

Characteristics of Patients Presenting to the Academic Emergency Department in Central Anatolia

Orta Anadolu'da Akademik Bir Acil Servise Başvuran Hastaların Özellikleri

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SUMMARY

Objectives

Determining the properties of patients admitted to the emergency department (ED) is important to plan for future and quality assurance. In this study, we aimed to evaluate the properties of patients admitted to our ED to improve the quality of care within our hospital.

Methods

In the study period, the patients: (i) who have their full information in hospital information and management system (HIMS) and (ii) older than 17 years of age were included into the study. Demographic information, admission and discharge rates, mean staying time in the ED, triage categories, International Classification of Diseases – 10 (ICD-10) diagnoses were evaluated.

Results

During the study period, 32,117 cases were seen by the ED. However, 22,955 patients (71.4%) had complete information in the HIMS. The mean age was 44.92±19.50 and female gender was found 52.2%. The patients who were located in 18-29 age group was the major group of all cases (30.8%). Emergent and urgent cases were 26.1% and 14.8%, respectively. Non-urgent cases were also found (59.1%). The mean age of patients located in the emergent group (55.19±18.59) were significantly higher than urgent and non-urgent group ($p<0.01$). The highest patient volume was seen on Sunday, between 20:00 and 22:00 o'clock. The mean staying time in the ED was 183.6 minutes and the admission rate was 17.6%. The three most noted ICD-10 codes were respiratory (16.6%), gastrointestinal (11.3%), musculoskeletal (11.2%) codes.

Conclusions

The data that was correctly uploaded into the system did not reach our expectation. Data can be more appropriately uploaded by medical secretaries. Registering patient information in a digital atmosphere while performing analyses will undoubtedly have an effect on future focused studies.

Key words: Data base management systems; demography; emergency department.

ÖZET

Amaç

Acil servise başvuran hastaların özelliklerinin bilinmesi, acil servis (AS) hizmetlerinin planlanması ve kalitesinin artırılması için önem taşımaktadır. Bu çalışmada, AS hastalarımızı bu perspektifte değerlendirmeyi amaçladık.

Gereç ve Yöntem

Çalışma periyodunda 17 yaş üstü ve hastane bilgi ve yönetim sistemine (HBYS) kaydı olan hastalar çalışmaya dahil edildi. Demografik bilgiler, yatış ve taburculuk oranları, AS'de ortalama kalış süresi, triyaj kategorileri, International Classification of Diseases – 10 (ICD-10) tanıları değerlendirildi.

Bulgular

Çalışma süresi boyunca 32117 olgu AS'de görüldü. Verileri eksiksiz olan 22955 hasta (%71.4) HBYS'den alındı. Hastaların yaş ortalaması 44.92±19.50 ve kadın cinsiyet %52.2 olarak bulundu. 18-29 yaş grubundaki hastalar tüm olguların majör grubunu oluşturmaktaydı (%30.8). Acil olmayan olgular %59.1, çok acil ve acil olanlar ise sırasıyla %26.1 ve %14.8 olarak bulundu. Çok acil kategorisindeki hastaların yaş ortalaması (55.19±18.59) acil ve acil olmayan gruptan anlamlı olarak yüksek bulundu ($p<0.01$). En çok başvurunun yapıldığı gün Pazar ve gün içinde saat 20:00 ile 22:00 arasıydı. Hastaların AS'de ortalama kalış süresi 183.6 dakikaydı. Hastalarda %17.6 yatış oranı saptandı. En çok not edilen ICD-10 kodları, solunumsal (%16.6), gastrointestinal sistem (%11.3), kas iskelet sistemi (%11.2) olarak saptandı.

Sonuç

Sistemden yüklenen veriler bizim beklentilerimizi karşılamamaktaydı (%71.4). Verilerin tıbbi sekreterler tarafından yüklenmesi daha uygun olabilir. Hastaların bilgilerini dijital atmosferde kayıt altına alınması ve analizlerinin yapılması gelecekte yapılacak çalışmalar üzerine etkili olacaktır.

Anahtar sözcükler: Acil servis; demografik; veritabanı yönetim sistemi.

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Introduction

The emergency service department requires a high level of public relations within the hospital. That is why public opinion regarding a hospital is mostly based on the healthcare service that people receive and the quality of time they experience within the ED.

Throughout the world, emergency medicine has been a 'medical specialty' of clinical medicine in its own right for thirty years. In particular, countries such as the United States, Canada, Japan, and the United Kingdom have pioneered this field.^[1] In our country, academic emergency medical services have been established for twenty years and continue to develop and become increasingly structured.^[2,3] According to the latest data, there are 1,350 hospitals and hospital affiliated EDs operating in Turkey.^[4] However, there is no up-to-date and accurate patient data information in the majority of these units due to the lack of sufficient personnel and the appropriate registration systems.

In recent years, advances in computer-aided data recording programs have been used particularly in EDs offering developed medical services. Nevertheless, the development of a data registration system eligible for use in all emergency departments has not been implemented due to financial difficulties.^[5]

There is a need to evaluate and review the services presently offered in order to improve the future healthcare and patient service quality of EDs. In particular, a need to store and retrieve patient data quickly, practically, and accurately is warranted.^[6] Characteristics of patients of the ED are important in order to plan for the future and improve quality assurance. In this study, we aimed to evaluate our ED patients from this perspective. Current developments in data storage technologies may not only reduce data loss but also contribute to the planning of future services.

Materials and Methods

This is a retrospective descriptive study based on computer-based records of all adult patients that were admitted to the ED between February 17, 2009 and February 16, 2010. The ED was associated with a medical faculty training and research hospital offering tertiary health services and approximately 900 beds in a central Anatolian city in Turkey. The study began after having received approval from the Ethics Committee (Eskisehir Osmangazi University Ethical Committee-21.05.2010/107).

The Hospital Information and Management System (HIMS), used by the computer center to record information on patients presenting to the emergency department, was employed to gather data required for this study.

Recordings of HIMS were used to access information on patients' age and gender, date on which they presented to the emergency department, admission and discharge time, patients' triage categories and diagnoses, the clinics where patients stayed in the hospital, and medical results when they were discharged from the emergency department. A three level system of triage categories were used in classification: emergent (triage 1), urgent (triage 2) and non-urgent (triage 3).

The data obtained from HIMS allowed us to study the following: (i) demographic information on patients (distribution by age and gender, distribution of patients' gender by age groups), (ii) triage categories, (iii) triage categories by age groups, (iv) triage categories by gender, (v) date and hour of presenting to the hospital, (vi) average period of stay in the emergency department, (vii) average period of stay in the emergency department by triage categories, (viii) distribution of patients by residents offering treatment, (ix) medical results of patients, (x) referral to other clinics for inpatient hospitalization from the emergency department, (xi) and distribution of diagnoses by body systems defined according to ICD-10 diagnosis coding system.

The Statistical Package for Social Sciences (SPSS) for Windows 17.0 was used for the statistical analyses of data collected for this study. In addition to descriptive statistical methods (i.e. frequency distribution, percentile distribution, standard deviation), Pearson's Chi-square test was used to compare qualitative data. For the analysis of quantitative data, independent samples t-test was used to compare parameters between groups in cases where there were two groups. One-way ANOVA was used to compare the groups' parameters, which showed a normal distribution, and the Tukey test was used to specify the group that caused difference in cases where there was more than one group. The results were evaluated bidirectionally at the confidence interval of 95% with a significance level of $p < 0.05$.

Results

Between February 17, 2009 and February 16, 2010, 32,117 patients were admitted to the adult emergency department of the hospital. Out of this number, 9,262 patients (28.5%) whose data were incomplete or inaccurate in HIMS were excluded from the study and 22,955 patients were included in the study.

The average age of the patients was 44.92 ± 19.50 . The majority of patients were in the young group (age 18 to 29, 30.8%). In the distribution of patients' age groups, the patients aged from 20 to 23 constituted the largest group in the distribution (Table 1).

Table 1. The distribution of patients by age group

Age group	Number of patients	Percentage
18-29	7.069	30.8
30-39	3.245	14.1
40-49	3.151	13.7
50-59	3.322	14.5
60-69	2.954	12.9
70-79	2.360	10.3
80-89	812	3.5
90-99	42	0.2
Total	22.955	100.0

The gender distribution of patients presenting in the emergency department was as follows: 11,270 (48.8%) patients were male (average age 45.96 ± 19.37) and 11,748 (51.2%) were female (average age 43.93 ± 19.56).

The number of female patients was greater in age groups 18 to 29, 30 to 39, and 40 to 49 whereas, the number of male patients was greater in age groups 50 to 59, 60 to 69, and 70 to 79 (Chi-square=90.22; $p < 0.01$). There was no difference in the number of female and male patients in the age groups 80 to 89 and 90 to 99.

In the group of participants, 5,981 patients (26.1%) were in Triage 1 (emergent), 3,400 (14.8%) in Triage 2 (urgent) and 13,574 (59.1%) in Triage 3 (non-urgent) category (Figure 1).

The average age of patients by triage category was as follows: 55.19 ± 18.59 in Triage 1, 48.74 ± 19.09 in Triage 2, and 39.44 ± 17.87 in Triage 3. The relationship between the triage category and the average age of patients was significant (Chi-square=1635; $p < 0.01$). The average age of patients in the emergent group was significantly higher compared to that of patients in the urgent and non-urgent groups ($p < 0.01$). Furthermore, the average age of patients in the urgent group was significantly higher compared to that of patients in the non-urgent group ($p < 0.01$).

Given the relationship between the age and the triage category, the study showed that the triage category of patients worsened as their age increased. This relationship is statistically significant (Chi-square=2823; $p < 0.01$) (Figure 2).

Given the distribution of triage categories by gender, the study revealed that triage 1, 2 and 3 were seen at a rate of respectively 55.8%, 49.0%, and 45.7% among male patients, and respectively 44.2%, 51.0%, and 54.3% among female patients.

The comparison of female and male groups with regard to tri-

age categories determined that the rate of male patients was higher in Triage 1 and that the rate of female patients was higher in Triage 3. Chi-square test revealed that this relationship was statistically significant (Chi-square=167; $p < 0.01$).

Patients were admitted to the ED most frequently on Sundays (15.3%) and least frequently on Fridays (13.3%). The

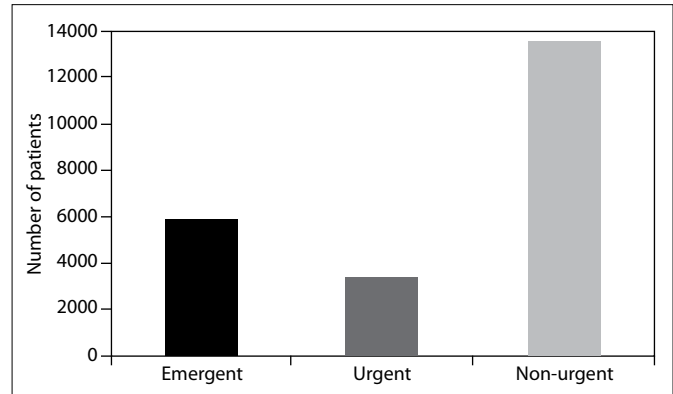


Figure 1. Triage categories of patients presenting to the emergency department.

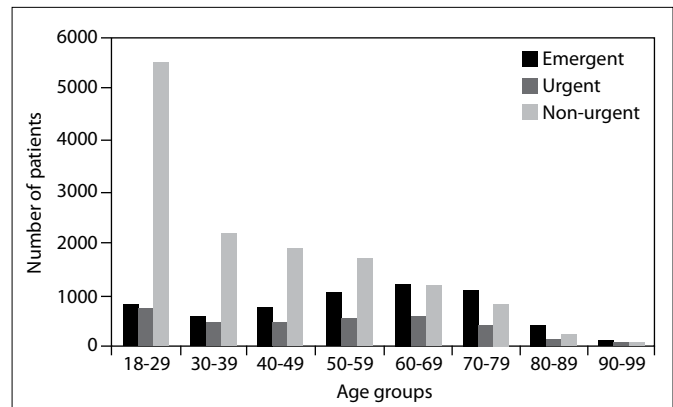


Figure 2. Distribution of triage categories of patients presenting to the emergency department by age group.

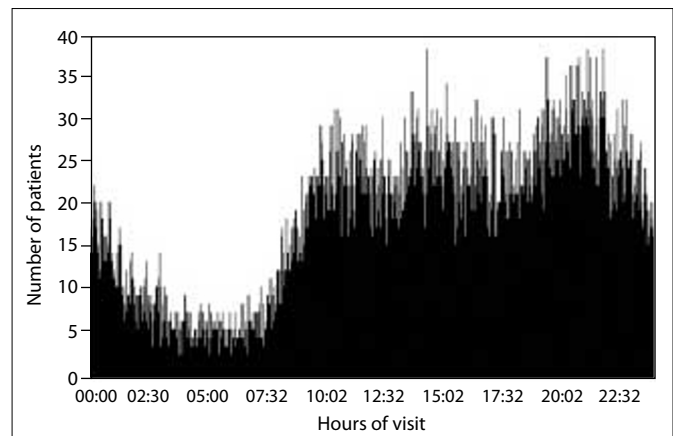


Figure 3. Distribution of emergency department patients by hours of the day.

rate of frequency on Sundays was significantly higher than the rates of weekdays ($p < 0.05$).

The number of patients presenting to the ED decreased from 12 pm to 8 am, and increased gradually after 8 am. The emergency department visits peaked between 8 pm and 10 pm (Figure 3).

The patients' average length of stay in the emergency department was 183.6 minutes (~three hours).

With respect to the relationship between triage categories and average length of stay, this study demonstrated that the average length of stay in Triage 1, 2, and 3 was 258.3 minutes (4.3 hours), 215.4 minutes (4 hours) and 142.6 minutes (2.4 hours), respectively. The groups were significantly different from each other with respect to the average length of stay by triage categories. The length of stay of patients in the emergent category was significantly higher than that of the urgent and non-urgent patients. Furthermore, the length of stay of urgent patients was significantly higher than that of non-urgent patients.

Of the subjects of this study, 17,988 patients (78.4%) were discharged from the hospital after medical examination, and 4,045 patients (17.6%) were hospitalized. In the latter group, 2,156 patients (9.3%) were hospitalized in various departments and 1,889 patients (8.2%) placed in intensive care units of the hospital. The total number of patients that died was 73 (0.3%). The number of patients that registered but then left the emergency department without examination or at any stage of the examination was 792 (3.5%). Of these patients, 729 (3.2%) rejected treatment by their own will, and 63 (0.3%) left the department without permission. The rate of patients referred to other healthcare institutions was 0.2%.

Given the distribution of patients discharged by triage categories, the following results were obtained: 53.4% of emergent patients, 72.0% of urgent patients, and 91.0% of non-urgent patients were discharged from the hospital. On the other hand, 39.4% of emergent patients, 23.7% of urgent patients, and 6.5% of non-urgent patients were hospitalized in intensive care units and various departments.

Table 2. The distribution of diagnoses, defined according to ICD-10 coding system, by triage categories

Code	Category	Immediate		Urgent		Non-urgent	
		n	%	n	%	n	%
A	Certain infectious and parasitic diseases	18	0.3	15	0.5	35	0.2
B	Viral infections	11	0.2	10	0.3	75	0.6
C	Tumors	495	8.3	338	10.0	497	3.7
D	Diseases of the blood and the immune system	123	2.0	80	2.4	150	1.1
E	Endocrine, nutritional and metabolic diseases	267	4.5	74	2.2	176	1.3
F	Mental and behavioral disorders	262	4.4	153	4.5	510	3.8
G	Diseases of the nervous system	490	8.2	205	6.1	694	5.1
H	Eye and otorhinolaryngology diseases	86	1.4	168	4.9	949	7.0
I	Diseases of the circulatory system	1717	29.0	302	8.9	442	3.3
J	Diseases of the respiratory system	683	11.5	295	8.6	3041	22.4
K	Diseases of the digestive system	362	6.1	464	13.6	1795	13.2
L	Diseases of the skin and subcutaneous tissue	39	0.6	69	2.0	561	4.1
M	Diseases of the musculoskeletal system and connective tissue	439	7.4	306	9.0	1755	12.9
N	Diseases of the genitourinary system	171	2.8	301	8.8	1341	9.9
O	Pregnancy, childbirth and the puerperium	14	0.2	41	1.2	39	0.3
P	Certain conditions originating in the perinatal period	5	0.1	17	0.5	9	0.1
Q	Congenital malformations, deformations	6	0.1	1	0.0	6	0.0
S	Injury of external causes	381	6.4	428	12.6	958	7.1
T	Poisoning and poisoning and certain other consequences of external causes	245	4.1	67	1.9	304	2.2
V	Transport accidents	48	0.8	5	0.1	2	0.0
W	Falls	34	0.5	16	0.5	113	0.8
X, Y, Z	Other (Poisoning, Assault, Other medical problems)	81	1.3	45	1.4	122	0.9
	Total	5.981	100	3.400	100	13.574	100

The medical units that ED patients were referred to for hospitalization were internal medicine with 641 patients [119 (3.0%) patients in medical oncology, 5 (0.1%) patients in rheumatology, 103 (2.5%) patients in hematology, 42 (1.0%) patients in gastroenterology, 37 (0.9%) patients in general internal medicine, 79 (2.0%) patients in nephrology, 22 (0.5%) patients in endocrinology, and 234 (5.8%) patients in the intensive care unit], cardiology with 636 patients [66 (1.6%) in the department and 570 (14.2%) patients in the intensive care unit], and neurology with 530 patients [429 (10.7%) in the department and 101 (2.5%) patients in the intensive care unit].

The diagnoses defined according to ICD-10 diagnosis coding system were recorded by HIMS. A total of 28,806 diagnoses were established for 22,955 patients because some patients were diagnosed with more than one disorder. Given the distribution of ICD-10 codes, the first four most frequently encountered codes were J (16.6%), K (11.3%), M (11.2%) and I (11.1%).

Given the distribution of diagnosis codes by triage categories, the following results were obtained: the most frequently encountered diagnosis in emergent category was "I" code representing diseases of the circulatory system, in urgent category was "K" code representing diseases of the digestive system, and in non-urgent category was "J" code representing diseases of the respiratory system (Table 2).

Discussion

The ED of a hospital is the first place to which patients have recourse in case of urgent medical needs. Emergency medicine is the field of specialty in which physicians provide diagnosis and treatment in case of an acute disease or injury, refer patients to other units for further support, and treatment when required, and also strive to prevent urgent cases.^[7,8]

There is a need to measure and assess the healthcare service provided in order to promote the quality of emergency medical services. This is possible only with a better documentation and data collection system. Better medical recording is important for, not only clinical purposes but, also medico-legal purposes.^[9] Today, there is a need for computer-based data collection and thus, specific software for the dynamic analysis of data. The next step is national and international integration of all data collected.^[5]

The rate of patients whose data were incomplete in the system for our study was higher than expected. Previous studies showed that data loss was reduced to 10% in similar cases.^[10] The loss of data in the present study mainly stems from the entry of incomplete data, due to lack of experience most likely because the HIMS was launched in January 2009

(just one and a half months before the start of this study). Furthermore, the number of residents in emergency medicine was limited. Thus, the data related to triage were not entered by paramedics who have received training on data entry, but by nurses and intern physicians. Schootman et al. showed that the loss of data decreased from 22.6% to 8.1% in a period of one year after a two-month training was issued, which is an indicator of the importance of personnel training in the success of recording systems.^[10]

In their study related to the use of computers in emergency departments, Hu et al. emphasized the need to use computer-based programs in medical data collection in emergency departments and highlighted the importance of the personnel's efforts in this process.^[11]

This study has also revealed that the health personnel, including physicians, are required to be competent in computer use to ensure accurate and complete entry of data. Adirim et al. stated that, in order to minimize data loss, at least one secretary should be responsible for data entry at any hour of the day in emergency departments.^[12]

The number of patients in the emergent triage category was higher compared to similar data in the US. This may be because the hospital where this study was conducted was a tertiary healthcare institution. As there are not sufficient healthcare institutions that may offer this service in surrounding cities, the number of patients in the emergent category may be higher compared to similar studies in the literature.

The average age of Triage 1 patients was 55.19, and the majority of these patients were over 50. The relationship between triage categories and age groups revealed that the triage category worsened as the age of patients increased. Singal et al. studied geriatric recourse to the emergency department. They found that geriatric patients that suffered more from comorbid diseases stayed for longer periods of time in the emergency department and, had higher rate of hospitalization and emergency compared to younger patients.^[13] Bozkurt et al. also stated that aged patients came to the emergency department more frequently.^[14]

Given the distribution of triage categories by gender, our study showed that the rate of male patients was higher in emergent category and that of female patients was higher in non-urgent category. According to similar findings, the rate of inappropriate emergency department visits is higher among women.^[3,15] The studies in the US did not show any significant difference in emergency status between men and women presenting to the ED.^[16,17] The fact that female patients tend to present to the ED in non-urgent cases may result from certain cultural characteristics of the Turkish so-

ciety. Many women are reluctant to go to polyclinics without being accompanied by their spouse or another acquaintance. As male family members are at work, they typically have to come to the ED after working hours. Because men are more engaged in work life, they have recourse to hospitals in case of higher emergency. There is a need for further research on polyclinic and hospital use to explain the difference between male and female behaviors more clearly.

The highest volume of emergency department visits occurred on Sundays and the lowest on Fridays. Some other studies have also reached similar findings related to the most frequently visited day, as other healthcare units are closed at weekends.^[18,19] Ersel et al. found that the busiest day of the emergency department was Saturday, and considered that people tend to more easily admit themselves to the ED for the solution of any health problem, whether it be urgent or not, because they could not access healthcare services during working hours on weekdays.^[20]

The number of patients was relatively low between 8 and 10 am and increased between 10 and 12 am. This may mean that patients with less severe complaints prefer coming to the ED for medical examination on the hours that are more appropriate for them. The number of patients visiting the department was stable between 12 am and 6 pm. The number peaked between 8 and 10 pm, which may mean that patients visited easily accessible, always-open EDs after completing their daily activities. The number of patients reduced considerably after 12 am. In the study of Ersel et al.,^[20] the same time interval was the busiest hours of the ED. Guterma et al. found that the number of patients decreased during the night hours, but that the rate of hospitalization at nights was two-fold higher compared to daytime.^[21] Given that the majority of emergency visits was between 11 am and 10 pm, the distribution of visit hours is similar to the 2007 CDC data (64.7% of emergency visits in the US were between 5 pm and 8 pm).^[22]

In the emergency department, the respiratory system with J code accounted for the highest rate of visits (16.6%) and respiratory system diseases were the leading cause of visits (10.3%). The high rate of emergency visits in case of upper respiratory track diseases leads us to consider that primary healthcare services do not function properly in Turkey. Furthermore, patients prefer presenting to the ED of university hospitals rather than primary healthcare centers. This may be related to the patients' expectations of receiving better service in tertiary healthcare institutions.

Given the distribution of diagnosis codes defined according to the ICD-10 coding system by triage categories, the following results were obtained. The most frequently encountered diagnosis in the emergent category was "I" code represent-

ing diseases of the circulatory system. The urgent category was "K" code representing diseases of the digestive system and the non-urgent category was "J" code representing diseases of the respiratory system. The cardiology department received the highest number of emergency department visits resulting in inpatient hospitalization. This supports the high rate of circulatory system diseases among Triage 1 patients.

In order to improve emergency departments, it is of particular importance to determine the appropriate number of beds in service and intensive care units of hospitals. In addition, it is important to determine the number of beds in the ED in proportion to the number of beds in the hospital, and optimize occupancy rates of beds. Some of the basic recommendations to improve the functioning of emergency departments are to increase the number of personnel, to modernize the equipment to facilitate and accelerate the functioning, to arrange working hours in consideration of patient volume, and to employ qualified and experienced healthcare professional in these departments.^[20]

Limitations

The limitations of our study can be summarized. Our study is single-centered and retrospective. Additionally, there was a 28.5% data loss. This can be explained by the following reasons: collection of the data was started after a month of the beginning of HIMS system, lack of experience in collecting the data, and lack of emergency medicine residents. In our emergency department, we do not have paramedics or physicians in the triage. Instead, there are nurses and intern doctors, which also contributes to the limitation. In summary, the data of our department may be different from the other EDs in Turkey. After all, further prospective multi-center studies must be done.

Conclusion

Gathering patient data through a well-designed data recording system in EDs contributes, not only to the statistical analyses and the evaluation of service quality but also, to the improvement of future EDs. Diagnosis codes used in the international area and computer-assisted recording programs, allowing integrated and easy data entry and analysis, may contribute considerably to the appropriate and regular collection of data. Particularly with advanced technologies, all medical procedures and results related to a patient may be recorded in addition to their demographic data. Data entry in the system is as important as a well-designed recording system. We had data loss of 28.5% implicating the need for well-trained medical secretaries to provide uninterrupted service in addition to healthcare professionals in EDs.

Annual data should be taken into consideration to determine the number and quality of staff to be employed in EDs. There is also need to update job definitions and qualifications of specialists, research assistants, general practitioners, nurses, sanitarians, paramedics, emergency medical technicians, and medical secretaries. Furthermore, the workload of hospitals in the city and in surrounding cities should be determined with a view for identifying the source of high patient volume during certain days and hours.

Conflict of Interest

The authors declare that there is no potential conflicts of interest.

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