

ORIGINAL RESEARCH

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Volume of intensive care unit patients in the emergency department: clinical experience in a training and research hospital**Murat Guzel¹, Şener Cindoruk¹, Mehmet Tevfik Demir¹, Mehmet Yorgun¹, Erdinc Yavuz², Emre Ozgen¹,
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Abstract

There is an increasing tendency for critically ill patients to present to emergency departments (EDs). In this study, it was aimed to assess patients who presented to the ED and admitted to the intensive care unit (ICU) and to identify waiting times in the ED. This retrospective study was conducted by reviewing data from 4904 patients (aged >18 years) who presented to the ED for whom the decision was made for hospitalization in the ICU between January 1st, 2016, and December 31st, 2017. Waiting time in the ED, demographic data, and length of ICU stay were reviewed for 3572 patients who were admitted to ICUs from the ED. The total number of patients who presented to the ED between January 1st, 2016, and December 31st, 2017 was 200,603. Among these patients, the ICU admission rate was 2.4%. Of 4904 patients who presented to the ED and the decision was made for ICU admission, 1332 patients were transferred to other facilities. When these patients were excluded, the ICU admission rate was found as 1.8% in our facility. When time to ICU admission from the ED was assessed, it was found that the shortest time recorded for admission from the ED to the burns unit was 48 minutes. The second shortest waiting time (148 min) was seen in patients admitted to the coronary intensive care unit. The mean waiting time of ICU patients in the ED was 282 min. The increase in the patients who have been decided to hospitalization in the ICU in the ED remains an important problem that should be managed in the ED crowd. Long waiting times for ICU patients in the ED make the already existing crowd more complicated.

Keywords: Emergency department, intensive care, emergency department crowding**Introduction**

Emergency department (ED) crowding is a major global healthcare issue. The increase in patients who require treatment in the intensive care unit (ICU) and the elderly population along with the insufficient number of hospital beds, general increase in ED presentations, delays in laboratory and radiology results, prolonged time of consultations, and ED use for inappropriate presentations leads to crowding of patients in the ED and prolonged stay [1-4]. Longer stay in the ED or non-acceptance to ICUs has resulted in areas known as virtual ICUs in EDs. In these areas, it is attempted to provide intensive care treatment in the ED. However, ICUs are different from EDs due to factors such as specialized care, lower

patient circulation, appropriate equipment, and the presence of a closed area [3]. In this study, our primary objective was to assess patients who presented to the ED and were subsequently admitted to an ICU. The secondary objective was to identify waiting times in the ED.

Material and Methods

This study was approved by the Medical Board of Expertise of the Samsun Training and Research Hospital (Date 30.04.2019, No. 2019/09). This retrospective study was conducted by reviewing data from 4904 patients (aged >18 years) who presented to the ED for whom the decision was made for hospitalization in the ICU between January 1st, 2016, and December 31st, 2017. Patients who had insufficiency in the hospital automation system and did not meet the criteria of intensive care hospitalization were excluded from the study. Overall, 1332 patients were transferred to other facilities due to the lack of available ICU beds. Waiting

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time in the ED, demographic data, and length of ICU stay were reviewed among 3572 patients who were admitted to the ICU. The hospital database was used to extract patient data. Intensive care hospitalization decision was made after the patients were evaluated by the specialist physicians about the department. ICU admissions were classified as level 1, level 2, and level 3 according to the level of ICU admission. Which patient was admitted to the level 1, level 2, and level 3 intensive care units was decided according to the current clinical status of the patient. In addition, ICU admissions were assessed separately according to the type of ICU.

Results

Overall, 200,603 patients presented to Samsun Research and Training Hospital between January 1st, 2016, and December 31st, 2017. Among these, the ICU admission rate was 2.4%. After exclusion of patients who transferred to other facilities from the ED, the ICU admission rate was 1.8% for our hospital. Of the 4904 patients who presented to the ED and decision was made for ICU admission, 1332 patients were transferred to other facilities due to the lack of available ICU beds. Of these, 348 (26%) patients were transferred within working hours and 984 patients (74%) were transferred out of working hours. The patients were most commonly transferred to Cardiology, Internal Medicine and Chest ICUs. In general, the least referred patients were found to have been hospitalized due to surgery. (Table 1).

Table 1. Should change to 'Intensive care unit patients transferred from the emergency department to other hospitals

Departments	Number of patients transferred	Transferred in working hours	Transferred out of working hours	%
Emergency department	124	28	96	9.30
Neurosurgery	61	44	17	4.57
Pediatric surgery	10	2	8	0.75
Infectious diseases	19	5	14	1.42
Gastroenterology	9	2	7	0.67
General surgery	58	15	43	4.35
Thoracic surgery	39	13	26	2.92
Chest diseases	219	75	144	16.44
Internal medicine	224	65	159	16.81
Cardiovascular surgery	14	1	13	1.05
Cardiology	413	57	356	31
Neurology	116	38	78	8.70
Orthopedics	22	2	20	1.65
Plastic surgery	4	1	3	0.30
Total	1332	348	984	100
%	100	26.12	73.87	

Of the patients admitted to our ICUs, 2151 (60.2%) were male and 1421 (39.8%) were female (Table 2).

Table 2. Sex distribution in patients admitted to the intensive care unit

Departments	Male	Female	Total	Discharged
ED ICU	177	155	332	255
General ICU	141	139	280	211
Surgical ICU	311	179	490	326
Medical ICU	206	188	394	237
Coronary ICU	1062	530	1592	1539
CVS ICU	54	33	87	73
Neurology ICU	176	182	358	287
Burns Unit	22	8	30	20
Anesthesia ICU	2	7	9	6
Total	2151	1421	3572	2954
%	60.2	39.8	100	82.7

When time to ICU admission from the ED was assessed, it was found that the shortest time recorded for admission from the ED to the burns unit was 48 minutes. The mean waiting time of ICU patients in the ED was 282 min. The second shortest waiting time (148 min) was seen in patients admitted to the coronary intensive care unit. The waiting times of patients admitted to other ICUs were similar. Table 3 presents the number of patients admitted to ICUs, time to admission to the ICU, and length of ICU stay. The mean length of ICU stay was 13.5 days. The shortest length of stay was recorded in the coronary ICU as 4 days. The mean age of patients admitted to ICUs was 40 years, the youngest age group associated with the burns unit (Table 3). When assessed according to ICU type, it was seen that 45.3% of patients had cardiologic disorders. The second most common disease group was internal diseases (16.5%) (Table 4).

Table 3. Time to admission from the emergency department to the intensive care unit and length of stay in the intensive care unit

	n	%	Age	Time to admission from ED to ICU (minutes)	Length of stay (days)
ED ICU	332	9.3	70	396	13
General ICU	280	7.8	70	385	13
Surgical ICU	490	13.7	62	321	14
Medical ICU	394	11	70	398	15
Coronary ICU	1592	44.6	63	148	4
CVS ICU	87	2.43	56	234	10
Neurology ICU	358	10	68	209	13
Burns unit	30	0.8	40	48	18
Anesthesia ICU	9	0.25	68	398	22
Mean	3572	100	63	282	13.5

Table 4. Patient distribution according to intensive care unit level

	Level 1 ICU	Level 2 ICU	Level 3 ICU	Number of patients	%
Anesthesia and Reanimation	1	0	7	8	0.2
Neurosurgery	13	14	98	125	3.5
Pediatric Surgery	4	0	15	19	0.5
Endocrinology	15	2	11	28	0.7
Infectious diseases	19	7	16	42	1.1
Gastroenterology	46	0	23	69	2
General Surgery	17	6	103	126	3.6
Thoracic Surgery	18	6	70	94	2.6
Chest Diseases	108	13	164	285	8
Hematology	19	1	19	39	1.1
Internal Medicine	297	28	263	588	16.5
Cardiovascular Surgery	6	6	50	62	1.7
Cardiology	1578	4	35	1617	45.3
Nephrology	44	4	46	94	2.6
Neurology	12	275	29	316	8.9
Orthopedics	1	1	22	24	0.7
Plastic Surgery	1	1	28	30	0.8
Urology	-	-	6	6	0.2
Total	2199	368	1005	3572	100
%	61.4	10.4	28.2	100	

Discussion

There is an increasing tendency for critically ill patients to present to EDs [5]. Failure to expand the capacity of ICUs to a level sufficient to meet the needs of care for critically ill patients promotes triage for admission of patients [6]. The aim is to admit patients who would most benefit from ICU care by triage [6,7]. However, failure to admit patients to appropriate critical care areas has led to several problems. Thus, the length of ED stay and crowding in EDs are increasing, resulting in poorer care of quality and increased morbidity and mortality rates [8-13]. In addition, although there are guidelines about admission to ICUs, these guidelines provide insufficient information regarding which patients should be admitted to the ICU or acute care or palliative care areas [14]. In the present study, we intended to assess ED presentations, ICU admissions, and length of ED stay among critically ill patients. It was aimed to assess the process of admission to the ICU in critically ill patients who presented to the ED.

According to 2001-2009 data from the United States National Hospital Ambulatory Medical Care Survey, presentation to EDs by critically ill patients had increased by 79% (from 1.2 million to 2.2 million). The rate of all ED presentations that resulted in ICU admission was found to be increased from 0.9% to 1.6%. Again, in the 2001-2009 period, length of ED stay for critically ill patients was found to be significantly prolonged from 195 to 245 minutes.

It was also observed that one-third of critically ill patients spent more than 6 hours in the ED. Stay in the ED may prolong to hours or even days. Moreover, the length of ED stay has progressively increased over time [5]. In our study, the mean length of ED stay was found as 280 minutes (Table 3), which was higher than our country average and that in other areas of the world [1, 10, 15-17]. In a study on patients admitted to the ICU from the ED, it was found that the mean length of ED stay was 5 hours [1]. In our study, we think that the short waiting times of the patients admitted to the burns unit were due to the fact that they are specialized ICUs and that patients other than those with burns cannot be hospitalized. Furthermore, we believe that the shorter waiting times of the patients admitted to the coronary ICU were due to the fact that they are specialized ICUs and the patient circulation is fast.

The increase in the population of critically ill patients plays an important role in ED crowding; however, delays in admission also result in similar consequences. In other words, both the increased number of critically ill patients and delays in admission results in crowding in the ED [19]. In our study, it was found that 1331 (27%) patients who required admission were transferred to other facilities due to the lack of available beds (Table 1). We think that the reason for this is that the hospital intensive care bed capacity for critical patients cannot meet the demand. In agreement with the literature, it was found that there was a male preponderance (60.2%) among patients who presented to the ED and were subsequently admitted

to the ICU [16]. The mean age of the critically ill patients who were referred to the ICU was 63 years. Our data is similar with the literature from other areas of world [16, 18]. According to data from US National Hospital Ambulatory Medical Care Survey, the mean age of patients requiring admission to the ICU has been increasing [16], which is attributed to the increase in average life expectancy worldwide. With aging, the incidence of chronic diseases and need for hospitalization including the ICU has increased together with the involvement of several clinical specialties. Departments wait for results from other departments and the ED process can be prolonged by orders from these departments. In addition, it becomes challenging to decide to which department patients should be admitted due to several distinct symptoms related to many departments. Together, these factors prolong time to admission. In a study by Simchen et al., the most common causes of admission were reported as pulmonary, cardiac, and neurologic disorders, as well as shock-sepsis [19]. Similarly, in our study, when assessed based on diagnosis, it was seen that cardiac disorders, chest disorders, and neurologic disorders were the most common causes of ICU admission (Table 4). Implementing palliative care facilities providing care for chronic disorders, oncologic problems, and bedridden patients will markedly reduce presentations to EDs by these patients [20-22]. In addition, increasing the number of intermediate care units will shorten the length of ED stay in critically ill patients [22]. It was seen that patients in the ED of our hospital were referred to other hospitals because there was no area where critical ICU-like patients could be followed for critical patient follow-up; one-quarter of patients who required admission were transferred to another facility. For this purpose, we think that intermediate intensive care units could be a solution for critical patient management. For the care and follow-up of these patients, it is important to support them with an experienced health perspective. Chalfin et al. suggested a possible benefit from expeditious transfer of critically ill patients from the ED to the ICU, and the need to further evaluate factors responsible for delayed ICU admission, as well as the specific determinants of adverse outcomes [10]. In our study, although the main reason for the insufficiency of patient transfer to the ICU was the lack of beds, we think that this problem may be different in every ED and necessary precautions should be taken accordingly.

Limitations

There are some limitations in our study. First, our study is the single-centered and may not be generalizable to other hospitals or settings. Second, our study is limited by the retrospective nature

Conclusion

The increase in the patients who have been decided to hospitalization in the ICU in the ED remains an important problem that should be managed in the ED crowd. Long waiting times for ICU patients in the ED make the already existing crowd more complicated. We believe that making the necessary arrangements in terms of health policies related to this patient group will contribute to the ED crowd.

Competing interests

The authors declare that they have no competing interest.

Financial Disclosure

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Ethical approval

This study was approved by the Medical Board of Expertise of the Samsun Training and Research Hospital (Date 30.04.2019, No. 2019/09).

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