	Unemployed	79	12.3	4.607	4.84	
	Retired	94	14.7	7.670	7.79	
Place of residence	Native	256	40	5.858	7.02	0.568
	Non-native	377	58.9	5.185	5.50	
	Unclear	7	1.1	-	-	

**Table 2.** Distribution of LOS based on clinical and nonclinical variables

Variable	Variable Level	<i>n</i>	%	Mean	SD	<i>p</i> -value
History of previous admission	Yes	209	32.7	6.385	6.155	<0.001
	No	431	67.3	5.001	6.092	
Patient condition at discharge	Improved	484	75.6	5.554	5.592	0.002
	Expired	42	6.6	7.738	9.563	
	Discharge with personal wish	39	6.1	2.842	1.990	
	Transfer to another health center	7	1.1	3.857	3.933	
	Unclear	68	10.6	-	-	
Type of admission	Elective	234	36.6	5.536	5.994	0.525
	Emergency	405	63.3	5.406	6.241	
Method of payment	No insurance	40	6.25	2.769	3.316	<0.001
	Treatment services	206	32.18	6.085	6.641	
	Social Security	330	51.56	4.951	4.866	
	Army	23	3.59	8.326	12.285	
	Relief committee	18	2.81	8.833	10.798	
	Health Deputy of Ministry of Health	12	1.87	6.250	6.648	
Type of treatment	Other	11	1.71	6	4.604	
	Surgery	255	39.8	4.868	5.597	
	Medical	385	60.2	5.842	6.456	

#### 4. Discussion

The mean LOS in teaching centers of Qazvin Medical Sciences University was  $5.45 \pm 6.14$  days. Among four evaluated hospitals, the Velayat Hospital with mean LOS of 7.57 days had the longest, and Ghods Hospital with mean LOS of 3.76 days had the shortest LOS in hospital. It could be related to the fact that the newly established Velayat Hospital with 160 active beds admits patients in a variety of therapeutic range and different specialties, which could affect LOS. Furthermore, in Ghods Hospital most of surgeries are ENT surgeries, which could be a reason for shorter LOS. Gender did not affect LOS, and the mean LOS was not significantly different between males and females in Qazvin hospitals. This could be explained by the fact that one of the hospitals is only active in

gynecology and obstetrics, and most of deliveries and female surgeries are performed there. However, the Singh study in India showed that gender has an influence on LOS (16). Among different age groups, patients older than 40 years had the longest stay, and age groups between 20 to 30 years old had the shortest stay, so patient age influences LOS. The reason for increased LOS along with age could be the presence of chronic disease in older ages, which required a longer hospital stay. A Lim study in south Thailand showed that age affected LOS, and with increasing age LOS increases as well (17). The current study results indicated that marital status affects LOS, and married patients had longer stays than bachelors, which is similar to the results of other studies (18, 19). Regarding occupation, the retired patients had the longest LOS and students had the shortest. The reason for shorter stays of students could be the existence of acute and early treated diseases among this group. In addition, retired people usually have chronic diseases, which increase their LOS. The results of a previous study in Iran showed that housewives had the shortest LOS (20). The LOS of Qazvin native people was longer than non-natives, while the number of hospitalized non-natives was higher. Because Qazvin's teaching hospitals have good medical facilities and many specialists in different fields, patients from all over the province refer to them for treatment. Studies from other provinces in Iran also had shown that place of residence affect LOS in hospitals (21, 22). In respect to the history of previous hospital admission, the study results showed that patients with this history had longer LOS. A study in one of the Tabriz province's hospitals also had shown that history of previous admission influence LOS (23). In regard to patient condition at discharge, patients who eventually passed away in a hospital had the longest LOS. Other studies also confirmed that patient condition at discharge affected LOS (24, 25). In the present study in 68 reviewed health records, the patient condition at discharge was unclear: the weakness of the HIS system of studied hospitals in documenting patient condition was the reason. In this study, LOS was not significantly different between patients with elective and emergency admissions, so type of admission did not affect LOS. The reason could be inappropriate use of emergency department and admission of non-emergency patients from an entrance way into some teaching medical centers, which require attention and revision of admitting criteria. Freitas in his study in Portugal found a significant relation between type of admission and LOS (26). Bolden also in his study had reported that type of admission has an influence on LOS (27). In regard to method of payment, the LOS was longer in those who were treated for free compared with those who had to pay. Similar to this result, another study in one of Tehran's hospitals showed that LOS in patients who had no insurance was less than those who paid by insurance (28). Other studies also have confirmed the relationship between method of payment and LOS (29, 30). The results of this study showed that the mean LOS was higher among patients with medical treatment compared with those with surgical intervention because general surgeries usually require less hospitalization compared with medical treatments in intensive care departments such as ICU and CCU. The other reason could be performance of global surgeries in studied hospitals, which require more evaluation to assess its effect on LOS. Some other studies also indicated the effect of type of treatment on LOS (31-33). This study had limitations as follows: the restricted population study that limits the results to Qazvin University of Medical Sciences. In this regard, it is recommended to conduct national surveys for comparing the results in different parts of the country. Furthermore, applying qualitative findings through interviews with hospital management experts can help improve the results.

## **5. Conclusions**

Results of present study showed that many clinical and nonclinical factors such as age, employment, marital status, history of previous admission, patient condition at discharge, method of payment, and type of treatment can affect LOS. Because health system resources are limited, especially in hospitals, knowing these factors can help reducing inappropriate LOS and optimizing use of resources as well. Further studies are recommended to evaluate factors affecting LOS and providing solutions to reduce inappropriate hospital stay.

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## **Conflict of Interest:**

There is no conflict of interest to be declared.

## **Authors' contributions:**

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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