Factors Associated with Prolonged Length of Stay in the Emergency Department Prior to Hospitalization

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ABSTRACT

Objective: The aim of this study was to investigate the factors associated with prolonged emergency department (ED) length of stay (LOS) in inpatients.

Methods: This was a retrospective and cross-sectional study conducted in the adult ED of a tertiary care hospital where approximately half a million patients are examined annually. Between August 1, 2022 and August 1, 2023, patients hospitalized from the adult ED were included in the study. Prolonged LOS was defined as patients who stayed in the ED for at least 8 hours. The relationship between prolonged LOS and patient-related and hospital-related factors was investigated. Mann-Whitney U and chi-square tests were performed statistically.

Results: The median LOS of all patients in the ED was 4.4 h. Prolonged LOS (>8 hours) was independently significantly associated with older age (p=0.009), refugee status (p=0.004), non-urgent triage category (p<0.001), diagnostic tests and imaging (p<0.01), internal ward admission, and night shift arrival (p<0.01).

Conclusion: Several factors were significantly associated with prolonged LOS in the ED. Prolonged LOS can be reduced through the implementation of these strategies designed to address these contributing factors.

Keywords: Emergency department, length of stay, prolonged length of stay, overcrowding

INTRODUCTION

It has been reported that emergency room admissions have increased (1). Emergency department (ED) crowding is an important phenomenon that negatively affects emergency health services (2-4). This phenomenon leads to delayed treatment of emergency patients, decreased service quality, increased costs, and mortality (5-9). Prolonged ED length of stay (LOS) is an important factor that increases ED crowding (10,11). LOS in the ED includes the time between patient registration and discharge from the ED or hospitalization (12,13). At the same time, ED LOS is associated with patient satisfaction (14). It is thought that determining the factors affecting LOS in the ED and making improvements accordingly will increase the quality of emergency health services.

The aim of this study was to evaluate the relationship between prolonged LOS in the ED and factors related to patients and hospitals.

METHODS

Study Design and Settings

This was a retrospective single-center cross-sectional study. University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital is a tertiary care university hospital with 650 beds. Provides healthcare services to a population of approximately one million in its region. In the Adult ED, healthcare services are provided to an average of 1500 patients daily. Three-level triage is used and patients are classified as nonurgent (green), urgent (yellow), and emergent (red) according to their urgency. Emergency laboratory, radiography, ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) are available 24/7. One associate professor, one assistant professor, 13 emergency medicine specialists, 25 emergency medicine assistants, and 10 general practitioners work in the ED.

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Study Population

Between August 1, 2022 and August 1, 2023, 5568 adult patients (age>17 years) admitted to the inpatient ward from the adult ED of University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital were included in the study. Data were obtained anonymously from the Hospital Information Management System. After excluding patients with missing data, patients hospitalized in obstetrics and pediatrics wards, and coronavirus disease-2019 patients, 5240 patients were included in the study.

Methods

ED LOS was determined by calculating the time in minutes between the time of registration and hospitalization. According to the legislation in Türkiye, patients who need hospitalization should not wait more than 8 h in the ED (15). Therefore, prolonged LOS was defined as an ED stay of 8 h. In our study, we focused on patient-related factors such as age, gender, social security, citizenship, and time of arrival, and hospital-related factors such as triage category, urine and blood tests, ultrasound, CT and MRI, and hospitalization.

Approval for the research protocol was obtained from the Clinical Research Ethics Committee of University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital (decision no: 388, date: 22.12.2021). Because our study was a retrospective study based on anonymous data, patient consent was not obtained.

Statistical Analysis

The data evaluation and analysis were conducted using IBM Corp.'s Statistical Package for the Social Sciences version 29.0.2.0 software on Windows. Descriptive characteristics were presented using frequencies (n) and percentages (%), while numerical variables were expressed as median (interquartile range). The normal distribution of the data was assessed using descriptive techniques, including the coefficient of variation, skewness, and kurtosis, along with the Kolmogorov-Smirnov test. The Mann-Whitney U test was used to compare variables that exhibited a non-normal distribution between the two groups. Distribution among categorical variables was assessed using the chi-square test. The findings are presented in the form of a 95% confidence interval. A p-value <0.05 was considered the threshold for statistical significance.

RESULTS

The characteristics of the groups with and without prolonged ED stay and the statistical results between the groups are shown in Table 1. Of the 5240 patients included in the study, 1060 (20.2%) had prolonged LOS and 4180 (79.2%) did not. The median LOS was 4.43 (4.83) hours. A significant relationship was found between older age and prolonged LOS in the ED (p=0.009). Sex distribution was similar between the groups (p=0.099). Almost all patients had insurance (98%) and there was no significant correlation between the presence of insurance and prolonged LOS (p=0.131). It was

found that most of the patients were Turkish citizens (94.7%), 3.8% were Syrian refugees, 1.5% were from other countries, and the LOS of Syrian refugees was significantly longer (p=0.004).

It was observed that 35.6% of the patients had a triage category of nonurgent, 43.9% urgent, and 20.4% emergent at the first presentation, and those with a triage category of nonurgent had a significantly prolonged LOS (p<0.001). Urine test was ordered in 38.2%, blood test in 77.7%, ultrasound in 21.2%, CT in 76.3%, and MRI in 15.4% of the patients, and all of them were significantly associated with prolonged LOS (p<0.001). In addition, 56.2% of the patients were hospitalized in surgical wards, 28.1% in internal medicine wards, and 15.8% in intensive care unit, and those hospitalized in internal medicine wards were significantly associated with prolonged LOS (p<0.01). However, although 19.8% of the patients arrived at night, LOS was significantly prolonged (p<0.001).

DISCUSSION

Prolonged LOS in the ED is important in terms of service quality, patient satisfaction, and evaluation of the administrative processes of the ED (16). It has also been shown that ED LOS over 6 h increases in-hospital mortality and is associated with poor prognosis (17-20). However, according to the study by Richardson (21), the LOS of patients with an ED stay of more than 8 h is also significantly prolonged, which limits the bed utilization capacity.

According to the legislation in Türkiye, it is recommended that emergency patients be hospitalized within 8 h (15). In our study, it was determined that the average LOS was 5.5 h and 20.8% of the patients hospitalized from the ED stayed in the ED for more than 8 h. Targeted LOS varies between studies. In some studies, the cut-off value is not specified, but 4 h, 6 h, 8 h, 12 h, etc. different values were used (22-25). The average LOS in crowded EDs has been reported as 5.8 h (26). However, we obtained a result similar to this in our study.

The initial triage of 35.6% of patients was stated as nonurgent. However, patients admitted to nonurgent triage were found to have significantly longer LOS. First, the fact that a significant proportion of hospitalized patients are triaged as nonurgent shows that triage is not done effectively. For this reason, we observe that the LOS is prolonged. It is thought that this problem can be solved by effective triage.

According to the United Nations, there are approximately 3.6 million registered Syrian refugees in Türkiye (27). Previous studies have shown that language and communication barriers are associated with prolonged LOS (28). In this study as well, a significant association was identified between Syrian refugees and prolonged LOS. Similar results have been reported in previous studies on refugees (29,30). More widespread use of interpreters can reduce prolonged LOS.

Patients hospitalized for internal medicine and older age have prolonged LOS due to having more comorbidities and special needs such as isolation (31,32). Previous studies have also demonstrated that comorbidities prolong LOS in the ED (33-35).

Table 1. Characteristics of patients admitted from the ED to the inpatient ward (n=5240)

| Presenting characteristics | All n (%) | LOS n (%) | | p-value |
		Not prolonged 4180 (79.8)	Prolonged 1060 (20.2)	
Patient-related				
Age				
Median (IQR)	56 (37)	56 (17.104)	58 (34)	0.009[1]
Sex				
Female	2329 (44.4)	1834 (43.9)	495 (46.7)	0.099[2]
Male	2911 (55.6)	2346 (56.1)	565 (53.3)	
Social security				
Secured	5128 (97.9)	4097 (98)	1031 (97.3)	0.131[2]
Not secured	112 (2.1)	83 (2)	29 (2.7)	
Citizenship				
Turkish citizen	4960 (94.7)	3976 (95.1)	984 (92.8)	**0.004[2]**
Syrian	200 (3.8)	141 (3.4)	59 (5.6)	
Other	80 (1.5)	63 (1.5)	17 (1.6)	
Time of arrival				
Night shift	1040 (19.8)	725 (17.3)	315 (29.7)	**<0.01[2]**
Day shift	2377 (45.4)	932 (46.2)	445 (42)	
Evening shift	1823 (34.8)	1523 (36.4)	300 (28.3)	
Hospital-related				
Triage				
Non-urgent	1867 (35.6)	1304 (31.2)	563 (53.1)	**<0.01[2]**
Urgent	2302 (43.9)	2002 (47.9)	300 (28.3)	
Emergent	1071 (20.4)	874 (20.9)	197 (18.6)	
Urine test				
Yes	2004 (38.2)	1341 (32.1)	663 (62.5)	**<0.01[2]**
No	3236 (61.8)	2839 (67.9)	397 (37.5)	
Blood test				
Yes	4073 (77.7)	3042 (72.8)	1031 (97.3)	**<0.01[2]**
No	1167 (22.3)	1138 (27.2)	29 (2.7)	
Ultrasonography				
Yes	1110 (21.2)	724 (17.3)	386 (36.4)	**<0.01[2]**
No	4130 (78.8)	3456 (82.7)	674 (63.6)	
Computed tomography				
Yes	3996 (76.3)	3079 (73.7)	917 (86.5)	**<0.01[2]**
No	1244 (23.7)	1101 (26.3)	143 (13.6)	
Magnetic resonance imaging				
Yes	808 (15.4)	606 (14.5)	202 (19.1)	**<0.01[2]**
No	4432 (84.6)	3574 (85.5)	858 (80.9)	
Inpatient ward				
Surgery	2943 (56.2)	2510 (60)	433 (40.8)	**<0.01[2]**
Medicine	1470 (28.1)	1031 (24.7)	439 (41.4)	
İntensive care unit	827 (15.8)	639 (15.3)	188 (17.7)	
Time of arrival				
Night shift	1040 (19.8)	725 (17.3)	315 (29.7)	**<0.01[2]**
Day shift	2377 (45.4)	1932 (46.2)	445 (42)	
Evening shift	1823 (34.8)	1523 (36.4)	300 (28.3)	

[1]Mann-Whitney U test was applied. [2]Chi-square test was applied. ED: emergency department, LOS: length of stay, IQR: interquartile range

In this study, elderly patients and patients hospitalized in the internal medicine department were significantly associated with prolonged LOS in the ED. Effectively assessing elderly and comorbid patients in the ED, in line with guidelines, and increasing awareness among clinicians and hospital management regarding admission care may contribute to reducing prolonged LOS.

It was found that 19.8% of patients were admitted during the night shift, and these patients were significantly associated with prolonged LOS. Previous studies have reported that access to consultations, investigations, and treatment is more limited during the night shift than during the day (25). Although night shift was found to be associated with prolonged LOS in some studies, there are also studies showing the association of day shift with prolonged LOS (25). This may vary according to population characteristics, region, and hospital and institutional preferences. It is thought that accelerating the health service processes during the night shift will contribute to the solution of the problem.

Study Limitations

Our study has some limitations. First, the fact that our study is a single-center, retrospective study covering only one year weakens its generalisability. In addition, factors that may have a possible effect on prolonged LOS, such as the number of consultations, presence of comorbid diseases, treatments applied, and clinical diagnosis, were not investigated.

CONCLUSION

We identified both patient-related and hospital-related factors associated with prolonged LOS in the ED, including older age, Syrian refugee status, diagnostic tests, admission to internal medicine units, and nighttime arrivals. Prolonged LOS can be reduced through the implementation of these strategies designed to address these contributing factors. Furthermore, multicenter, prospective studies investigating the factors affecting prolonged LOS in the ED should be conducted in the future.

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