

Research Article

How Appropriate are The Emergency Department Admissions? A Study From a Tertiary Hospital Emergency Department

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Abstract

Objectives: Healthcare provided in the emergency department (ED) should be nonstop and every patient should be evaluated carefully. This makes EDs open to inappropriate admissions. The improper use of ED is frequent and leads to negative consequences on both patients and the healthcare system. The aim of this study was to evaluate the frequency of inappropriate ED admissions in a tertiary hospital and to investigate the underlying factors associated with inappropriate ED admissions.

Methods: Patients admitted to ED between November 19 and December 2 were evaluated according to the color triage coding and the patient socio-demographic characteristics, complaints and the reason for ED admissions were assessed.

Results: Of the 4847 admissions, 34.9% (n=1695) were found to be inappropriate. The factors that significantly and independently affect inappropriate ED admissions were found to be age <45 years (OR=1.629), male gender (OR=1.467), single or divorced status (OR=1.303), education level of university or higher (OR=1.312), and admission during work hours (OR=1.309).

Conclusion: Inappropriate admission to the ED is quite common. The most crucial measure to be taken in this regard is to strengthen primary healthcare services.

Keywords: Emergency departments, inappropriate admissions, sociodemographic factors, triage

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Emergency Departments (ED) are healthcare providers with the aim of dealing with urgent and life-threatening conditions or health problems for which immediate treatment is needed. Due to the nature of the service, healthcare provided in the ED should be nonstop and every patient should be evaluated carefully. This makes EDs open to inappropriate admissions.^[1] Inappropriate use of ED is generally accepted as the use of ED for health problems that develop without accident or injury, which do not require special ED care, and which can be safely treated in other healthcare institutions, such as primary healthcare telephone advice helplines or pharmacies.^[2]

The improper use of ED is frequent and the percentage of inappropriate ED admissions in different countries has been reported as 5-82%.^[3,4] Obviously this leads to negative consequences on both patients and the healthcare system. Inappropriate ED admissions may prevent patients from forming a bond with primary healthcare providers. It may cause overcrowding in ED, and thus delay the provision of services to those who really need urgent healthcare. It may also lead to reduced healthcare quality and patient satisfaction. In addition, unnecessary emergency applications may cause unnecessary examinations and high costs.^[4]

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Studies have reported that the main motives of inappropriate presentation at ED are proximity to the hospital,^[5] rapid diagnosis and treatment in ED,^[6] lack of accessibility to primary care,^[7] and the misconception of having a serious health condition.^[8]

Very few studies have investigated the suitability of the ED admissions in Turkey. In the light of the aforementioned information, the main goal of this study was to evaluate the frequency of inappropriate ED admissions in a tertiary hospital. The secondary aim was to investigate the underlying factors associated with inappropriate ED admissions.

Methods

Study Type and Setting

This descriptive study was conducted in a tertiary hospital ED. The study period was determined as the two-week period between November 19 and December 2, 2018. All patients admitted to ED in the defined study period were evaluated according to the color triage coding (CTC) designated by the Republic of Turkey Ministry of Health.

The CTC

According to the CTC, patients are classified in three colors: Green, Yellow and Red.

Green Zone

Category 1: Outpatients who are stable in general, waiting for more than 1 hour may cause life-threatening conditions, morbidity or complications due to acute symptoms.

Category 2: Outpatients who are stable in general and have minor health problems. Waiting for 1 to 4 hours does not cause life-threatening conditions, morbidity or complications.

Yellow Zone

Category 1: Patients with life-threatening conditions, risk of limb loss and significant morbidity.

Category 2: Potentially serious conditions with moderate to prolonged symptoms. (Patients with abnormal respiratory rate, pulse, blood pressure, oxygen saturation, body temperature, patients in need of medical treatment and patients with 80% of maximum subjective pain score).

Red Zone

Category 1: Life-threatening conditions in need of a rapid aggressive approach and immediate simultaneous assessment and treatment. In these cases, the patient is instantly taken to the red zone.

Category 2: Life-threatening conditions that need to be evaluated and treated within 10 minutes.

Due to the urgency of their health conditions, yellow and red zone patients were not included in the study. The participating green zone patients were classified as green zone 1 (category 1) and green zone 2 (category 2) according to CTC. While admissions of green zone 1 patients were considered appropriate, admissions of green zone 2 patients were considered inappropriate.

Participants and Data Collection

During the study period, 4847 patients were admitted to ED. Of these admissions, 2606 were referred to the yellow or red zones and were therefore not included in the study. The remaining 2241 patients were green zone patients of whom 546 were evaluated as green zone 1 and 1695 were evaluated as green zone 2 patients. Since 156 patients refused to participate, a total of 2085 green zone patients were included in the study. A brief survey form querying socio-demographic characteristics, complaints and the reasons for ED admissions of patients were applied to all participants with a face-to-face interview.

Exclusion Criteria

Patients presenting with cardiac symptoms, a history of known malignancy, chronic obstructive pulmonary disease, and forensic cases were excluded from the study, regardless of their urgency category.

Statistical Analysis

Statistical analysis of data was performed with Statistical Package for Social Sciences (SPSS) for Windows version 20.0 software (SPSS Inc., Chicago, IL, USA). Descriptive results were expressed as number and percentage. Conformity of the data to normal distribution was evaluated with the Shapiro-Wilk test. The time between the onset of complaints and admission to the ED was evaluated with the Mann Whitney U test. Pearson's Chi-square test was performed to identify the differences in categorical variables between appropriate and inappropriate admissions. A final binary logistic regression model was applied to determine the factors that affect inappropriate admissions.

Ethical Considerations

Participation in the study was purely voluntary. The study was approved by the Scientific Research Ethics Committee of Kahramanmaraş Sütçü İmam University (Decision date: 07.11.2018, Decision number: 14).

Results

A total of 4847 patients were admitted to the ED during the study. According to the triage colour coding, 2606 (53.8%) of these admissions were referred to the yellow or red zones, 546 patients were evaluated as green zone 1 and

Table 1. Sociodemographic characteristics of green zone patients

Sociodemographic characteristics	Total		Green zone 1		Green zone 2		p
	n	%	n	%	n	%	
Age group							
<25 years	607	29.1	107	20.8	500	31.8	<0.0001
25–44 years	1035	49.6	251	48.9	784	49.9	
45–64 years	347	16.7	123	23.9	224	14.3	
≥65 years	96	4.6	33	6.4	63	4	
Gender							
Male	967	46.4	206	40.1	761	48.4	0.001
Female	1118	53.6	308	59.9	810	51.6	
Educational status							
Illiterate	79	3.8	25	4.9	54	3.4	<0.0001
Literate	37	1.8	14	2.7	23	1.5	
Primary school	449	21.5	137	26.7	312	19.9	
Middle school	278	13.3	80	15.6	198	12.6	
High school	456	21.9	94	18.2	362	23	
University graduate or higher	786	37.7	164	31.9	622	39.6	
Income							
Minimum wage or lower	1294	62.1	321	62.5	973	61.9	0.834
More than minimum wage	791	37.9	193	37.5	598	38.1	
Social security							
Public social security	2021	96.9	501	97.4	1520	96.7	0.567
Private health insurance	27	1.3	7	1.4	20	1.3	
Out of pocket payment	37	1.8	6	1.2	31	2	
Having a chronic disease							
Yes	511	24.5	177	34.4	334	21.3	<0.0001
No	1574	75.5	337	65.6	1237	78.7	

1695 patients as green zone 2. Thus, 34.9% of the admissions to the ED were found to be inappropriate.

The median time between the onset of the patients' complaints and their admission to the ED was 8 hours for green zone 1 patients and 48 hours for green zone 2 patients (Mann Whitney U=134.950, Z=-22.806, p<0.0001). Of the green zone patients, 49.6% (n=1035) were between the ages of 25 and 44 years, 53.6% (n=1118) were female and the majority had an education level of high school or above. Certain sociodemographic characteristics of the green zone patients are presented in Table 1.

The 3 most common complaints of all the green zone patients were symptoms of upper respiratory tract infections (URTI) (33.7%), diarrhea (12.9%) and headache (10.4%), respectively. For green zone 1 patients, the most common complaint was stomach ache (21.4%) and for green zone 2 patients it was URTI symptoms (39.8%). The distribution of green zone patients' complaints of at the time of their admission are presented in Table 2.

When the motives for ED admission of the green zone

patients were examined, it was revealed that the most important reason was their proximity to the hospital. This was followed by the speed of diagnosis and treatment in ED (Table 3)

There was no difference in the distribution of green zone 1 and green zone 2 patients according to the day of admission (df=6, $\chi^2=7.538$, p=0.274) (Fig. 1).

A statistically significant difference was determined between the green zone 1 and green zone 2 patients according to the hours of admission (df=5, $\chi^2=24.263$, p<0.0001) (Fig. 2).

As stated in the Methods section, the admission of green zone 2 patients was considered inappropriate. A binary logistic regression model (enter method used) was applied to determine the factors that affect inappropriate ED admissions. The factors that significantly and independently affect inappropriate ED admissions were found to be age <45 years (OR=1.629), male gender (OR=1.467), single or divorced status (OR=1.303), an education level of university or higher (OR=1.312), and admission during work hours (OR=1.309) (Table 4).

Table 2. Most common complaints of green zone patients on admission to ED

Complaints at ED admission	Total		Green zone 1		Green zone 2	
	n	%	n	%	n	%
URTI ^a symptoms ^b	702	33.7	77	15	625	39.8
Diarrhea	268	12.9	92	17.9	176	11.2
Headache	216	10.4	91	17.7	125	8
No complaint (for injection or dressing)	202	9.7	1	0.2	201	12.8
Stomach ache	158	7.6	110	21.4	48	3.1
Musculoskeletal pain ^c	134	6.3	40	7.8	94	6
Fatigue	57	2.7	2	0.4	55	3.5
Urticaria	36	1.7	19	3.7	17	1.1
Dizziness	36	1.7	29	5.6	7	0.4
Dysuria	35	1.7	12	2.3	23	1.5
Other ^d	241	11.6	41	8	200	12.6

ED: Emergency departments; a: Upper respiratory tract infections; b: Symptoms for common cold, flu, sinusitis, tonsillitis, pharyngitis, acute otitis media; c: Neck, waist, back, hip, lower and upper extremity pain; d: Toothache, dysmenorrhea, high blood pressure, for suture removal, opening vascular access, etc.

Table 3. The reasons for green zone patients' applications to ED

Reason for ED application	Total		Green zone 1		Green zone 2	
	n	%	n	%	n	%
Proximity to the hospital	1136	54.5	284	55.3	852	54.2
Rapid results of diagnosis and treatment	338	16.2	91	17.7	247	15.7
Satisfaction with emergency health care	229	11	51	9.9	178	11.3
Absence of healthcare in other health institutions	203	9.7	23	4.5	180	11.5
Perception of a serious health problem	83	4	38	7.4	45	2.9
Other ^a	96	4.6	27	5.2	69	4.4

ED: Emergency departments; a: Suggestion of relatives, accompanying another patient, economic reasons, for blood glucose and blood pressure measurement.

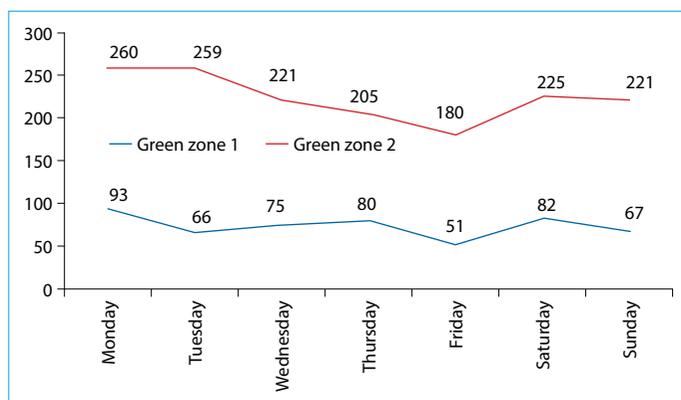


Figure 1. Distribution of green zone patients according to days of admission to ED.

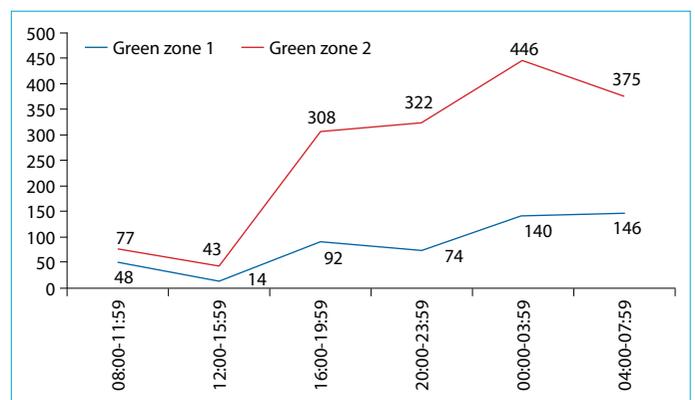


Figure 2. Distribution of green zone patients according to the hours of admission to ED.

A final question was asked to the participating patients of whether they thought their current ED admission was urgent. Strikingly, 21.5% (n=448) of the patients stated that their admission was not urgent. This rate was 6% for green zone 1 patients and 26.5% for green zone 2 patients.

Discussion

This study was conducted to determine the frequency of inappropriate ED admissions and to investigate the underlying causes. In Turkey, only a few epidemiological studies have been conducted on this subject. The frequency of in-

Table 4. Factors affecting inappropriate emergency admissions

Factors	95% CI for Exp(B)				
	B	Exp(B)	Lower	Upper	Sig.
Age below 45 years	0.488	1.629	1.269	2.092	<0.0001
Male gender	0.383	1.467	1.178	1.828	0.001
Single or divorced status	0.265	1.303	1.012	1.678	0.040
An education level of university or higher	0.272	1.312	1.029	1.674	0.028
Income of more than the minimum wage	0.157	1.170	0.923	1.484	0.195
Admission during work hours	0.270	1.309	1.025	1.674	0.031
Admission on a weekday	0.122	1.130	0.885	1.443	0.328

CI: Confidence interval.

appropriate emergency admissions in a study conducted in a state hospital in Turkey was found to be 22.1%,^[9] and in another two studies conducted in tertiary hospital EDs this rate was determined to be 31.2% and 32.2%, respectively.^[10,11] In the current study, a slightly higher proportion (35%) of the admissions were evaluated as inappropriate, which is consistent with the latter studies. It was thought that this result may indicate that ED in tertiary hospitals are more frequently subjected to inappropriate admissions. The frequency of inappropriate ED admission has been reported to vary in different countries; between 9% and 54% in the USA, between 25.5% and 60% in Canada and between 19.6% and 40.9% in Europe.^[3] The different frequency rates found in these various studies could be attributed to the assignment of different criteria regarding the concept of inappropriate admissions.

The 3 most common complaints among patients whose admissions were considered inappropriate (green zone 2) were symptoms of URTI (39.8%), diarrhea (11.2%) and headache (8%), respectively. Moreover, 12.8% of green zone 2 patients presented at the ED with no complaints, but only for an injection or dressing. Similar to these results, Lee et al.^[12] reported that patients inappropriately admitted to ED had respiratory and digestive complaints. Likewise, the above-mentioned study conducted in a state hospital in Turkey counted injection and dressing as common types of inappropriate ED admissions.^[9] All of these health-related issues can be resolved at a primary healthcare level. Primary health care needs to be strengthened on a full-time working basis. Thus, patients will direct their demands to primary care instead of to the ED, which will eventually contribute to the reduction of overcrowding in the ED.

The most important motive behind patients' inappropriate admission to ED was their proximity to the hospital. This was followed by speed of diagnosis and treatment in ED. Relevant studies in the literature have underlined that

proximity, the desire to receive care on the same day of admission and convenience are important causes for non-urgent emergency visits.^[3,4,10-14] Although it is reasonable that patients want to receive healthcare easily and quickly, this should not be achieved in a way that overcrowds the ED unnecessarily. Better provision of health literacy to the general public would help in the appropriate utilization of healthcare services.

In the current study, the sociodemographic factors associated with inappropriate ED admissions were found to be age younger than 45 years, male gender, single or divorced status, and an education level of university or higher. In the literature, studies are predominantly in agreement that there is an inverse relationship between age and inappropriate ED admissions, which is consistent with the current study results.^[10,15-17] Elderly patients may have more chronic and co-morbid conditions and their symptoms tend to indicate more serious health problems than younger adults. The association with gender is controversial in the literature, as some studies have indicated more inappropriate women's admissions,^[10,11,15] some have indicated more inappropriate men's admissions, similar to the current study results,^[18,19] and some have found no associations between inappropriate ED admissions and gender.^[20,21] Afilalo et al.^[22] reported that unnecessary admissions of patients living alone was more frequent. Ersel et al.^[11] found that the suitability of ED admissions of single patients was lower than for other groups, and it was speculated that this could be due to the young age group of single patients, which may also apply to the current study results. Another socio-demographic factor thought to affect ED admissions is education. There is evidence in the literature that with an increasing education level, the probability of inappropriate ED admissions also rises.^[10,11,15,18,23] It can be concluded that there may be a disparity between more and less educated patients in healthcare access. The current study results revealed that inappropri-

ate ED admissions occurred mostly during working hours, when healthcare services other than ED are also active. This situation indicates that at least some patients are referred to ED by outpatient clinics.

Limitations

This study has some limitations. The study period was short and thus the effect of temporal changes such as seasonality could not be assessed. The results cannot be extrapolated to other hospitals since the data of only one ED was evaluated. Finally, the most important limitation of the study was that the comparisons of appropriate and inappropriate patient admissions was only applied to green zone 1 and green zone 2 patients. Although yellow and red zone patients were appropriate admissions, they were not included in the study due to the urgency of their health conditions.

Conclusion

In conclusion, inappropriate admission to the ED is quite common. Moreover, approximately one quarter of the people who present at the ED unnecessarily are aware that their application is not urgent. The most crucial measure to be taken in this regard is to strengthen primary healthcare services. In this way, patients who could utilize the primary healthcare system would not present at the ED, and thus ED overcrowding could be prevented. In addition, inappropriate admissions should be prevented with legal regulations. However, if the regulation is too strict, individuals with a really urgent health problem may also avoid applying to ED. This study can be considered to provide important epidemiological data on inappropriate ED admissions. Further studies are needed to make detailed temporal evaluations by evaluating patient applications over longer periods of time.

Disclosures

Ethics Committee Approval: The study was approved by the Scientific Research Ethics Committee of Kahramanmaraş Sutcu Imam University (decision date: 07.11.2018, decision number: 14).

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