

**ORIGINAL ARTICLE**

# The impact of the duration of admission to the emergency room on the mortality of intensive care patients

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## Abstract

**Objective:** There are many factors affecting the mortality of patients admitted to the intensive care unit (ICU). Among these are the patients' age, diagnosis, and concomitant pathology. The aim of this retrospective study was to investigate whether there is an adverse effect of the time between admission to the Emergency Room (ER) and admission to the ICU on the mortality of these patients.

**Materials and Methods:** The medical records of the patients who were admitted to the Emergency Department (ED) of the Bolu İzzet Baysal State Hospital and subsequently were admitted to the ICU between December 2009 and August 2011 were analyzed in terms of the time of admission, the season of admission, and the waiting and the stand-by times in the ER.

**Results:** A total of 2380 patients, who were admitted to the ED of the Bolu İzzet Baysal State Hospital and subsequently to the ICU, were included in the study. The median waiting time in the ER was 1.23 h (10 min to 10.02 h). After completion of the admission procedures, the median hospitalization time in the ER was 0.16 h (3 min to 2.58 h). There was no statistically significant difference between the patients who died after admission to the ICU and the ones who survived, in terms of the waiting and the stand-by times in the ER ( $P > 0.05$ ).

**Conclusion:** The waiting times at the ED did not affect the mortality of the ICU patients.

**Key words:** Intensive care, mortality, stand-by time

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## Introduction

There are many factors that affect the mortality of patients in intensive care units (ICUs). The morbidity and prolonged hospital stay of critically ill patients are associated with higher health expenditures and costs.<sup>[1]</sup> One of the most effective ways to prevent the high costs is to act quickly and to begin the treatment early. When effective treatment cannot be provided, the process can lead to undesirable results. For this reason, the rapid transfer of the patient to the intensive care unit and a short waiting time at the emergency room (ER) are also important.

Across the United States, the overcrowded ERs have attracted the attention of the hospital administrators, public health officials, and politicians.<sup>[2]</sup> Due to the congestion and the prolonged length of stay in the emergency department (ED), some patients get worse while waiting for the transfer to the post-admission department.<sup>[3]</sup> A variety of public works throughout the country have evaluated the length of stay and the waiting time for admission in the ER.<sup>[4]</sup> The gradual increase in the number of patients in the ER resulted in longer waiting times and

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process of examination.<sup>[5]</sup> Additionally, the waiting time to be examined by an emergency physician in the ER is increasing.<sup>[6]</sup> The prolonged waiting time and length of stay in the ED reduces the quality of care for patients with serious diseases, and increase adverse events.<sup>[6]</sup>

The aim of this retrospective study was to investigate whether there is an adverse effect of the time between admission to the Emergency Room (ER) and admission to the ICU on the mortality of these patients.

## Materials and Methods

Data collected of the patients who consulted the ER at Bolu Izzet Baysal Government Hospital and who were hospitalized between December 2009 and August 2011 was used in this study. The automation system of the hospital was used to identify the season in which the patients consulted the ER, the month, the day, time, examination time, hospitalization decision time, and hospitalization time.

The ER waiting time was defined as the time between patient registration and the hospitalization decision. The hospitalization waiting time was defined as the time from the decision regarding hospitalization to the actual admission to the ICU. Group A included survived patients and Group B included deaths after hospitalization to the ICU.

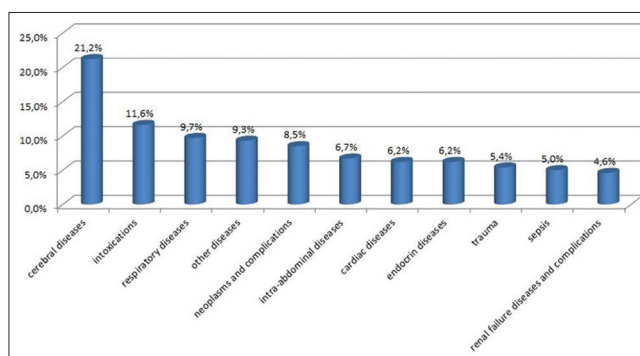
The data was evaluated using Package for the Social Sciences (SPSS, Inc., Chicago, IL), Version 17.0 for Windows statistical program. One-way analysis of variance, *Post Hoc* Tukey test, Independent sample T test as well as Chi-square test were used for statistical evaluation and  $P < 0.05$  was accepted as significant.

## Results

Medical records of 200355 patients who were admitted to the ED of the Bolu Izzet Baysal State Hospital between December 2009 and August 2011 were analyzed. A total of 2380 patients were admitted to the ICU due to various etiologies. Of these, 2314 (97.2%) had survived (Group A) and 66 (2.8%) (Group B) had died after admission to the ICU. The overall mortality rate was 2.77%. The distribution of the diagnoses of the patients admitted to the intensive care unit is shown in [Figure 1].

The mean age of Group A was  $61.45 \pm 20.67$  years. The mean age of 66 patients (Group B), who were admitted to the ICU immediately following admittance to the ER and subsequently died, was  $73.65 \pm 11.77$  years.

The elapsed time until the hospitalization decision in the ER, the median emergency waiting time was 1.23 h (10 min to 10.02 h) in all patients. The median emergency waiting



**Figure 1:** The distribution of the diagnoses of the patients admitted to the intensive care unit

time was 1.23 h (10 min to 9.59 h) for Group A and 0.57 h (10 min to 10.02 h) for Group B. There was no statistically significant difference between groups in this respect. The emergency waiting time was significantly shorter between 20:00-23:00 h compared to the other periods ( $P < 0.05$ ). Depending on the time of the referral, the emergency waiting time was significantly shorter between 00:00-03:00 h and 12:00-15:00 h in Group B ( $P < 0.05$ ).

The elapsed time between the hospitalization decision and patient admission to the ICU, the median hospitalization time to the ICU, was 16 min (3 min to 2.58 h) in all patients. The median hospitalization time in the ER was 16 min (10 min to 02.58 h) for Group A, and 16 min (3 min to 1.50 h) for Group B. No statistically significant difference was detected between the groups in terms of the median hospitalization time. The median hospitalization time was significantly shorter between 00:00-03:00 h and 08:00-11:00 h ( $P < 0.05$ ). Depending on the time of the referral, the median hospitalization time was significantly shorter in Group A between 12:00-15:00 h compared to other time periods ( $P < 0.05$ ).

The highest number of admissions in the ICU was observed in the spring (32%), whereas the highest number of deaths was observed in the summer (95.5%). There was no statistically significant difference between groups in terms of season.

As to the distribution of the admissions in the ICU according to the months, the months with the highest number of admissions were May (11.1%), March (10.6%), July (10.5%), and April (10.2%), while the least number of admissions in the ICU were in September (5%), October (5%) and November (5.5%) [Table 1]. When the months of admission were analyzed in terms of the waiting time for admission in the ED, the emergency waiting time, and the hospitalization time to the ICU, there was no significant difference with respect to the waiting time for hospitalization in the ED. The emergency waiting time was significantly shorter in February, June and December, compared to the other

**Table 1: Relationship and statistical evaluation of the waiting time by months**

	Waiting time			Hospitalization time		
	Group A median	Group B median	P	Group A median	Group B median	P
January	6:40	14:01	,031	0:41	0:27	,633
February	12:37	14:07	,445	0:57	0:27	,132
March	10:55	14:05	,381	0:25	0:29	,970
April	16:19	14:05	,214	0:23	0:25	,764
May	13:22	14:26	,419	0:15	0:25	,571
June	19:39	13:16	,002	0:20	0:28	,517
July	12:23	13:43	,719	0:21	0:28	,674
August	14:56	12:38	,649	0:16	0:25	,799
September	14:56	14:32	,934	0:12	0:29	,556
October	15:09	15:00	,782	0:22	0:33	,749
November	4:26	14:17	,007	0:16	0:26	,798
December	12:32	13:50	,486	0:16	0:31	,493

months ( $P < 0.05$ ). The hospitalization time to the ICU was significantly shorter in February, March, June, July, August, September, October, November and December, compared to the other months ( $P < 0.05$ ).

As to the distribution of the admissions in the ICU according to the days of the week and the weekend, there were no statistically significant differences between the groups, while the patients who died in the ICU were most frequently admitted on the weekend (47%).

The least number of admissions in the ICU occurred particularly between 00:00-08:00 h. There were no statistically significant differences between the groups with regard to the time of referral.

## Discussion

In Turkey, as in the rest of the world, admissions to the ER consist of life-threatening trauma and illnesses that require emergency services. However, the admission of patients not requiring emergency care results in accumulations in the ER.<sup>[7]</sup> Another reason for the accumulations is the delay in transfers to the hospital wards. The transfer to the ICU should be faster than the elective admissions to the wards. The high mortality of intensive care patients increases the importance of this issue. The delays and disruptions in the transfer from the ER to the ICU may affect the future quality of life.

The extreme intensity of patients in the EDs of hospitals has been known for years, and the long waiting times and the delay in management of the patient is considered to be a major problem.<sup>[8]</sup> The changing and the evolving healthcare system in Turkey has provided an easier achievement of the health services for the patients. Parallel to this, the intensity of patients in the EDs has increased. Furthermore, the use

of the ER as the first place of referral/admission is one of the factors that prolongs the waiting time in the ED.<sup>[5]</sup>

As the waiting time at the ER gets longer, the number of patients who leave without medical care increases.<sup>[5]</sup> The recommended waiting time for admission in the ED was determined to be about 15 min.<sup>[9]</sup> The mean waiting time for admission to the ED has been reported to be about 47.4 min.<sup>[10,11]</sup> There are also studies reporting a waiting time for admission to the ED as long as 92.5 min.<sup>[12]</sup> In our study, the waiting time for admission to the ED was  $13 \pm 6$  min. With an effective triage system, there should be 10 min between the discharge of the patient from the ambulance and the examination by the physician.

The recommended emergency waiting time was determined to be  $377 \pm 261.3$  min (13). In our study, the emergency waiting time was  $131 \pm 143$  min. Considering the need for extensive investigations and consultations in this group of patients, this waiting time seems to be reasonable.

In our study, the mean admission time to the ICU was  $24 \pm 23$  min. Considering the distance between the ER and the ICU, this seems to be reasonable. There were no significant differences between the groups, which also supports this conclusion.

There are also studies reporting that there is no difference between the week and the weekend in terms of number of patients referred to the ER.<sup>[13]</sup> In this study, there were no significant differences in terms of the number of referrals to the ER, which implies that the possibility of admission of an intensive care patient remains unchanged throughout the week. It is, however, an important finding that the patients who died were admitted during the weekend. This makes the evaluation of the patients in need of emergency treatment more crucial, especially during the weekend.

The patient density in the ER was reported to increase between 08:00-16:00, 16:00-24:00, and 24:00-08:00 h, respectively.<sup>[14,15]</sup> There are also studies reporting that the maximum number of admittances in the ER takes place between 16:00-24:00 h, with a rate of 50.5%.<sup>[16]</sup> In this study, the highest number of admittances was between 08:00-24:00, whereas there were a few admittances between 24:00-08:00 h. These findings are in accordance with the literature. The process of illnesses usually begins during this time of the day. The fact that there is no significant difference between the groups suggests that the time of referral does not have any impact on the mortality.

In the EDs, the waiting times are prolonged during the peak hours and shortened during periods of reduced density.<sup>[17]</sup> In our ER, the waiting time during 16:00-23:00 h, which are the hours of the maximum density, was not different from any other period throughout the day. This

suggests that these patients received the same attention regardless of how crowded the ER was. The admittances also vary as per the different seasons and are reported to increase in the winter months.<sup>[18]</sup> In our study, patients who were admitted to the intensive care unit were found to reach a maximum in the spring. The patients who died during their stay in the ICU, were most frequently admitted in the summer. This is probably due to the increased number of the acute and fatal events in the summer.

References to the ER were shown to increase between August to January,<sup>[15]</sup> May to August,<sup>[19]</sup> November and February.<sup>[20]</sup> In our study, an increased number of referrals were noted between March and July. The minimum number of referrals was seen in the autumn. This was probably associated with the increase in the population density in our region in the spring and the summer months. The increased number of cerebral events in these months is another reason for the increased need for intensive care services.

## Conclusion

The time of referral during the day had no effect on mortality. In addition, we have demonstrated that the waiting times at the ED did not affect the mortality in ICU patients.

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