Trends in emergency department utilization in a hospital in the Eastern region of Saudi Arabia

Rifat Rehmani, MSc, FRCSEd (A&E), *Ahmed Norain,* MRCP (UK), ABIM.

ABSTRACT

Objectives: To examine the changes in emergency department (ED) utilization over a 3-year period and identify the factors that affect utilization.

Methods: We performed an analysis of administrative ED records at King Abdul-Aziz Hospital from the years 2003 to 2005 for all patients to assess the demographic characteristics, periodicity of ED use, and acuity level.

Results: During the study period, the number of ED visits increased approximately 30%. Patients demographic characteristics, periodicity, and acuity were comparable for ED visits across each study year. Fall (between September and November) was the busiest season (30%), and the greatest volume was between 3 and 11 pm (57.5% of all visits). We found that 52% had 1 visit, 18% had 2 visits, 12% had 3 visits, and 8% had 4 or more visits. The Canadian Triage and Acuity Scale (CTAS) IV and V visits comprised 59.5% of the ED visits. The patients' admission has increased from 7.2-9%, while the ED length of stay increased from 72 minutes to 78 minutes during the study period.

Conclusions: Emergency department utilization increased during the study period, with almost no change in the proportions for triage category. The numbers of patients requiring hospital admission increased, as the length of their stay. Nearly 60% of emergency visits are for CTAS IV and V care. There were significant patients with multiple visits to ED. We recommend the strengthening of the primary health care in our institution and a designated "Fast Track" in ED for the expeditious management of low acuity patients

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From the Department of Emergency Medicine, King Abdul-Aziz Hospital, Al-Ahsa, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Rifat Rehmani, Consultant, Department of Emergency Medicine, King Abdul-Aziz Hospital, PO Box 2477, Al-Ahsa 31982, Kingdom of Saudi Arabia. Tel. +966 (3) 5910000 ext. 3349. Fax. +966 (3) 5910000 ext. 4322. E-mail: rehmanir@ngha.med.sa

Emergency medicine is the medical specialty with the principal mission of evaluating, managing, treating, and preventing unexpected illness and injury.[1] The Emergency Department (ED) is considered the vital link between pre-hospital and in-hospital medical care, offering professional care at any time to everyone in need.[2] During the past few decades, a continuous increase in ED visits has been universally observed.[3,4] If to this increase add the organizational problems (such as laboratory delays, admission delays, shortage of staff, and others), and this explains why an ED becomes overcrowded, with inevitable consequences.[3,5]

There were prior studies in the West that examined factors associated with ED use and the trends over the years.[6,7] Our search has found only one study that looked at the extent of inappropriate emergency room attendance in a Saudi community.[8] We have examined the epidemiology of ED use among those seeking non-urgent as well as urgent and emergent care at our hospital. The objectives were to establish general demographic trends over a 3-year period, establish patterns of use (time of day, day of week, and season of year) within the year, and to examine whether there were differences in factors associated with varying acuity.

Methods. We analyzed the administrative ED records at our hospital of all patients cared for during 2003 to 2005, with the objective of studying ED utilization and identifying factors that affect ED utilization.

Study data were collected at King Abdul-Aziz National Guard Hospital (KAH), which is a 300-bed capacity and provides primary and secondary care to National Guard personnel, their dependents and the citizens of the region at Al-Ahsa in the Eastern region of KSA. The hospital started to function in late 2002, dedicated to delivering services of the highest international standard.[9]

The ED provides patients with easy access and streamlined care in state of the art facility and features a reception area for visual triage for early recognition of critically ill or injured patients who are in need of immediate medical care. The ED of the studied hospital is broadly divided into ER1 with 5 monitored beds, serves

as high dependency unit and ER2 with 5 treatment beds. There is also one trauma room with 2 monitored beds, one room for cardiopulmonary resuscitation, one isolation room, one plaster room, and a triage area with 2 consultation rooms. Currently, there is no separate pediatric ED, however, recently 3 beds are assigned for pediatrics. The staffing consists of 2 staff physicians per shift of 8 hours, and the Consultants supervised them. The staff physicians from the internal medicine, intensive care unit, surgery, obstetrics and gynecology, and pediatrics are called, if patients need admission to relevant specialty. There were no renovations or redesign of the ED during the study period.

Demographic characteristics included gender, age at first visit during study year, and the distance the patient lived from the hospital as well as employment status and mode of transportation. Age was grouped into 4 categories: 0-12 years, 13-40 years, 41-60 years, and more than 61 years. Employment status was categorized into National Guard employed or others. The mode of transportation was reported as private car, ambulance, and walking.

Several variables were examined to describe the pattern and timing of ED use. We dichotomized the number of ED visits (1 or 2+) to identify patients with multiple annual visits. The time of visits was categorized based on nursing shifts and divided into 8-hour blocks beginning at 7:00 am. The seasons were defined as follows: summer (June-August), fall (September-November), winter (December-February), and spring (March-May). The patients' disposition was also recorded, as admission, expired, and left against medical advice.

Acuity level was based on Canadian Emergency Department Triage and Acuity Scale (CTAS).[10] The CTAS has 5 acuity levels - Resuscitation, Emergent, Urgent, Less Urgent and Non Urgent - numbered I to V respectively. It enables rapid patient classification at the time of first contact based on urgency (risk and symptom severity) and likely service intensity required.

This study has relied on secondary data without patient identifiers. Scrambled identification numbers were used to identify individuals' repeated ED use over time. The approval from the Hospital Research Committee was taken for this study.

Across the 3-year study, demographics, acuity level, and periodicity of ED use were examined with visits as the unit of analyses. We further assessed whether individuals using the ED exclusively for low triage problems had different demographic characteristics from higher triage level ED users. All data were entered on Microsoft Excel spreadsheets (Microsoft, Seattle, WA) and imported into the Statistical Package for Social Sciences (SPSS) version 10.0 for descriptive statistics, as well as the univariate and regression analysis (SPSS, Chicago, IL). We used $\chi 2$ statistics to examine associations between patients and visit characteristics and volume of ED use.

Results. **Table 1** revealed the essential information of ED over the study period, while **Table 2** illustrates the patient profile.

The number of ED visits at the studied hospital has increased by 29.4% from 2003 to 2005. The number of visits for each of 5 triage categories is given in **Table 3**. It showed that triage category visits did not vary significantly during the study period. Hence, the growth in ED visits occurred in all the triage categories in the same proportion.

There were no characteristic differences between people who used the ED both for CTAS II and III and for CTAS IV and V care. Overall, there were more visits by male than female patients (55% versus 45%, $p<0.001$). When comparing the levels of acuity, there were more male patients than female patients overall, but for CTAS IV and V care, the ratio of male to female was comparable. The percentage of patients admitted increased steadily from 7.2-9% during the study period. The mean ED length of stay also increased during the study period from 72 minutes to 78 minutes.

There was a seasonal variation across the 3-study years as shown in **Table 4**. The fall was the busiest (30%), followed by winter (25%) and the spring (24.7%). The ED had the greatest volume between the hours of 3 and 11 pm (57.5% of all visits). Also, the acuity differed based on the time of visit in the ED. Triage IV and V visits were greatest between 3 and 11 pm (46.2%), whereas Triage II and III visits were more evenly distributed (66.8% of visits were between 10:00 am and 9:00 pm). (Data not shown). Lastly, Triage IV and V visits comprised 59.5% of the ED visits.

We also found that 52% had 1 visit, 18% had 2 visits, 12% had 3 visits, and 8% had 4 or more visits (Data not shown).

Table 1 - Emergency Department (ED) essential data.

Studied variables	2003	2004	2005
Total visits to ED	**35146**	**48685**	**45483**
Adult visits	21117	29732	28649
Pediatric visits	14029	18953	16834
Admission to the hospital	2527	3538	4088
Average daily census	96	133	125
Average length of stay (min)	72	74	78
Trauma	1251	2441	3170
Deaths in ED	2	11	14
Left against medical advice	281	590	661

Discussion. The ED of our hospital experienced an increase in utilization over a 3-year period. During the study period, the proportion of patients treated with different triage categories remained almost the same. However, the length of stay increased, and the number of patients admitted to the hospital also increased.

The ED volume has increased approximately 30% during the study period. Actually, in 2005, there was a cumulative negative variance of 6.6% than in 2004 (11.2% for pediatrics and 3.6% for adult patients). We believe it was directly related to Hospital's Primary Health Care Clinic (PHCC) schedule. The PHCC was closed in August and functioned at reduced hours during September - November 2005, and therefore, ED had to entertain more patients during that period. However, the number of sick patients is increasing, as reflected by positive variance of approximately 62% in hospital admissions from ED. Similarly, the number of injured patients has also increased by 150%, which included 25% with severe trauma.

Nearly 60% of the patients used the ED exclusively for CTAS IV and V conditions. These results are similar with the only study published from the Kingdom, which showed that 59.4% of the patients had primary care or non-urgent problems.[8] Factors that may contribute to the use of ED for less/non-urgent care include convenience, limited access to primary care, limited availability of social supports, and similar caregiver patterns of healthcare seeking for one's self.[11-13] This increase in the number of patients visiting ED with primary care problems, resulted in increased waiting time for urgent cases.

The number and percentage of ED patients with prolonged stay (more than 3 hours is our benchmark) increased during the study period, but still was less than 2% of the patients' visits. Some of the increased length of stay may be related to the increase in acuity, and the increase in the number of patients requiring admission. This interpretation was consistent with the study that

Table 2 - Characteristics of patients arriving at the Emergency Department for a visit.

Variables	2003 N=35146	(%)	2004 N=48685	(%)	2005 N=45483	(%)
Gender	**35146**	**(100)**	**48685**	**(100)**	**45483**	**(100)**
Male	19120	(54.4)	27459	(56.4)	24652	(54.2)
Female	16026	(45.6)	21226	(43.6)	20831	(45.8)
Age (years)						
Pediatric (0-12)	14029	(39.9)	18921	(38.9)	16834	(37)
13-40	6571	(18.7)	9358	(19.2)	9051	(19.9)
41-60	8468	(24.1)	11880	(24.4)	11231	(24.7)
>60	6078	(17.3)	8526	(17.5)	8367	(18.4)
Employment (%)						
National Guard (dependents)		(99)	98		96	
Mode of Transport (%)						
Private car		(99)		(99)		(99)
Ambulance		(<1)		(<1)		(<1)
Others		(<0.1)		(<0.1)		(<0.1)
Duration of complaint						
≤24 hours	19682	(56)	26289	(54)	24106	(53)
>24 hours	15464	(44)	22396	(46)	21377	(47)

Table 3 - Triage acuity levels.

Year	Level - I Resuscitation	Level - II Emergent	Level - III Urgent	Level - IV Less urgent	Level - V Non-urgent	Total
2003	56 (0.16)	1280 (3.64)	12125 (34.5)	14164 (40.3)	7521 (21.4)	35146
2004	66 (0.14)	1853 (3.8)	18390 (37.8)	22720 (46.66)	5656 (11.6)	48685
2005	68 (0.15)	1637 (3.6)	17148 (37.7)	21377 (47.0)	5253 (11.55)	45483

showed ED throughput was affected by the number of inpatient admissions from the ED, daily ED census, and number of ambulance arrivals.[14] An additional cause for more patients' having prolonged length of stay may be a change in expectations of what service is provided by EDs. Consultations by specialists, scheduling of high-tech tests, and serial physical examinations can change a 2-hour ED visit into an 8-hour prolonged service visit. Many EDs have developed observation units for the management of these prolonged service need patients.[15]

During the study period, the overall number of visits differed for each season; the fall was the busiest (30%), and the winter was second busiest (25%). An increase of respiratory and gastrointestinal illnesses during these months may account for higher volume of patients, especially children and elderly population. The summer is the lightest season due to school vacation, during that time most of the National Guards and their families visit their extended family and travel. We found that 52% of patients using the ED had only 1 visit per year, while 48% used the ED more than twice (28% for 2 visits, 12% for 3 visits, and 8% for 4 or more visits). The repeated use was very high, and importantly, most patients presented multiple times for CTAS IV and V care. Our results were not consistent with the available literature,[7,16] and we believe that this is due to the fact that the facility is primarily designed to serve the workers of the establishment (National Guards) and members of their families.

The ED had the greatest volume between the hours of 3 and 11 pm. This result is consistent with recent studies conducted in an urban hospital.[7,8] Volume of ED use varies on daily basis as well. We find that Saturdays had substantially greater number of visits than other days of the week. Moreover, when we examined days of the week based on acuity, there were more CTAS II and III patients on Saturdays and Sundays and more CTAS IV and V patients on Thursdays and Fridays (weekend days in Kingdom). Therefore, the data did demonstrate an increase in volume on Saturdays, thus, perception of the "busy Saturday" is true in our department. Overcrowding has been a serious problem globally in EDs for some time. Planning must begin now to accommodate the increases in ED patients that will take place over the next decade.

The results reported here describe the experience at one hospital over the last 3 years. The extent to which the experience generalizes to other hospitals will depend on the circumstances of that community. However, it is important while planning any emergency services in the Kingdom, that ED is a popular source of primary care. We must therefore, have a designated place, separate but close to ED, where such patients could be triaged and managed efficiently. Improvements in public education are needed to solve this problem. Our PHCC is understaffed and the services are not round the clock, which is one of the reasons, why patients prefer the emergency department care. This pattern of use is different in the United States, where 62% of

Table 4 - Periodicity of Emergency Department (ED) visits, Fiscal Year (FY) 2003 to 2005.

Periodicity	FY 2003 N=35146	(%)	FY 2004 N=48685	(%)	FY 2005 N=45483	(%)
Days of week						
Saturday	5048	(14.4)	6819	(14)	6680	(14.7)
Sunday	4709	(13.5)	6408	(13.2)	5962	(13.1)
Monday	4549	(12.9)	6124	(12.5)	5912	(13)
Tuesday	4586	(13)	6301	(13)	5754	(12.6)
Wednesday	4497	(12.8)	6457	(13.3)	5853	(12.9)
Thursday	5880	(16.7)	8324	(17.1)	7775	(17.1)
Friday	5877	(16.7)	8252	(16.9)	7547	(16.6)
Time of visits						
7 am to 3 pm	8302	(23.7)	11079	(22.8)	10896	(24)
3 to 11 pm	20755	(59)	28140	(57.8)	25475	(56)
11 pm to 7 am	6089	(17.3)	9466	(19.4)	9112	(20)
Season of the year						
Spring	8359	(23.8)	11679	(24)	11972	(26.3)
Summer	7609	(21.6)	9576	(19.6)	9032	(19.8)
Fall	11557	(32.9)	14318	(29.5)	11871	(26.1)
Winter	7621	(21.7)	13112	(26.9)	12608	(27.7)

patients have regular physicians, and 13% visits ED on physician's instructions, and only 10% visiting ED as they were not able to make an appointment with their physician.[17] The Primary Care facilities should be improved in order to reduce the demand for medical attention in ED by non-urgent patients. The department has the triage away policy to PHCC, but is not routinely implemented due to lack of consistent services at that facility.

Large proportions of patients presenting to our ED's have low acuity complaints, as in other studies.[18] We recommend that designated "fast track" units should be introduced in our department to entail the expeditious management of low acuity patients. This has been shown to improve the ED flow and reduce the rate of patients who leave without being seen by a physician, and is generally regarded as a more efficient alternative to main ED for care of uncomplicated patients with low-acuity concerns.[19-21] A recent study suggested that the introduction of "fast track" improved waiting time for minor injuries without delaying the care of those with more serious injury.[22] Similarly, study from North America has concluded that a dedicated fast track for low acuity patients can reduce the length of stay and leaving without being seen with no impact on more serious patients in ED.[23]

Limitations of study. There are several important limitations to the study reported here. First, the data set lacked the chief complaint or diagnosis, and so the reason for a visit could not be adequately assessed. The 3-year trend of ED utilization is reported for one hospital. It is impossible to generalize this data to other hospitals without further investigations. A major future question is "what are the national trends in ED utilization in the Kingdom?"

In summary, ED utilization has increased during the study period, with almost no change in the proportions for triage category, while numbers of patients requiring hospital admission increased. Lengths of stay also increased. There were no characteristic differences between people who used the ED both for CTAS II and III and for CTAS IV and V care. There were significant patients with multiple visits to the ED.

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