

# Evaluation of using pediatric emergency rooms

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## ABSTRACT

**OBJECTIVE:** The overload of pediatric emergency units around the world has become an increasing problem for patients and health care professionals alike. Researching the features of pediatric emergency services will provide the necessary information for creating an effective emergency medical system, increasing patient satisfaction, and reducing the treatment costs. In this study; we aimed to check the admissions in pediatric emergency rooms, evaluate the effectiveness of emergency service, and develop suitable strategies to increase the amount and quality of medical service given in pediatric emergency rooms.

**METHODS:** In this retrospective study, the records of 296,858 (51.2% female, 48.8% male) patient admissions in the emergency rooms and 384,171 (46.3% female, 53.7% male) admissions in the outpatient clinics of eight hospitals between January 2015 and June 2015 were scanned. Out of these hospitals, two facilities were research and training hospitals.

**RESULTS:** The average age of patients who were admitted to the emergency room was 89.1 ( $\pm 21.3$ ) months and the average age of patients admitted to the outpatient clinics was 87.2 ( $\pm 18.7$ ) months. Upper respiratory tract infection was the most frequent (44.23%) diagnosis in the emergency rooms and most of these infected patients (63.67%) had been admitted to the two training and research hospitals that provide an advanced level of health care. Also, the patient requests for diagnosis were determined to be significantly high in emergency rooms.

**CONCLUSION:** Proper understanding of the scope of emergency services is very important in order to provide fast and effective healthcare to the patients who get admitted to emergency rooms and maintain appropriate and judicious use of the resources of emergency rooms.

*Keywords:* Non-urgent; overcrowding; pediatric emergency.

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The emergency rooms (ER) and outpatient clinics (OC) of the hospitals are the areas where newly admitted patients are diagnosed and treated promptly. These areas are accepted as being the showcase of the hospitals; they are the “windows” of the hospitals that are accessible by the public [1]. The main goal in building a health service system is to categorize patients on an emergency and non-emergency basis and refer them accordingly either to the ER or to the OC. In a study conducted

in the U.S.A., it was shown that individuals who did not have health insurance had very limited access to health care services; the same services became augmented after these individuals were covered under health insurance. This approach also decreased the rates of ER admissions significantly [2]. However, in Turkey, the rate of ER admissions did not decrease under the same approach, despite there being easier access to health care services as compared to services available earlier [3, 4].

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Generally, the numbers of ER admissions are always higher than the number of OC admissions. Also, 25%–50% of hospitalized patients are admitted to the ER initially [1]. Today, the overload of emergency services in many countries is a very well-known and documented problem. The overload of emergency service causes fatigue and stress in health care professionals and dissatisfaction in patients. It also decreases the quality of the service provided [5]. In 2002, the American College of Emergency Physicians (ACEP) described the overcrowding of ERs as “the inability of the current emergency facilities to fulfill the basic needs of patients who admit to the ER.”

The reasons that contribute to overcrowding are different in adult and pediatric ERs. Admissions to pediatric ERs very rarely result in hospitalization [6, 7]. The most important reason contributing to the overload in pediatric ERs is the excessive number of patient admissions. As a result of this overload, the waiting period is prolonged, the duration of stay in the ER gets increased, and the treatment becomes more expensive. A former study from the U.S.A. showed that the cost of running the ER could be up to four times higher than that of the OC [4, 8].

Preventing needless occupation of the pediatric ERs will increase patient satisfaction and quality of services and will contribute to decreasing the treatment costs. The aim of this study is to determine whether or not the pediatric ERs and OCs are capable of delivering kind of care that is compatible with their purpose, and designing suitable strategies to help overcome problems related to patient overload.

## MATERIALS AND METHODS

Between January 2015 and June 2015, a retrospective review of medical records of the eight hospitals that are connected to the province of Istanbul was performed. Clinical and demographic data were retrospectively collected from the patients' medical records. This study was approved by a local institutional review board (No: 35278018-770) and written informed consent was obtained from local government authorities.

Patients of widely varying ages (from 1 month to 16 years) were included in the study. Demographic variables, number and type of diagnostic tests performed, and follow-up results of the patients who were admitted to the ER and OC were examined and compared. The diagnoses were categorized according to the International Classification of Diseases-10 (ICD-10) diagnostic coding system. The patients who were admitted had one or more of the following conditions; upper respiratory tract infections (URTI) (rhinitis, sinusitis, pharyngitis, otitis, laryngitis, laryngotracheitis), trauma and burns (various injuries originating from accidents, falls from heights, physical assault and exposure to heat, radiation, electricity or chemicals in the dermic and hypodermic tissue), general physical examination without any pathologic findings and diagnoses, gastrointestinal system diseases (gastroesophageal reflux disease, gastritis, gastroenteritis, constipation, intussusception, appendicitis, perforation, and intestinal obstruction), non-specific pain symptoms (headache, abdominal pain, chest pain or extremity pain in which an etiological factor has not been determined), lower respiratory tract diseases (acute bronchi-

**TABLE 1.** Distribution of the cases admitted to the emergency room and outpatient clinics according to age and gender groups

Ages (months)	Emergency room				Outpatient clinics			
	Female		Male		Female		Male	
	n	%	n	%	n	%	n	%
1–12	2199	0.74	1946	0.66	7151	1.86	9145	2.38
12–24	15837	5.34	15524	5.23	18346	4.78	23128	6.02
24–60	35937	12.11	35291	11.88	34478	8.98	45535	11.85
60–144	59620	20.08	54475	18.35	71513	18.62	81652	21.25
>144	38443	12.95	37666	12.69	46274	12.06	46949	12.22
Total	151956	51.19	144902	48.81	177762	46.27	206409	53.73

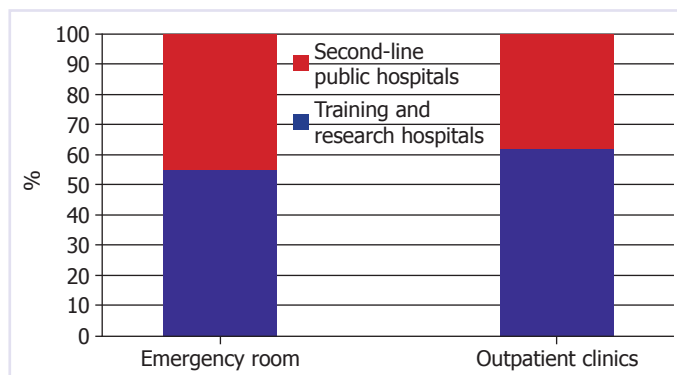


FIGURE 1. Distribution of patients in hospitals.

olitis, pneumonias, bronchiectasis, asthma, obstructive or restrictive lung diseases), urinary system diseases (urinary tract infections, urolithiasis, glomerular diseases), skin and dermal diseases (urticaria, erythema, dermatitis, eczema, bullous lesions), non-specific fever (fever in which an etiological factor has not been determined), ocular diseases (conjunctivitis, blepharitis, ocular extraneous body), hematologic diseases (anemias, coagulation disorders, immunodeficiency), and nervous system diseases (meningitis, encephalitis, neuropathy, convulsions, muscle diseases, cerebrovascular events).

The software program SPSS ver. 15.0 (Statistical Package for Social Sciences) for Windows was used in the research for statistical analysis and the value of  $p < 0.05$  was considered significant.

## RESULTS

Two of the eight hospitals included in the study were training and research hospitals and six of them were second-line public hospitals. A total of 296,858 (51.19% female, 48.81% male) patients were admitted to the ER

(Group 1) and 384,171 (46.27% female, 53.73% male) patients were admitted to the OC (Group 2) from January 2015 to June 2015. Almost all the 269,852 (90.90%) patients who were admitted to the ER were categorized into the diagnosis group. The "other" group (patients who very rare diseases which could not be further grouped in diagnosis groups) consisted of 27,006 (9.10%) patients. OC patients who were part of the "other" group numbered 48,966 (12.75%).

The average age of patients included in the study was 89.1 ( $\pm 21.3$ ) months in patients admitted to the ER while it was 87.2 ( $\pm 18.7$ ) months in patients admitted to the OC. The categorization of diagnosis groups in Group 1 and Group 2 are shown in Table 1. Female admissions to ER and male admissions to the OC was found significantly high ( $p < 0.05$ ). A total of 55.14% of admissions to ER and 61.74% of admissions to OC were detected in training and research hospitals (Fig. 1). In Group 1, URTI (44.22%) and trauma (14.48%) were the most common diagnoses (Fig. 2) ( $p < 0.05$ ). The relationship of patients with the diagnosis and age groups is seen in Table 2. A total of 63.67% of URTI patients were admitted to the ERs of training and research hospitals (Table 3). In Group 2, URTI (22.41%) and general physical examination (21.67%) were the most common diagnoses (Fig. 3) ( $p < 0.05$ ) (Table 4). Further diagnostic tests were required for 49.43% (146,745) of the 296,858 ER admissions and for 42.03% (161,469) of the 384,171 OC admissions. It was determined that more tests were required for ER admissions than for OC admissions and this difference was statistically significant ( $p < 0.05$ ) (Fig. 4).

## DISCUSSION

This study showed that the most common reason for

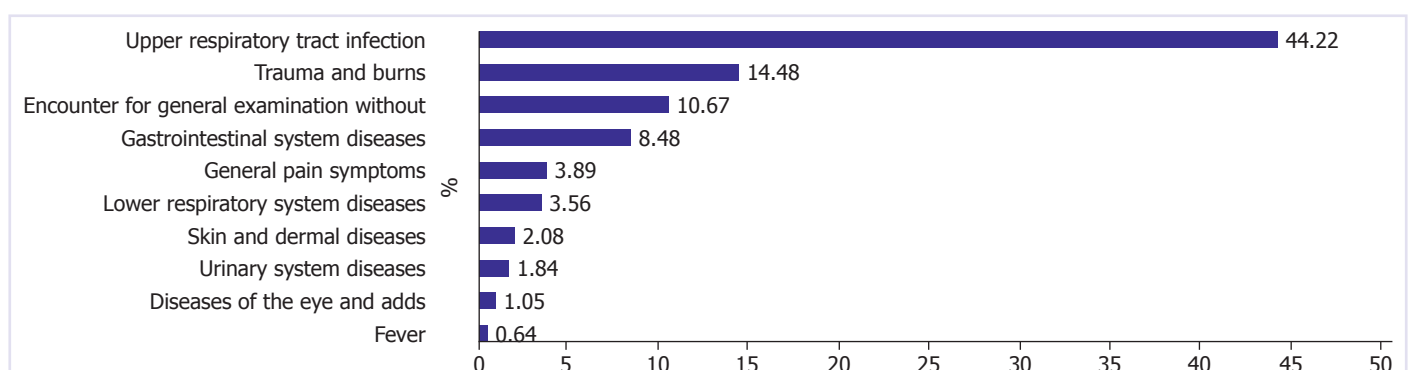


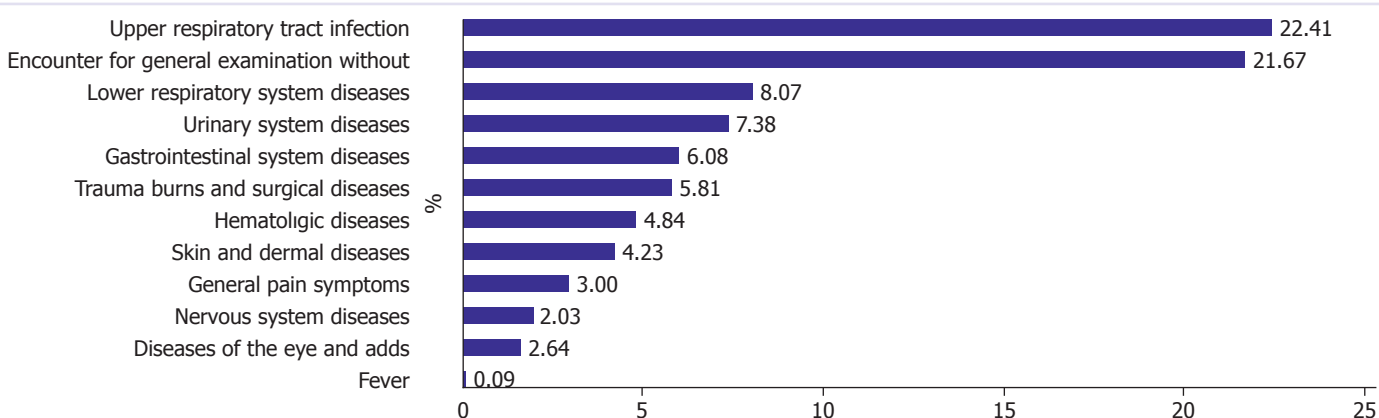
FIGURE 2. Prevalent diagnoses in the emergency room.

**TABLE 2.** Age distribution of the children according to prevalent diagnoses in the emergency room

	Age (months)										Total	
	1-12		12-24		24-60		60-144		>144			
	n	%	n	%	n	%	n	%	n	%	n	%
Upper respiratory tract infections	1427	1.09	13559	10.33	32079	24.44	52092	39.68	32108	24.46	131265	100
Trauma and burns	655	1.52	4162	9.68	9582	22.30	17264	40.18	11308	26.32	42971	100
General physical examination without complaint	446	1.41	2686	8.48	8705	27.47	11338	35.78	8514	26.87	31689	100
Gastrointestinal system diseases	338	1.34	2894	11.50	5827	23.16	9812	38.99	6294	25.01	25165	100
General pain symptoms	142	1.23	1240	10.73	2734	23.65	4332	37.47	3112	26.92	11560	100
Lower respiratory systems diseases	108	1.02	965	9.13	2438	23.07	4152	39.29	2905	27.49	10568	100
Skin and dermal diseases	76	1.23	770	12.48	1338	21.69	2422	39.26	1563	25.34	6169	100
Urinary system diseases	65	1.19	640	11.72	1173	21.49	2247	41.16	1334	24.44	5459	100
Ocular diseases	48	1.55	432	13.92	755	24.32	1220	39.30	649	20.91	3104	100
Fever	16	0.84	156	8.20	478	25.13	710	37.33	542	28.50	1902	100

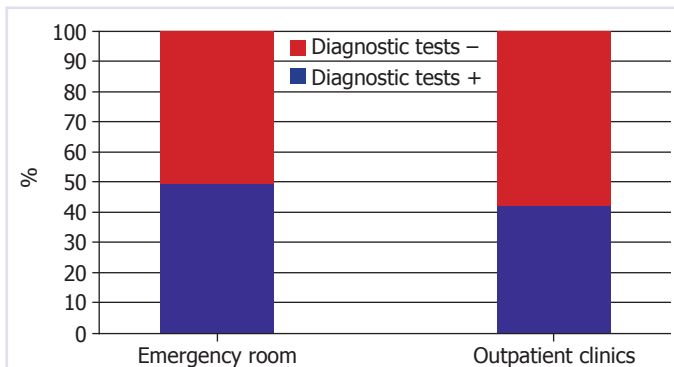
**TABLE 3.** Distribution of the most frequent diagnoses in hospitals

	Training and research hospitals		Second-line public hospitals		Total
	n	%	n	%	n
Upper respiratory tract infections	83578	63.67	47687	36.33	131265
Trauma and burns	19526	45.44	23445	54.56	42971
General physical examination without complaint	10600	33.45	21089	66.55	31689
Gastrointestinal system diseases	15094	59.98	10071	40.02	25165
General pain symptoms	6957	60.18	4603	39.82	11560

**FIGURE 3.** Prevalent diagnoses in outpatient clinics.

**TABLE 4.** Age distribution of children according to the prevalent diagnoses in outpatient clinics

	Age (months)										Total	
	1-12		12-24		24-60		60-144		>144			
	n	%	n	%	n	%	n	%	n	%	n	%
Upper respiratory tract infections	2840	3.30	9274	10.77	21645	25.15	39025	45.34	13294	15.44	86078	100
General physical examination without complaint	4590	5.51	8584	10.31	15280	18.35	33243	39.93	21553	25.89	83250	100
Lower respiratory systems diseases	1280	4.13	4748	15.32	8453	27.28	12395	40.00	4110	13.26	30986	100
Urinary system diseases	580	2.05	2684	9.47	5066	17.88	14046	49.57	5960	21.03	28336	100
Gastrointestinal system diseases	1254	5.37	3088	13.22	5539	23.71	8957	38.34	4526	19.37	23364	100
Trauma burns and surgical diseases	467	2.09	2635	11.80	5051	22.61	7102	31.79	7082	31.71	22337	100
Hematologic diseases	642	3.45	2864	15.39	4286	23.04	6836	36.74	3978	21.28	18606	100
Skin and dermal diseases	1072	6.59	2258	13.89	3157	19.41	5024	30.89	4751	29.22	16262	100
General pain symptoms	232	2.01	435	3.77	1085	9.40	3784	32.79	6004	52.03	11540	100
Nervous system diseases	88	1.13	799	10.26	1873	24.05	2728	35.02	2301	29.54	7789	100
Ocular diseases	940	14.93	1029	16.34	982	15.59	2102	33.38	1245	19.77	6298	100
Fever	36	10.03	89	24.79	110	30.64	98	27.30	26	7.24	359	100

**FIGURE 4.** Rates of diagnostic tests required from patients admitted to emergency rooms and outpatient clinics.

pediatric ER and OC admissions in Istanbul was for URTI. Although not statistically significant, both ER and OC admissions preferred the two training and research hospitals when compared to the other six general state hospitals.

In a comprehensive study in the U.S.A., the average age of the children who admitted to the hospitals was determined as 6.9 years and it was reported that more than half of all applications were the children were aged 0–4 years [9]. Compatible with this literature, the average age of admissions in both Group 1 and 2 in our study was

found to be 7 years. In previous studies, the rate of admission of younger age groups was high [10, 11]. In our study, the ER admission rate of children under 5 years was found at 35.96%. Only 11.97% of patients admitted to ERs were under 2 years. At the same time, the age distribution of patients in OCs was also found similar to that in ERs. The variance in age distribution may be explained by the school attendance age since a school-going child will certainly be exposed to more infectious and traumatic agents than a child at home.

In 2005, 65% of patients who applied to emergency services were composed of non-urgent cases and this rate has reached 70% today [12]. This finding should be enough to motivate the scientific community to think of new strategies for streamlining ER admissions.

When we evaluated patients according to their diagnosis, we detected that many conditions that could be treated in OCs and primary healthcare services were being attempted in emergency services. This indicates that patients prefer using emergency services instead of being examined in turn by doctors because of the easy and fast access to ERs verses having to wait for an appointment. In ER admissions, the diagnosis of URTI (44.22%) and trauma (14.48%) were the most common [9, 13]. We determined that most of the patients who were diagnosed



with URTI in emergency services were admitted in tertiary hospitals.

In a study carried out in the U.S.A., it was reported that respiratory tract infections were seen mostly in younger children while injuries were seen mostly in older children [9]. In our study, ERs were identified as the first point of diagnosis of URTI in all groups and the diagnosis of URTI was more common in ERs than in OCs. The most common diagnosis groups in the OCs were URTI and general examination, including complaints of Mongolian spot, teething, physiological developmental behaviors, and non-specific controls. While it is acceptable that general examination is one of the most common diagnoses in OC, it becomes a problem when it is one of the most common diagnoses in the ER.

Appropriate medical care in ERs in terms of cost and effectiveness is also important. The cost of patients getting admitted to ERs is much more than the cost of patients getting admitted to OCs [8]. As per the record of diagnostic tests in our study, we found that investigations were required in 49.43% of ER admissions and 42.03% of OC admissions. This may be because of an insufficient number of specialized health staff working in ERs or because of the tendency of the physicians to maximize time in order to examine more patients. One of the most important proven reasons for overload in ERs is the unnecessarily prolonged patient stay in the ER [14], and diagnostic tests combined with waiting time for results leads to exactly this situation. Additional diagnostic tests also increase treatment costs.

Qualified and functional health services will lead to more number of healthy individuals. Although the level of quality of health services varies from country to the country, the main target is to ultimately best protect the health of the patients. In recent years, it has become easier for people to access health services as a result of the increasing demand for quality health services and changing health policies. Due to these policies, patients should be able to reach a healthcare facility before the condition warrants emergency status. Thus, lower rates of ER admissions can be expected, however, our study has demonstrated that despite all new approaches and new policies, individuals still prefer ER admissions even for non-emergencies. The reasons underlying this condition should be evaluated meticulously in order to prevent this attitude.

In many countries including ours, the only unit that can provide health care services to children at all hours

is the pediatric emergency service. Therefore, in some situations (weekends, holidays, after 5 pm, etc.) patients have no choice but to get admitted to the ER in order to receive healthcare. Further, inadequate number of pediatric ERs, inadequate number of beds in hospitals (or decreasing the number of beds for directory reasons), and inadequate number of trained and experienced staff such as physicians and nurses who can give emergency health care services are among the other important reasons for overload in the ER [15]. On the other hand, over-caring parents are another contributory factor in the overload of pediatric ER. Former studies have shown that mothers tend to consider their children to have more serious diseases than what is the actual condition [16].

Occupying the emergency services for non-emergency cases is a big problem in many countries including ours [17, 18]. To counter this, there are some suggestions and applications present in ERs that facilitate effective care and better workflow. The most common ones are; five-step triage system, emergency care applications started by the nurse at the first admission, fast maintenance, grouping of patients, and providing more trained and tolerant staff with improved clinical skills [19].

The overload of ERs can be decreased by strengthening the primary health care services, structuring the agenda of the referral chain, and by organizing OCs on duty for some hours out of the conventional working hours for a certain time period. Additionally, some public awareness that explains to the people when they should apply to ERs and where and when they should get the appropriate healthcare services can be telecast over mass media.

In conclusion, the proper use of ER can be summarized as an appropriate patient being present at the appropriate health care facility at the appropriate time. By this method, the real emergency patients who are arriving the ERs can receive medical care faster and more effectively and the sources of ER can be used properly. This problem cannot be solved on a personal level and definitely requires proper governmental intervention and organization of health care systems worldwide.

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**Authorship Contributions:** Concept – MO; Design – YC; Supervision – AAO; Materials – YC; Data collection and/or processing – HE; Analysis and/or interpretation – YC; Writing – MO; Critical review – YC.

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