

## Do we need to enlarge emergency services or new emergency hospitals?

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### ABSTRACT

**Objective:** It was aimed to obtain a notion about the needed hospital bed capacity by analyzing the number of hospitalizations and referrals from the ER in this study.

**Material and Method:** This study is a retrospective, analytical cross-sectional research. Patients admitted to a tertiary hospital's adult emergency service in 2018-2019, hospitalized, or referred to another hospital were analyzed.

**Results:** Of the patients, 28036 were hospitalized; furthermore, this number corresponded to 38.4 patients per day. Of these cases, 15303 (54.6%) were male, and the mean age was 57.89 ( $\pm 19.5$ ); 8438 cases (30.1%) were admitted to the intensive care unit. The department with the most hospitalizations was internal medicine with 6105 patients (21.78%) and cardiology, with 4822 hospitalized, the most intensive care patients; moreover, psychiatry had the most prolonged length of stay service average of 28 days. The number of patients required to be hospitalized from the emergency room was an average of 48.5 patients per day. The average hospital stay was seven days.

**Conclusion:** Mainly in regions with several emergency admissions, it can be considered to establish emergency hospitals that serve particularly emergency cases to engage the number of patients to be hospitalized from the emergency room.

**Keywords:** Emergency Room, Hospital, Admission

### INTRODUCTION

Emergency services are one of the departments where most patients are examined among the hospital units. According to the National Center for Health Statistics report, several emergency service visits were 130 million (40% of all population) throughout 2018 in the USA, 12.3% of the patients who applied to the USA's emergency department were hospitalized; moreover, 2.3% of them were referred to another hospital (1). According to the Republic of Turkey Ministry of Health data, the just government hospital examination in 2017 was over 90 million in the emergency room; furthermore, this was over 112% of Turkey's population (2).

It is inevitable to undergo density in emergency services where so several cases admit. One of the critical reasons for the emergency services' intensity is that the patients continue to stay in the emergency department due to the lack of suitable empty beds, although the patient's emergency room process is over. It has been reported that each surgical case hospitalized increases the waiting period in the emergency department (3). Also, the decrease in the number of discharges contributes to the emergency department's density, reducing the bed capacity (4). The hospital beds are filled with patients hospitalized from the emergency and elective from the polyclinics (5). Therefore, hospital occupancy causes an increase in emergency room density. The emergency services' density, on the other hand, spreads not only the hospital but also the waiting time of the ambulances, generating the entire emergency health system to be adversely affected. Seeking the solution to expand the emergency service might not present the assumed advantages (6).

The increase in the number of emergency admissions brings together the rise in hospitalizations from the emergency department, necessitates the discussion of whether there are sufficient beds in hospitals.

### Research Article

Received 01-05-2021

Accepted 15-05-2021

Available Online: 16-05-2021

Published 28-05-2021

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Reducing the number of unnecessary patients applying to the emergency department may decrease the emergency department's density. However, it can be thought that people with poor health conditions who need to be hospitalized will continue to apply to the emergency department, and as a result, hospitalizations from the emergency department will continue. Therefore, it is essential to examine hospitalizations and referrals from the emergency department.

It was aimed to contribute to the current medical literature and to obtain a notion about the needed hospital bed capacity by analyzing the number of hospitalizations and referrals from the ER in this study. Thus, the answer to the question asked in the title of the article was endeavored.

## MATERIAL and METHODS

**Research Type:** This study is a retrospective, analytical cross-sectional research.

**Definitions:** While categorizing the branches in the research, each branch's sub-branch was included in the primary department. Data belonging to general surgery sub-branches such as surgical oncology and gastroenterological surgery were combined with the general surgery branch. The data of hematology, endocrinology, gastroenterology, medical oncology, nephrology, and rheumatology sub-branches were affixed to the internal medicine department's data.

Departments such as otorhinolaryngology, ophthalmology, physical therapy and rehabilitation, and dermatology departments, which the emergency service infrequently consults patients, are assorted under the name of "other branches".

Gynecological oncology data has been included in the gynecology department. The palliative service, which admits patients from the intensive care unit, has been accepted as the anesthesia department's ward.

**Inclusion Criteria:** Patients aged 18 and over who applied to Sakarya Training and Research Hospital Adult Emergency Service between 01.01.2018-31.12.2019 and were admitted to the hospital's service and intensive care units were included in the research. Moreover, patients who were referred from the adult emergency room to another hospital due to the lack of patient beds were also included in the research.

**Exclusion Criteria:** Pregnant cases, patients younger than 18 years old, patients admitted to other hospital units, patients with incomplete files were eliminated from the study. The patients left the emergency service by their means, and those who refused treatment were excluded from the study.

**Data Collecting:** The gender, age, intensive care admission status, the total length of stay in the intensive care unit, wards, and hospital, the departments' name in which the patients were admitted from the emergency department, the mortality data of the patients in the service or intensive care unit were obtained from the patient files and the hospital automation system. Data on patients referred from the SEAH adult emergency department to another hospital due to bed insufficiency was collected.

**Statistical Analysis:** The data acquired were analyzed with the IBM Statistical Package for the Social Sciences (SPSS) version 21 program. Skewness and Kurtosis values were

required to be in the range of  $-2/+2$  for the data's normal distribution (1). Chi-square test was used for comparison of categorical data, and results with  $p < 0.05$  were recognized as statistically meaningful. The Mann-Whitney U test was used to compare two independent data groups that were not normally distributed, and the Kruskal Wallis Test was used to analyze more than two independent data groups and results with  $p < 0.05$  were regarded significant.

**Permission:** Approval was obtained from Sakarya Training and Research Hospital Chief Physician's Office on 12.02.2021. Ethical approval was obtained from Sakarya University Medical Faculty, Date: 02.03.2021, No: E71522473-050.01.04-15144-147.

## RESULTS

During the research period, the number of examinations performed in the adult emergency department was 762919. The rate of all hospitalizations from the emergency room to the hospital was 3.7%, the rate of admission to intensive care was 1.1%, and the rate of referral from the emergency service to another hospital was 1%. Of the patients, 28036 from the SEAH adult emergency room were hospitalized; furthermore, this number corresponded to 38.4 patients per day. Of these cases, 15303 (54.6%) were male, 12733 of them (45.4%) were female, the mean age was 57.89 ( $\pm 19.5$ ), the median age value was 61, and the age range was 18-106.

Of these patients, 8438 cases (30.1%) were hospitalized from the emergency room to the intensive care unit. The department with the most maximum hospitalizations was internal medicine, with 6105 patients (21.78%). The cardiology, with 4822 hospitalized the most patients in intensive care. This number was 17.2% of all emergency hospitalized patients and corresponded to 57.15% of all intensive care hospitalizations. The anesthesia department, which followed 95.7% of its patients in intensive care, had the highest intensive care patients rate.

Considering the mortality status, that was determined that the internal medicine department had the highest number of deaths with 1137, and the anesthesia department had the highest mortality rate, with 70.3%. See **Table 1** for gender, intensive care hospitalization, and mortality status of all departments.

Psychiatry had the most prolonged length of stay in service with an average of 28 days (median 24 days), while the most extended hospitalization time in the intensive care unit belonged to the anesthesia with an average of 24 days (median 11 days). See **Table 2** for the patients' service and intensive care stay periods according to all departments.

**Looking at the statistical analysis:** There was a significant discrepancy in mortality between the genders; furthermore, 12.8% of men and 10.8% of women died ( $p=0.001$ ). There is a meaningful distinction between genders and intensive care unit admission, with 35.3% of men and 23.8% of women accepted to intensive care ( $p=0.001$ ). There was also a notable variation among genders and hospitalized departments ( $p=0.001$ ). While women were hospitalized more in psychiatry, gynecology, and internal medicine branches, men were hospitalized increased in all other units.

**Table 1.** Distribution of patients according to the branches

	Gender				Total	ICU State <sup>1</sup>				Mortality Status <sup>2</sup>			
	Male		Female			No		Yes		Alive		Ex	
	Count	% <sup>3</sup>	Count	% <sup>3</sup>		Count	% <sup>3</sup>	Count	% <sup>3</sup>	Count	% <sup>3</sup>	Count	% <sup>3</sup>
Internal medicine	2960	48.5%	3145	51.5%	6105	5095	83.5%	1010	16.5%	4968	81.4%	1137	18.6%
Cardiology	3899	68.5%	1791	31.5%	5690	868	15.3%	4822	84.7%	5087	89.4%	603	10.6%
General surgery	1958	56.1%	1532	43.9%	3490	3129	89.7%	361	10.3%	3193	91.5%	297	8.5%
Neurology	1669	51.4%	1580	48.6%	3249	2608	80.3%	641	19.7%	2898	89.2%	351	10.8%
Orthopedics	1371	58.2%	984	41.8%	2355	2031	86.2%	324	13.8%	2199	93.4%	156	6.6%
Gynecology	0	.0%	1823	100.0%	1823	1803	98.9%	20	1.1%	1817	99.7%	6	.3%
Pulmonology	989	60.7%	639	39.3%	1628	1015	62.3%	613	37.7%	1284	78.9%	344	21.1%
Thoracic surgery	771	78.2%	215	21.8%	986	863	87.5%	123	12.5%	928	94.1%	58	5.9%
Others branches	587	72.1%	227	27.9%	814	779	95.7%	35	4.3%	764	93.9%	50	6.1%
Infectious Diseases	384	50.1%	383	49.9%	767	686	89.4%	81	10.6%	685	89.3%	82	10.7%
Neurosurgery	349	69.0%	157	31.0%	506	399	78.9%	107	21.1%	431	85.2%	75	14.8%
Psychiatry	106	46.9%	120	53.1%	226	222	98.2%	4	1.8%	222	98.2%	4	1.8%
CVS <sup>4</sup>	151	71.2%	61	28.8%	212	92	43.4%	120	56.6%	173	81.6%	39	18.4%
Anesthesia	109	58.9%	76	41.1%	185	8	4.3%	177	95.7%	55	29.7%	130	70.3%
Total	15303	54.6%	12733	45.4%	28036	19598	69.9%	8438	30.1%	24704	88.1%	3332	11.9%

<sup>1</sup>The patient's state of admission to intensive care from the emergency department

<sup>2</sup>Mortality status after hospitalization from the emergency department, before discharge from the hospital

<sup>3</sup>Percentage in the relevant branch

<sup>4</sup>Cardiovascular surgery

**Table 2.** Patients' duration of hospitalization according to the branches

Branches	Length of Stay in Service			Length of Stay in ICU			Total Length of Stay in Hospital		
	Count	Mean	Median	Count	Mean	Median	Count	Mean	Median
Anesthesia	8	9	11	177	24	11	185	25	12
Neurosurgery	399	3	2	107	11	4	506	6	3
Infectious Diseases	686	7	6	81	9	5	767	8	6
General surgery	3129	4	3	361	6	3	3490	5	3
Thoracic surgery	863	7	5	123	4	2	986	8	6
Pulmonology	1015	9	8	613	11	6	1628	12	8
Internal medicine	5095	5	3	1010	8	4	6105	6	4
Gynecology	1803	3	2	20	9	1	1823	3	2
Cardiovascular surgery	92	15	5	120	4	2	212	13	5
Cardiology	868	4	3	4822	3	2	5690	5	3
Neurology	2608	6	5	641	14	5	3249	8	5
Orthopedics	2031	7	5	324	7	3	2355	8	6
Psychiatry	222	28	24	4	17	3	226	28	24
Others branches	779	5	3	35	3	2	814	5	4
Total	19598	5.4	4	8438	6	2	28036	7	4

**Table 3.** Patients' statistics

	Service Duration	ICU Duration	Total Duration	Gender	ICU Status <sup>1</sup>	Mortality <sup>2</sup>	Branches
Gender	p=0.163 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.001 <sup>a</sup>	N/A	p=0.001 <sup>b</sup>	p=0.001 <sup>b</sup>	p=0.001 <sup>b</sup>
ICU Status	N/A	N/A	p=0.001 <sup>a</sup>	p=0.001 <sup>b</sup>	N/A	p=0.001 <sup>b</sup>	p=0.001 <sup>b</sup>
Mortality	p=0.001 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.001 <sup>a</sup>	p=0.001 <sup>b</sup>	p=0.001 <sup>b</sup>	N/A	p=0.001 <sup>b</sup>
Branches	p=0.001 <sup>c</sup>	p=0.001 <sup>c</sup>	p=0.001 <sup>c</sup>	p=0.001 <sup>b</sup>	p=0.001 <sup>b</sup>	p=0.001 <sup>b</sup>	N/A

<sup>a</sup>Mann-Whitney U test results

<sup>b</sup>Pearson Chi-Square test results

<sup>c</sup>Kruskal Wallis test results

<sup>1</sup>The patient's intensive care unit admission

<sup>2</sup>Mortality status of the patient

A critical relationship was found between mortality and hospitalization in intensive care (p=0.001). While 7% of the cases who were not admitted to the intensive care unit died, 23.1% of the patients hospitalized in the intensive care unit died. A significant deviation was found within mortality and departments (p=0.001). Thus, anesthesia was perceived to have the most extraordinary mortality rate with 70.3%, pulmonology 21.1%, internal medicine 18.6%, cardiovascular surgery 18.4%.

While gender had no significant impact on hospital stay duration (p=0.163), it was observed that it significantly influenced intensive care duration and total days of hospital stay (p=0.001).

Hence, men stayed in the intensive care unit and hospital for a more sustained whole time.

Staying in intensive care had a stimulating effect on the whole hospitalization days (p=0.001); moreover, the total length of stay in the intensive care unit was prolonged. See **Table 3** for statistical outcomes.

The referring from the emergency department cases' number was 7391 due to insufficient hospital bed capacity. This situation confirmed that an average of 10.1 patients per day was referred to another hospital. It was ascertained that the branch where the highest number of patients were transferred from the emergency department was cardiology, with 2372 cases. See **Table 4** for patient referral data.

**Table 4.** Adult patient referrals from the emergency department to other hospitals

Branches <sup>1</sup>	Median Age	Referrals From Emergency Room		Total Count
		Male Count	Female Count	
Anesthesia	74	139	123	262
Neurosurgery	58	117	100	217
Infectious Diseases	76	112	146	258
General Surgery	33	258	144	402
Thoracic Surgery	55	22	8	30
Pulmonology	75	698	498	1196
Internal Medicine	72	518	598	1116
Cardiovascular Surgery	56	11	6	17
Cardiology	69	1306	1066	2372
Neurology	72	545	606	1151
Orthopedics	51	66	27	93
Psychiatry	37	165	31	196
Others Branches	39	32	8	40
Emergency Medicine	72	22	19	41
<b>Total</b>	<b>70</b>	<b>4011</b>	<b>3380</b>	<b>7391</b>

<sup>1</sup>The branch of the physician decides to refer the patient from the emergency department to another hospital.

**Table 5.** Number of patients required to be hospitalized

Branches	Referral Count <sup>1</sup>	Inpatient Count <sup>2</sup>	Total Count <sup>3</sup>	Number Per Day <sup>4</sup>
Anesthesia	262	185	447	0.6
Neurosurgery	217	506	723	1
Infectious Diseases	258	767	1025	1.4
General Surgery	402	3490	3892	5.3
Thoracic Surgery	30	986	1016	1.4
Pulmonology	1196	1628	2824	3.9
Internal Medicine	1116	6105	7221	9.9
Cardiovascular Surgery	17	212	229	0.3
Cardiology	2372	5690	8062	11
Neurology	1151	3249	4400	6
Orthopedics	93	2355	2448	3.4
Psychiatry	196	226	422	0.6
Gynecology	0	1823	1823	2.5
Others Branches	40	814	854	1.2
Emergency Medicine	41	0	41	0.1
<b>Total</b>	<b>7391</b>	<b>28036</b>	<b>35427</b>	<b>48.5</b>

<sup>1</sup> Number of patients transferred from the emergency department to another hospital

<sup>2</sup> Number of patients hospitalized from the emergency department

<sup>3</sup> Total number of patients requiring hospitalization from the emergency department

<sup>4</sup> Average number of patients that should be hospitalized from the emergency department per day

Briefly, when the number of patients required to be hospitalized from the emergency room was checked, it was remarked that the cumulative number of cases who were hospitalized and referred from the emergency room was 35427. This number corresponds to an average of 48.5 patients per day. See **Table 5** for a summary of patients requiring the hospitalization.

## DISCUSSION

Sultanoglu et al. (7) reported that 6318 (8.4%) of the patients who applied to a tertiary hospital's emergency service within one year were hospitalized, and 0.4% were referred. Erkurun et al. (8) reviewed the emergency room patients and noticed that 2380 of these patients (1.2%) were hospitalized to ICU from the emergency department, and 66 of them (2.8%) died in ICU. On the other hand, Groenland et al. (9) reported that 18.1% of the cases hospitalized from the emergency department to the intensive care unit died. Furthermore, the hospitalization period's prolongation from the emergency department to the ICU was associated with increased patient mortality.

Simpson et al. (10) stated that 26% of the patients hospitalized in intensive care were hospitalized from the emergency room, and the mortality rate could stretch to 46.4% among them.

The medical literature studies reported the density of emergency services and their destructive effects on receiving emergency medical care. Niels et al. (3) found that elective surgical operations and hospital occupancy harmed patients' waiting time in the emergency department. Sun et al. (11) stated that more sick cases were admitted to the emergency department on weekends. Besides, Peter et al. (5) reported that discharge from the hospital on weekends was 50% less than on weekdays. This situation presents us with more severe patients and fewer hospital beds. Emilie et al. (4) similarly stated that patients' discharge from the hospital services reduces emergency room overcrowding.

### When all these above researches are assessed together;

In this study, the average number of patients requiring daily hospitalization from the ER was 48.5, and the average hospital stay of all patients hospitalized from the emergency

department was observed to be seven days. Thus, approximately 340 patient beds should be reserved for the patients hospitalized in the emergency department to evade hospital occupancy. Besides, these numbers do not include the patients hospitalized from the pediatric emergency and obstetrics emergency services. Considering that the number of emergency service admissions has risen every year, the number of beds required to suffice the ER hospitalizations suggests that an “emergency hospital” is required separately. Here, an emergency hospital is meant to be a hospital structure where elective hospitalization is not admitted, and all branches work for emergency patients. An increase in the emergency service admissions and the inpatients’ numbers obstruct managing emergency services and elective services together, primarily in regions where emergency admissions are intense. In this case, we will come across two options:

Firstly, emergency hospitalizations will interrupt several elective treatments and operations planned before, and these patients will be disrupted due to the continuous hospitalization of patients from the emergency room. Secondly, the patients who require several urgent interventions will be referred to another hospital or wait for hospitalization in the emergency department while the elective cases are hospitalized. Researches in the current medical literature have also determined that elective patients’ admissions increase the length of stay in the emergency room. The prolongation of the emergency department’s stay will negatively affect the medical care that patients will receive.

The branches with the highest number of hospitalizations from the ER are internal medicine, cardiology, general surgery, neurology, orthopedics, gynecology, and pulmonology; moreover, these have the highest patient rate referred to other hospitals. It is perceived that hospitals should have adequate service and intensive care beds for these branches to provide adequate health care from the ER. Unfortunately, these departments are among the main branches with many outpatients; elective hospitalizations from polyclinics will be confronted with hospitalizations from the ER.

## CONCLUSIONS

The number of emergency service admissions increases worldwide and patients hospitalized from the emergency department has a unique place among all inpatients. Mainly in regions with several emergency admissions, it can be considered to establish emergency hospitals that serve particularly emergency cases in order to engage the number of patients to be hospitalized from the emergency room, to prevent unnecessary waiting and intensity in emergency services, and to decrease the referring patients to another hospital. Oppositely, either emergency treatment services or elective treatment procedures may be obstructed.

**Author Contributions: ED, FG:** Study design and Data collection, Statistical Analyzes, **ED:** Article writing and revisions.

**Financial & competing interest’s disclosure:** The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

**Ethical approval:** The study was conducted according to the guidelines of the Declaration of Helsinki and approved by Local Ethical Committee.

**Conflict of interest:** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. This research did not receive and specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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