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Factors Associated with Overcrowding and Prolonged Length of Stay in Emergency Department: A 3-Year Analysis of a University Hospital

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Abstract

Objective: To determine factors associated with overcrowding in the Emergency Department (ED) and make suggestions in the light of current data.

Material and Methods: In a 3-year period, the number of patients admitted to our ED, number of forensic examination cases, number of patients who died, waiting times and Length of Stay (LOS) in the ED, consultation arrival times, length of laboratory result times, number of patients followed up in ED observation room and hospitalized to a ward were recorded. Findings were compared according to years.

Results: Number of patients admitted to the ED did not significantly differ among years. LOS in the ED and the number of patients followed-up in the ED observation room increased significantly when compared according to years. Number of consultations also tended to increase. Even though the number of patients admitted to the red zone increases, when compared to 2016, mortality rate was significantly lower in 2017 and 2018.

Conclusion: Rapid transfer of patients from ED to wards when indicated, education of staff in order to reduce number of consultations and guidance of non-urgent patients to Family Physicians System may reduce overcrowding in EDs.

Keywords: Overcrowding, Emergency department, Length of stay

Introduction

Emergency Department (ED) overcrowding is a situation where the demand for emergency services exceeds the ability to provide care in a reasonable amount of time [1]. Overcrowding in EDs is a multi-factorial problem, occurring as a result of prolonged Length of Stay (LOS) in the ED, inadequate healthcare personnel appointment, delayed response to ED consultations, repeated ED visits, and hospital-specifc factors (size and location, lack of available inpatient beds) [2]. When the capacity of the ED can not compansate the demand for patient triage, diagnostic images, laboratory tests, and specialty consultations, overcrowding occurs [3]. Also, non-urgent patients are a significant cause of ED overcrowding [4]. Overcrowding in EDs has numerous adverse effects on critical patients who needs rapid interventions [5,6]. In this study, our aim was to determine the factors associated with overcrowding and LOS in the ED.

Materials and Methods

This study was conducted in Hitit University Hospital Emergency Department (ED) between January 1st, 2016 and December 31st, 2018. Approval and permission for the study was obtained from Hospital Administration. Number of patients admitted (green, yellow and red zones), number of forensic

examination cases, number of patients who died, waiting times and Length of Stay (LOS) in the ED, consultation arrival times, length of laboratory result times, number of patients followed up in ED Observation Room (OR) and hospitalized to a ward were obtained from Hospital Database. Data were compared according to years.

For statistical analyses Statistical Package for Social Sciences (SPSS) 20.0 was used. Descriptive statistical analysis was performed for demographical variables. Data were given as numbers (n) and percentages (%). Chi-square test was used to compare variables in three years.

Results

In the study period, a total of 1,223,917 patients were admitted to the ED. Of these patients, 48,462; 1,183,562 and 1,596 were admitted to green, yellow and red zones, respectively. When compared to the rest of the hospital, rate of patients admitted to the ED was 27.9%. Number of individuals brought to the ED by police officers for forensic examination without any injury was 28,114 (2,2%). A total of 568 patients died in the ED. Mean LOS time was found to be 187,7 minutes. When shifts are considered, the longest LOS was between the hours 00:00-08:00. Of the patients admitted to our ED, 2,052 patients were transferred to another center for further treatment. A total of 48,549 were followed up in the ED OR and mean LOS in the OR was 158.6 minutes. It was also determined that 12,947 patients were consulted with other specialties. The most common consulted specialty was pediatrics. Pediatrics was also the branch that had the longest time of arrival to the ED. Number of patients hospitalized was 18,867.

Mean times for Ultrasonograhy (USG) and Computed Tomography (CT) results were 2.7 hours and 1.3 hours, respectively. Mean times for Complete Blood Count (CBC) and biochemistry analyses were 0,03 and 0,05 hours, respectively. The most common reason for ED admission was soft tissue injury (n=108,457), followed by abdominal pain (n=21,944), Upper Respiratory Tract İnfection (URTI) (n=18,987) and chest pain (n=11842).

When the variables were compared according to years, number of patients admitted to the ED was not significantly different. While statistical significant decrease was obtained in green zone admissions, yellow and red zone admissions were determined to increase significantly. The ratio of ED admissions to entire hospital admissions has not changed over the years. Number of forensic cases was determined to decrease significantly. When compared to 2016, mortality rate was significantly lower in 2017 and 2018. LOS in the ED and number of patients followed-up in the ED OR increased significantly when compared according to years. In 2018, number of patients transferred to an advance center significantly decreased when compared to 2017. Resulting times of CT and USG studies significantly decreased in 2017 and 2018 when compared to 2016. When reasons for admission to the ED were investigated, number of soft tissue injury, abdominal pain, URTI and chest pain was significantly higher in 2018 when compared to other years. Number of cases of myalgia and headache tend to decrease significantly by years. Comparison of variables according to years is summarized in the Table 1.

	2016	**2017**	**2018**
Admissions to the ED (n)	407185	409164	407568
Green Zone	25639	12311	10512
Yellow Zone	378568	396552	395830
Red Zone	72	298	1226
Proportion of ED Admissions (%)	29.8	27.2	26.9
Forensic Examination Cases (n)	11073	9962	7079
Exitus (n)	236	172	160
LOS in the ED (min)	173.3	180	210
Transfer to an Advanced Center (n, %)	796 (0.2)	482 (0.1)	774 (0.2)
Patients followed up in ED OR (n, %)	6178 (1.7)	14481 (4.1)	27350 (7.5)
LOS in the OR (min)	146	135	195
Consulted Patients (n)	11543	12089	15211
Hospitalized Patients (n)	18644	19375	18583
Lab and Imaging Result Times (h)			

BT	5	1.6	1.5
USG	2	1	0.9
CBC	0.03	0.03	0.03
Biochemistry	0.05	0.05	0.05
Diagnosis on Admission (n)			
Soft Tissue Injury	42548	42680	44584
Abdominal Pain	18613	19640	19822
URTI	17689	16984	17746
Chest Pain	16436	12757	15456
Myalgia	15014	12398	10552
Headache	8270	6727	7868

Table 1: Comparison of Variables According to Years.

Discussion

It is well-described in the literature that the overcrowding of EDs is at critical levels in Turkey. The number of annual ED visits exceeds total population. The rate of ED visits per person was calculated as 1.11 in 2009 and 1.12 in 2013. This rate is quite high when compared to the Western World [4,7,8].

Çorum is located in mid-Karadeniz Region of Turkey. Its population is 294.807 in the city center. Hitit University Erol Olçok Education and Research Hospital serves to Çorum as the only state hospital in the city. A total of 1,233,917 admissions in a 3-year period reveal that annual admissions to the ED exceeds the population of the city, as in other parts of Turkey. Overcrowding in the ED is a growing problem in Çorum.

Many factors contribute to overcrowding in EDs. In order to reduce admissions to EDs, family physicians system was put into practice. Additionally, triage system was applied to Turkish Hospitals. In 3-level triage system (green, yellow, red), patients were grouped according to their urgencies [4]. The aim was to reduce number of patients in yellow and red zones where real emergencies were managed. Non-urgent patients applied to EDs, instead of first step healthcare facilities and polyclinics, are directed to green zones of EDs. However, according to our results, while number of green zone patients reduce, number of yellow and red zone patients increase over the years. In fact, green zone numbers are probably higher than in our results. However, hospital database automatically turns colour into yellow when a green zone patient gets injection or fluid therapy. Nevertheless, when additional challenges like assigning limited personnel to green zone is considered, it is difficult to say that triage system meets the demands of EDs.

Another unwanted outcome of overcrowding is the prolonged LOS in EDs. It is also known that delay of radiological and laboratory test results, delayed and inappropriate consultations, and inadequate inpatient bed counts also cause prolonged LOS [6,9]. With increasing demand and shortage of resources, waiting time is an inevitable problem in all clinical fields, particularly in EDs [10]. In a study from Turkey, mean LOS in ED was found to be 164.1 minutes. In our study, mean LOS in the ED was more than three hours. Even though the total number of admissions to our ED did not significantly rise in the study period, number of patients followed-up in the ED OR and LOS significantly increased by the years. One of the reasons of this remarkable result may be legal concerns of healthcare providers about medical malpractice. Administrators must focus on this issue since overcrowding and prolonged LOS in the ED is also responsible for majority of workplace violence incidents which has multi-dimensional, undesired psychological affects on ED personnel [11].

In our study, forensic examination cases define suspicious or wanted individuals brought to ED for control examination without any injuries. We assume that these type of admissions also contribute to overcrowding and insecure environment of EDs. EDs routinely evaluate the victims of motor vehicle trauma, gunshot and stab wounds, physical assault, domestic violence, sexual assault, elder abuse, suspicious deaths, child abuse, occupational injuries, suicide attempts, terrorist attacks, burns, electrical-related injuries, and poisonings in both adults and pediatric populations. EDs frequently receive requests from law enforcement officials for statements and medicolegal reports pertaining to injuries treated in the ED and according to our laws, ED physicians have responsibility to report forensic cases to police [12,13]. Forensic patients constitute 7.01% of all admissions to the ED [14]. However, routine controls of individuals or those with minor trauma without

a need for an ED admission may be evaluated by forensic medicine specialists in another secure place outside EDs.

Consultation is an essential procedure in ED practice. Delays in consultations, as mentioned above, is another factor contributing to overcrowding. In a study by Woods, et al. it was reported that at least 1 consultation was requested in 38% of patients. Their study also revealed that most of the consulted patients were hospitalized by the consultants [15]. Our study revealed that while number of hospitalized patients did not differ, number of consultations tended to increase. There are two probable reasons for this result. Either some of the patients with indications are not hospitalized or the number of inappropriate consultations are rising. Whatever the reason is, in both cases, sensitivity of consultants on arrival times to ED play an important role on reducing overcrowding in the ED.

Imbalances between the capacity of the ED and the demand for diagnostic images and laboratory tests affect the patient flow in ED [3]. Achieving timely laboratory and radiology reports may also help reduce overcrowding [9]. In a study by Moghadam, et al. the average interval between the request of a lab data and its performance was 87 minutes. It was also reported that increasing the laboratory capacity by 100% reduced the average stay by about 45 minutes [10]. Our results revealed that, after the year 2016, time to reach to radiology reports significantly decreased. Increasing the number of radiologists and assigning certain radiologists to ED may be the reasons for this result. As the reports reach to the physicians faster, the possibility to reduce overcrowding increases.

When reasons for ED admissions are investigated in our study, the most common reasons were soft tissue injuries, abdominal pain and URTIs. In a study by Idil, et al. it was also reproted that the most common complaints of non-urgent patients admitted to ED were myalgia and URTIs. Non-urgent patients apply for EDs is an important issue, despite precautionary measures [4]. Fully implementation of Family Medicine System may solve the problem and the patients may be directed to these facilities instead of EDs.

Another noteworthy result of our study is that, despite these challenging conditions, we have achieved a significant decrease in the number of exitus patients.This finding results from devotion and attentiveness of ED personnel in our hospital, as in the other parts of the country. Also, increased number of ED specialist over the years and their supervision on whole ward may be another factor in reduction of mortality rate. In a study by Ugara, et al. 355 mortalities among 4011 ED admissions were recorded [16]. In another study, of the 22,791 patients, 446 died [17]. Mortality rates may vary according to substructure status of facilities and variation of patient spectrum.

Conclusion

Our study revealed that even though number admissions to our ED do not change; LOS in the ED, number of patients followed up in ED OR, LOS in the OR and number of consulted patients are increasing over the years. Timely transfer of patients to an appropriate ward, decreasing number of unnecessary consultations by training and education programmes and proper execution of Family Medicine System may be solution to ED overcrowding problem.

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