

## EVALUATION OF THE FREQUENT APPLICATIONS TO AN UNIVERSITY HOSPITAL EMERGENCY DEPARTMENT: A 1- YEAR REVIEW

*Bir Üniversite Hastanesi Acil Servisine Yapılan Sık Başvuruların Değerlendirilmesi: Bir  
Yıllık İnceleme*

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### ABSTRACT

### ÖZ

**Objective:** Frequent use of emergency departments is an important problem that leads to decreased service quality and increased health costs in these departments. In the present study, the purpose was to analyze the demographic and clinical characteristics of “frequent users” in applications to emergency departments.

**Material and Methods:** In the study, the records of patients, who were aged 18 years and older and who applied to the emergency department of a university hospital in 2016, were analyzed retrospectively. Those who applied to the emergency department between 4 and 9 times were defined as “Low ED Users”, and those who applied for 10 or more were defined as “High ED Users”.

**Results:** In 1 year, a total of 86.287 applications were made to the emergency department by 54.258 patients, during which 5.26% (n=2859) of those who applied to the emergency department applied 4-9 times (Low ED Users) and 0.29% (n=162) applied 10 or more times (High ED Users). Applications made by frequent users (n=16.277) constituted 18.8% of all applications in a year. The most common reason for frequent users’ admission was upper respiratory tract infections and 44.3% of the frequent user referrals were young patients who were under the age of 30. It was found that the patients in the High ED Users group underwent more examination and treatment than the Low ED Users group, and the hospitalization rates were higher in the High ED Users group (p<0.001).

**Conclusion:** “Frequent applications” are made more by young individuals who are under the age of 30 and consist of health problems that do not require emergency care in general. This especially increases the need for medical resources.

**Amaç:** Sık kullanım, acil servislerde hizmet kalitesinin düşmesine ve sağlık giderlerinin artmasına yol açan önemli bir sorundur. Çalışmada, acil servislere yapılan başvurularda ‘sık kullanıcıların’ demografik ve klinik özelliklerinin analiz edilmesi hedeflendi.

**Gereç ve Yöntemler:** Çalışmada bir üniversite hastanesi acil servisine, 2016 yılı içerisinde 18 yaş ve üzerindeki hastalar tarafından yapılan başvurulara ait kayıtlar retrospektif olarak incelendi. Sık kullanıcılardan, 4-9 arasında acil servis başvurusu yapanlar “Acil Servisi Az Kullananlar”, 10 ve daha fazla sayıda başvuru yapanlar ise “Acil Servisi Çok Kullananlar” olarak nitelendirildi.

**Bulgular:** Bir yıllık dönemde acil servise 54.258 hasta tarafından 86.287 başvuru yapıldı. Bu dönemde acil servise başvuranların %5.26’sı (n=2.859) 4-9 kez (Acil Servisi Az Kullananlar), %0.29’u (n=162) ise 10 ve daha fazla kez (Acil Servisi Çok Kullananlar) başvurdu. Sık kullanıcıların yaptığı başvurular (n=16.277), bir yıl içinde yapılan tüm başvuruların %18.8’ini oluşturuyordu. Sık kullanıcıların en sık başvuru nedeni üst solunum yolu enfeksiyonları idi. Sık kullanıcı başvurularının %44.3’ü 30 yaş altı genç hastalardı. “Acil Servisi Çok Kullananlar” grubundaki hastalara “Acil Servisi Az Kullananlar” grubuna oranla daha fazla tetkik ve tedavi işlemi uygulandığı ve hastaneye yatış oranlarının “Acil Servisi Çok Kullananlar” grubunda daha yüksek olduğu belirlendi (p<0.001).

**Sonuç:** Sık başvurular özellikle 30 yaş altı genç bireyler tarafından daha fazla yapılmaktadır. Acil servislere yapılan ‘sık başvurular’ genel anlamda acil bakım gerektirmeyen sağlık sorunlarından oluşmaktadır. Bu durum özellikle tıbbi kaynak ihtiyacını da arttırmaktadır.

**Keywords:** Emergency medicine, frequent admission, frequent users

**Anahtar Kelimeler:** Acil tıp, sık başvuru, sık başvuranlar



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## INTRODUCTION

The demand for emergency departments is increasing all over the world. A total of 144.8 million emergency department applications were made in 2017 In the United States of America, and it was recorded that the cost of the emergency department amounted to 76.3 billion dollars (1). Also, 23.4 million applications were made to emergency departments in 2016-2017 in the UK, which shows that emergency department applications increased by 22% compared to 2008 (2). It was determined that emergency department applications, which were 107.4 million in 2017, reached 93.5 million in 2020 and 129.5 million in 2021 in Turkey, and this increase was 38.4% between 2020-2021 (3).

As the number of accidents, injuries, and unavoidable emergencies increases, the number of emergency applications also increases at a similar rate. However, the increased non-urgent and recurrent admissions increase the burden of emergency departments further (4). Recurrent applications to emergency departments are defined as “frequent use of emergency departments”. Although there are different definitions in the literature, four or more applications per year are generally accepted as frequent use, and those of 10 or more are considered as “overuse” (5,6).

A proportional evaluation was made between frequent users and other patients in emergency department admissions in some previous studies and it was reported that approximately 3.5-29% of emergency department admissions were frequent users. It was also reported that approximately 12.1-67% of all applications to emergency departments were made by frequent users (7). The recurrent applications of frequent users to the emergency departments are considered to be the main reason for the higher ratios between the applications made to the emergency departments and the applicants. Frequent applications increase the workload of emergency departments and may cause crowding (4). Solutions can be made to reduce the frequency of admission by determining the reasons for frequent applications. For this reason, the purpose of the present

study was to examine the clinical and demographic characteristics associated with frequent admissions.

## MATERIALS AND METHODS

It is a retrospective study conducted on all the emergency service visits of the year 2016 (01.01.2016-31.12.2016). The necessary information and data were recorded by using ICD-10 codes. The researchers examined patients who were aged 18 years and older. Patients, who were under the age of 18 and who applied for non-traumatic reasons, were excluded from the study because they were examined by the Pediatric Emergency Department in our hospital. The Adult Emergency Department accepts only patients who are under the age of 18 from the pediatric patient group who apply for trauma-related reasons. These patients under the age of 18 who applied for trauma were calculated only for the purpose of evaluating demographic data in the general population, but were not included in the frequent user patient group.

Patients who applied to the emergency department for 4 or more times were considered as frequent users. In this group of frequent users, those with 4 to 9 applications were defined as "Low ED users", and those with 10 or more applications were defined as "High ED users". The Hospital Information Management System (HIMS) was scanned retrospectively and the data on patients' complaints, chronic diseases, number of hospitalizations, examination, and treatment information were recorded. The Ethics Committee Approval was received from the Regional Ethics Committee to conduct the study (Protocol Number: 2017/92).

### *Place of Study*

The study was conducted in the emergency department of a 3rd level hospital with an annual average of 70 thousand applications in the Black Sea Region of Turkey (8). The green, yellow, and red triage system is used in the emergency department of this university hospital.

*Statistical Analysis*

The descriptive data are given as numbers and percentages (%). The chi-square test was used in the analysis of the categorical data. The suitability for normal distribution was evaluated with the Kolmogorov-Smirnov Test. The data that did not conform to the normal distribution were analyzed by using the Kruskal Wallis and Mann-Whitney U-Test. The relationship between examination and treatment practices and age was evaluated with relationship analysis. The continuous variables were reported with Interquartile Ranges (IQR) and median values. The IBM SPSS Statistics 24.0 program was used in the analyses and statistical significance was accepted as  $p < 0.05$  at the 95% confidence interval.

**RESULTS**

*Demographic Characteristics of the Frequent User Population*

A total of 86.287 applications made by 54.258 patients were evaluated during the study period. It was determined that 5.6% ( $n=3.021$ ) of 54.258 patients who applied to the emergency department were frequent users. Demographic data of frequent users and percentages of chronic diseases are shown in Table 1. The number of applications according to the age range of frequent users is shown in Table 2. In the frequent user group, the most common chronic diseases were hypertension (10.3%;  $n=312$ ), malignancy (9.5%;  $n=289$ ), and heart failure (5.9%;  $n=181$ ). No significant difference was detected between the genders in terms of the frequency of admission ( $p=0.921$ ). A weak, significant, and positive relationship was detected between age and the frequency of admission ( $r=0.068$ ,  $p < 0.001$ ).

**Table 1:** Demographic characteristics of the frequent users population

<i>Demographics and medical history</i>	Frequent Users ( $n=3021$ ) (5.6%)		<i>P</i> value
	High ED Users ( $n=162$ ) (5.4%)	Low ED Users ( $n=2859$ ) (94.6%)	
Age (year (range))	47.9 ±1.617 (18-92)	39.7 ±0.379 (18-97)	<0.001
Gender			
Male, $n^a$ (%)	86 (53.1)	1323 (46.3)	0.921
Female, $n^b$ (%)	76 (46.9)	1536 (53.7)	
Chronic disease, $n$ (%)	104 (64.2)	939 (32.9)	
Number of applications, $n$ (%)	2017 (12.4)	14260 (87.6)	

a, b, the two groups were not statistically significant when compared with the Mann-Whitney U test  $p=0.921$ .

**Table 2:** The number of applications of the frequent users according to age range ( $n=16277$ )

	<i>n</i> (%)	<i>M</i> *	<i>IQR</i> **	Mean rank	<i>p</i>
<b>Low ED users</b>					
≤30	6673 (40.9)	4	1	1411.87	0.060
31-60	4613 (28.3)	4	2	1414.52	
>61	2970 (18.2)	5	2	1496.99	
<b>High ED users</b>					
≤30	546 (3.3)	11	2	69.15	0.025
31-60	867 (5.3)	12	4	92.55	
>61	608 (3.7)	11	3	78.75	
<b>Total frequent users</b>					
≤30	7219 (44.3)	5	2	1462.81	0.001
31-60	5480 (33.6)	5	2	1515.24	
>61	3578 (21.9)	5	2	1611.34	

\*: Median, \*\*: Interquartile range, ED: Emergency department

The examination and treatment applications applied for frequent users are given in Table 3. It was determined that there was a statistically significant, positive, and weak relationship between the frequency of application of the laboratory testing ( $r=0.394$ ,  $p<0.001$ ), radiological imaging ( $r=0.332$ ,  $p<0.001$ ), IV drug

administration ( $r=0.372$ ,  $p<0.001$ ) and ECG ( $r=0.441$ ,  $p<0.001$ ) procedures and age ( $p<0.05$ ). A statistically significant, negative, and weak relationship was found between the frequency of IM injections and age ( $r=-0.204$ ,  $p<0.001$ ).

**Table 3:** The examination and treatment modalities of the frequent users

<i>Examination Methods</i>												
	ECG				Lab				Radiology			
	M*	IQR**	Mean rank	p	M*	IQR	Mean rank	p	M	IQR	Mean rank	p
Low ED users	0	0	1489.77	0.000	2	2	1457.74	0.000	1	2	1464.72	0.000
High ED users	0	1	1885.73		6	5	2441.25		4	4	2327.77	
<i>Treatment Modalities</i>												
	IV treatment				IM treatment							
	M*	IQR	Mean rank	p	M	IQR	Mean rank	p				
Low ED users	1	1	1455.92	0.000	1	2	1487.19	0.000				
High ED users	5	4	2482.98		2	3	1931.19					

\*:Median, \*\*: Interquartile range, ECG: Electrocardiography, Lab: Laboratory, ED: Emergency department

*Reasons for Frequent Users*

The most common complaints in general admission are shown in Table 4, and the distribution of frequent users' complaints by age is shown in Table 5. The number of frequent users according to the shifts are shown in Figure 1.

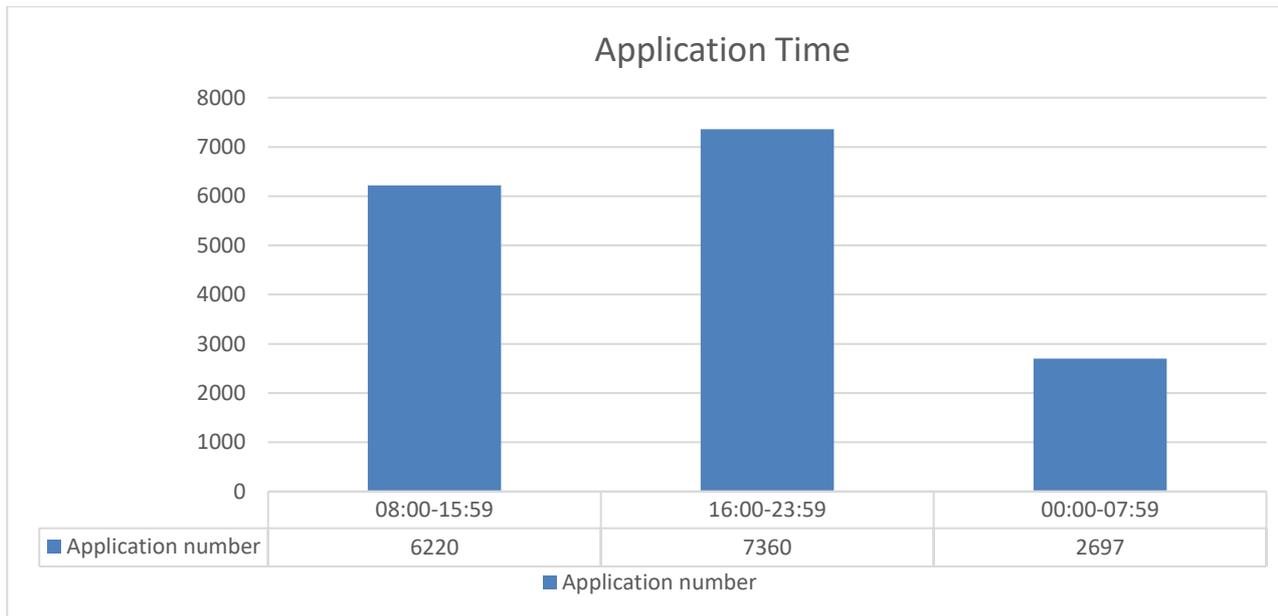
**Table 4:** Admission complaints according to groups (n=86.287)

Complaint	General Population		Low ED users		High ED users	
	n	%	n	%	n	%
Upper respiratory tract diseases	16172	23.1	3092	21.7	279	13.8
Gastrointestinal complaints	11692	16.7	2566	17.9	344	17.1
Applications associated with nonspecific pain	6300	9.0	1895	13.3	304	15.1
Headache	2941	4.2	1101	7.7	97	4.8
Chest pain/cardiac complaints	2240	3.2	770	5.4	199	9.9
Fever	2871	4.1	695	4.9	109	5.4
Lower respiratory tract diseases	1680	2.4	595	4.2	140	6.9
Trauma-related applications	9312	13.3	681	4.8	35	1.8
Psychiatric complaints	910	1.3	372	2.6	68	3.4
Pregnancy-associated	1330	1.9	306	2.2	47	2.3
Cerebrovascular event	1400	2.0	130	0.9	20	0.9
Other	13162	18.8	2030	14.2	363	18.0
Unknown diagnosis	-	-	27	0.2	12	0.6
<i>Total</i>	<i>70010</i>	<i>100</i>	<i>14260</i>	<i>100</i>	<i>2017</i>	<i>100</i>

ED: Emergency department

**Table 5:** Distribution of complaints by age range of frequent users (n=16277)

Complaint	≤30 years	31-60 years	>60 years
	%	%	%
Upper respiratory tract diseases	31.1	17.1	5.5
Gastrointestinal complaints	19.1	18.1	15.1
Applications associated with nonspecific pain	13.1	16.1	9.7
Headache	7.5	8.1	7.0
Chest pain/ cardiac complaints	2.0	5.4	14.9
Fever	3.4	4.9	7.7
Lower respiratory tract diseases	1.2	3.9	12.2
Trauma-related applications	5.6	4.1	2.4
Psychiatric complaints	3.6	2.2	0.6
Pregnancy-associated	3.4	2.1	0
Cerebrovascular event	0.02	1.0	2.7
Other	9.98	16.2	22.2
Unknown diagnosis	31.1	17.1	5.5
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>



**Figure 1:** Frequent user application hours (n=16277)

#### Hospitalization Rates of Frequent Users

It was found that the rate of admissions that ended with hospitalization was 9.3% (n=188) in the high ED users group, 6.9% (n=994) in the low ED users group, and 7.3% (n=1182) in the common users. The median number of hospitalizations in the high ED users group was found to be 11 (IQR: 3) and 4 (IQR: 2) in the low ED users group. The difference between the groups was statistically significant (p<0.001). In terms of the number of hospitalizations, the rate of hospitalization

was found to be significantly higher in the 60 and over age group (Median: 1, IQR: 2) when compared to the other two groups (≤30 Median: 0, IQR: 0; 31-60 Median: 0, IQR: 1) (p<0.001) and no significant differences were detected between genders (p=0.693). It was determined that the median number of applications in the high ED users group was significantly higher than those in the low ED users group in the day shift (high ED users median: 5 IQR: 4; low ED users median: IQR: 2 p<0.001), evening shift (high

ED users median: 4 IQR: 3, low ED users median: 2 IQR: 2  $p < 0.001$ ), and night shift (high ED users median: 1.5 IQR: 2, low ED users median: 1 IQR: 1  $p < 0.001$ ).

## DISCUSSION

In the literature, there is no generally accepted definition for the evaluation of applications made to emergency departments as “frequent” applications (9). In the study conducted by Chan et al., who evaluated five or more applications per year as frequent applications, 3.0% of the patients were found to be frequent users, and the applications made by frequent users were 14.6% of all applications (4). In the study conducted by Fuda et al., who used the same definition, the rate of frequent users was found to be 1%, and the rate of frequent users was 17.6% (10). Hardie et al., who considered four or more applications a year as frequent users, reported that frequent users accounted for 9.4% of all patients and 33.9% of all applications, and Boh et al. determined the rate of frequent users as 5.1% and the application rate to be 20.8%. It was found in this study that frequent users made up 5.6% of the patients and 18.8% of all referrals (11,12). Obtaining different results in studies by using the same definition seems to be associated with the prevalence of frequent use being affected by the health policies, and sociocultural and socioeconomic characteristics of countries.

Previous studies show that the rate of frequent use is high in elderly patients (7,13). However, Fuda et al. reported that the prevalence of frequent use was high in the 25-44 age range and in patients older than 65 years of age (10). Similarly, Milbrett et al. reported that the majority of frequent users were between the ages of 30-54 (14). It was determined in this study that the most frequent users who applied to the emergency department were patients who were younger than 30 years old. The university hospital where the study was conducted is located on the university campus and a significant proportion of the applications are university students. It is considered that this caused recurrent applications made by young patients.

It was reported that the prevalence of chronic diseases is high in the frequent user population and exacerbations of chronic diseases are among the important causes of these frequent admissions (4). In the study conducted by Boh et al., it was reported that 53.3% of frequent users had three or more chronic diseases (12). In this study, it was determined that 34.5% of frequent users had at least one chronic disease and the frequency of chronic disease was significantly higher in the High ED users group (64.2%) than in the Low ED users group (32.9%). The high frequency of chronic diseases in the high ED users group seems to be associated with the high average age of this group. It is considered that regular follow-up and control of chronic diseases will reduce frequent admissions. Right at this point, it is important to strengthen and activate primary health care services.

In the present study, it was found that IM treatment was applied more frequently in patients who were younger than 30 years of age, and IV treatment in patients aged 60 years and above. The fact that IV treatment was more common in elderly patients may be associated with the prevalence of chronic diseases in this patient group and the high level of urgency in admissions. The higher application rates of IM treatment in the group of patients under the age of 30 can be explained by the fact that applications in this group are mostly aimed at alleviating non-specific pain and symptoms. It was also seen in the study that emergency department resources such as examination and treatment applications were used more for the high ED users group. This is considered to be because of the higher average age of the high ED users group and the higher urgency level of their applications. Previous studies also show that frequent users usually apply to emergency departments because of health problems associated with chronic diseases and high urgency (12,15). However, there are also studies reporting that frequent admissions consist of inappropriate emergency department admissions (4). It was reported that the most common causes of frequent admissions are abdominal pain and chest pain, upper respiratory tract disease (URTI), pharyngitis, feeling unwell, social problems, and neurological diseases

(4,16,17). In this study, it was determined that the most common reason for admission in all patient groups (both frequent users and non-users) was URTI. The fact that the applications because of URTI do not require emergency intervention indicates that the majority of the applications are made for non-emergency reasons in patient groups with and without frequent users.

In the study conducted by Boh et al., approximately 47.5% of frequent admissions resulted in hospitalization (12). In the study conducted by Lacalle et al., the hospitalization rate in the high ED users group was found to be 15% (17). In this study, the hospitalization rate was 7.3%, while it was 9.3% in the high ED users group and 6.9% in the low ED users group for general admissions. The high rate of hospitalization in the High ED users group may be because it includes more elderly and chronically ill individuals compared to other groups. Also, the fact that the hospitalization rate of frequent users found in the study is lower than the rest of the world seems to be associated with the fact that the majority of frequent applications are for simple health problems.

Studies that investigated the hours of frequent users applying to the emergency department reported that these applications were often made in the evening times (18,19). Similarly, it was also found in this study that frequent users applied more in the evening hours. The reason for this may be the inability to benefit from family medicine and polyclinic services because of working during working hours. Also, the absence of alternative units providing service for simple health problems, apart from the emergency departments after working hours, is considered to be another factor that causes the intensification of emergency department applications during these hours.

Moore et al. reported that the majority of frequent users were male (15). On the other hand, studies are reporting that the majority of frequent users were women (10). Blank et al., on the other hand, reported no statistically significant differences between genders in terms of the frequency of admission (20). Although it was not statistically significant, it was found in this study that

female patients in the Low ED users group and male patients in the High ED users group were more.

The limitation of the study was that it had a retrospective design and limited data were presented on the patient group who were not frequent users. Also, the digital recording system used in the hospital where the study was conducted evaluated the individuals on the old records, not in the new records, if the same patient applied to the emergency department again within three days after the emergency department application. This is a limitation because it prevented the exact number of frequent users from being known. The fact that the study was conducted in one single center was another limitation. This eliminated the possibility of evaluating the effects that might arise from regional, cultural, and sociodemographic differences. Also, the fact that the hospital where the study was conducted was a 3rd level trauma center where complex patients were admitted more frequently might also have affected the results of this study.

Frequent admissions are mostly made by patients who are aged 30 and younger and for health problems that do not require emergency care (e.g., URTI). As a result of this, the rate of frequent admissions ending in hospitalization is low. In the High ED users group, the rate of use of emergency department resources such as diagnosis and treatment procedures is higher than in the low ED users group. Making primary healthcare services more effective, increasing social awareness, using integrated information and warning systems among health institutions by approaching the health system holistically not only in the hospital where the application is made, and taking administrative and professional measures will prevent frequent applications and abuse and reduce the number of frequent applications along with frequency-related problems.

*Conflict of Interest:* The authors have no conflicts of interest to declare.

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VÖ, PS; Critical Review: VÖ, ÖT, AG; Approver: VÖ, ÖT, AG

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