ORIGINAL ARTICLE

Factors predicting hospital admission for non-urgent patients presenting to the emergency department

Abdullah Shalabi[1], Omar Alsharqi[2] (iD), Maweyah Alnujaidi[3] (iD),
Rawan Alosaimy[3] (iD), Ebtehal Altalhi[4*] (iD), Rozan Kashmeeri[3] (iD),
Raghad Aldibane[3] (iD)

ABSTRACT

Background: The Canadian Triage and Acuity Scale (CTAS) is a scale that identifies the urgency of the case and helps to determine the time needed to be assessed by the physician in the emergency department (ED). However, further research is needed to identify factors that need to be taken into consideration in future CTAS to avoid misclassification of non-urgent patients at high risk who need admission and can be triaged away from the ED. The aim of the study was to evaluate the admission of non-urgent patients to decrease the burden on the ED by triaging them away from primary health care (PHC).

Methods: A descriptive-analytical retrospective cohort study was performed including all patients who presented to the ED of King Abdullah Medical Center, Makkah, during a period starting on 9 May 2019 and were classified as CTAS levels 4 and 5. Data of those patients regarding CTAS levels, sex, age, ED visit, vital signs at triage time, pain score, chief complaint, and past medical history extracted from their electronic medical records were entered into the Statistical Package for Social Sciences software (SPSS), and multivariate logistic regression was used to identify predictors of admission.

Results: CTAS IV and CTAS V patients accounted for 30.3% (2509/8277) of the total ED visits. The admission rate was 6.1%. Multivariate logistic regression analysis revealed that female patients were 48% less likely to be admitted than males (adjusted odds ratio "AOR": 0.52, 95% confidence interval "CI": 0.36-0.74). Patients who presented with nausea/vomiting had an almost double chance for admission (AOR: 2.03, 95% CI: 1.09-3.79). Patients with a history of hypertension (AOR: 2.39, 95% CI: 1.68-3.40), cancer patients (AOR: 3.02, 95% CI: 2.11-4.32), and patients who presented with a respiratory rate exceeding 20/minute (AOR: 4.88, 95% CI: 1.45-16.40) were more likely to be admitted than their counterparts.

Conclusion: Non-urgent visits to EDs are common practice, and a considerable percentage of patients were admitted. All CTAS V cases can be safely triaged away to the PHC; CTAS IV can be either triaged away to PHC or to the urgent care center taking into consideration whether the patient is tachypneic, hypertensive or an oncology patient.

Keywords: Emergency department, non-urgent, Canadian triage and acuity scale, triage, factor.

Introduction

Emergency departments (EDs) are an important component of health care safety and are always available to all who require and need care [1]. A significant percentage of ED visits are made by patients with non-urgent issues [2]. According to a newly published study in Turkey, non-urgent ED patients have been estimated to be more than half of all ED visitors [3]. Patients who present with problems that are unlikely to be life-

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threatening or require immediate attention are defined as non-urgent [4].

Non-urgent emergency visits are considered as an inefficient use of the health-care system, as they may lead to overcrowding [5]. Overcrowding and long waiting times are major problems of EDs worldwide; studies have demonstrated that ED crowding is associated with higher mortality rates, delayed treatment, return visits, decreased patient satisfaction, stretching resources, and the potential for poor performance of ED personnel to provide care to patients. It has also been identified as a potentially high-risk environment for medical errors [6,7]

This study took place in King Abdullah Medical City (KAMC), a tertiary health care system that follows the Canadian Triage and Acuity Scale (CTAS). This triage aims to prioritize patients according to their urgency and the time needed to be assessed by the physician [8].

CTAS has five levels: CTAS I is for life-threatening conditions that require immediate physician attendance and resuscitation, CTAS II is for emergency patients who need to be seen by the physician in 15 minutes, CTAS III is for urgent patients who need to be seen by the physician in 30 minutes, and CTAS IV and V represent patients with less urgent and non-urgent conditions for which physician assessment could be delayed [9]. CTAS IV and V are our focus in this study, and their criteria are shown below in Table 1.

Based on the high percentage of non-urgent visits to the ED and its consequences on the healthcare system, the aim of this study was to evaluate the admission of non-urgent patients to decrease the ED burden by triaging them away from primary health care (PHC) and determine the factors affecting the admission of patients at KAMC, Makkah. The study analysis focuses on the percentage of admission for patients leveled IV and V according to CTAS and the factors identified from the initial triage. This study also analyzed the percentage of consultations (referral to other specialties) from the ED and the length of stay for each category. The study hypothesized that the triage of CTAS IV and V patients with unstable vital signs (tachypnea, HTN, and tachycardia) or past medical history for several years [diabetes mellitus (DM), HTN, ischemic heart disease (IHD), oncology, or chemotherapy] would increase the

need for admission (inpatient care) and consultation (referral) to other specialties. Proving this hypothesis by knowing the factors that increase the possibility of the admission, triaging away (Diverting) non-urgent patients to alternate health care settings would be safely done without unintended consequences of adverse outcomes in patients' health while saving ED resources.

Study objectives

The primary objectives of this study are to determine the percentage of admission for patients with levels IV and V according to CTAS and to analyze the factors that increase the admission probability that can be identified early during the triage time from demographic data, vital signs, and past medical history.

The secondary objectives were to estimate the percentage of consultations (referral to other specialties), the percentage of admissions after discharging patients within 72 hours, and the percentage that occupied the ED.

Methods

The study was a descriptive-analytical study using a retrospective cohort technique. All patients who presented to the ED and were classified as CTAS levels 4 and 5 were eligible for inclusion. Data from those patients were obtained through electronic medical records after approval by the academic affairs administration and research center at KAMC. The study collected information regarding CTAS levels, gender, age, ED visit, vital signs at triage time [blood pressure (BP), heart rate (HR), oxygen saturation, respiratory rate (RR), body temperature and mean arterial pressure], pain score, chief complaint, past medical history (DM, HTN, IHD, Oncology, on chemotherapy), and disposition of the patient either upon admission to the hospital or at discharge. A total of 2,509 patients were included, which represented total visits to the ED of KAMC and triaged CTAS levels 4 and 5 during the period from 9 May 2019 (start of the electronic medical records system at the center) until August 21 2019 (proposed end of data collection phase of the study). According to the hospital's eligibility policy, if any patient is less than 14 years old, a trauma victim, or pregnant they will not be registered in the KAMC, ED.

Table 1. Criteria for CTAS IV and V.

Type of complaint	CTAS Level 4 - Less Urgent	CTAS Level 5 - Non-urgent
Cardiovascular	Hypertension (HTN) - SBP 200-220 or DBP 110-130 with no symptoms potential for dehydration	
Environmental	Hypothermia - mild with normal vital signs	Minor bites (+/− mild pain <4)
Gastrointestinal	Rectal Bleeding - small amountConstipation (mild pain < 4/10)	Diarrhea (mild, no dehydration)
Respiratory		Sore throat/upper respiratory illness - no respiratory symptoms/compromise
Genitourinary	Urinary tract infection complaints/symptoms (mild dysuria)	
Mental health and neurologic	Mild anxiety/agitation Confusion - chronic, no change from usual state	
Obstetrics/gynecology	Non-pregnant vaginal bleeding - minor/spotting	
Trauma	Burns - <5% body surface areaLaceration/puncture (sutures required) Upper extremity injury	Minor contusions, abrasions or lacerations (not requiring closure by any means)
General and minor		Dressing change (plus normal vital signs +/− mild pain <4)

Numerical variables are presented as the mean ± standard deviation (SD), whereas categorical variables are presented as the frequency and percentage. The chi-square test was utilized to test for the association and/or difference between categorical variables, and Fisher's exact test was used if the frequency in the category was less than five. Student's t-test was utilized to test for the association and/or difference between continuous variables. Finally, the correlation between each independent variable and the disposition of the patients, either admission or discharge, was evaluated by multivariate logistic regression analysis and expressed as adjusted odds ratios (AORs) and 95% confidence intervals (CIs). All statistical analyses were performed by using Statistical Package for Social Sciences (SPSS), version 25, and a p-value <0.05 was considered statistically significant.

Results

The data were extracted from the hospital track-care system between May 9 and August 20, 2019 and analyzed by SPSS version 25 software. The study investigated 8,277 ED visits. Non-urgent cases, according to CTAS triage, represented 30.3% of the cases (2,509/8,277) (Figure 1). Regarding non-urgent cases, the majority (88%) were CATS IV (2,208/2,509).

Demographic characteristics of non-urgent ED visits (n = 2,059). Their age ranged between 14 and 101 years with an arithmetic mean of 49.1 years and a SD of ± 17.1 years. Slightly more than half (50.8%, 1,275/2,509) were females, and the majority were Saudi nationals (2,031/2,509) (Table 2). The majority (92.5% "2,320/2,509") were discharged, whereas 5.9% (149/2,509) were admitted to wards. Only 5.6% (141-2,509) revisited the ED within 72 hours. Among them, 11 patients (0.4%) were admitted to the ward, and only one patient (0.03%) was admitted to critical care (Table 3).

As illustrated in Figure 3, the rate of admission for non-urgent ED visits was 6.1% (n = 153). As evident from Figure 4, the rate of admission of non-urgent ED visits was significantly higher among class CATS IV than CATS V patients (6.7% $vs.$ 1.3%),

Table 4 shows that patients with DM were more likely to be admitted to the hospital than those without DM (10.3% $vs.$ 4.6), p < 0.001. Similarly, hypertensive patients were more likely to be admitted to the hospital than patients without HTN (10.4% $vs.$ 4.3%, p < 0.001). Patients with a history of IHDs were more likely to be admitted than those without IHD (9.0% $vs.$ 5.6%), p = 0.009. Patients with cancer and those on chemotherapy were more likely to be admitted than their counterparts (12.2% and 11.2% $vs.$ 4.4% and 5.2%, respectively), p < 0.001.

Patients who presented with the common cold were less likely to be admitted than those without the common cold (1.4% $vs.$ 6.5%), p < 0.001. Similarly, patients who presented with back pain were less likely to be admitted than those without back pain (1.2% $vs.$ 6.3%), p = 0.036. On the other hand, patients who presented with nausea and vomiting were more likely to be admitted than those without nausea and vomiting (10.1% $vs.$ 5.9%). However, this difference was borderline insignificant (p = 0.052). Other chief complaints were not significantly associated with admission, as shown in Table 5.

Patients who presented with RRs exceeding 20/minutes were more likely to be admitted than those who presented with RRs ≤20/minutes (25% 5.8%), p = 0.001. Other

Table 2. Demographic characteristics of the non-urgent cases of ED visits (n = 2,509).

Characters	Frequency		Percentage
Age in years			
< 40	1,092		43.5
40-60	788		30.4
> 60	629		25.1
Range	14-101		
Mean ± SD	49.1 ± 17.1		
Gender			
Male	1,234		49.2
Female	1,275		50.8
Nationality			
Saudi	2,031		80.9
Non-Saudi	478		19.1
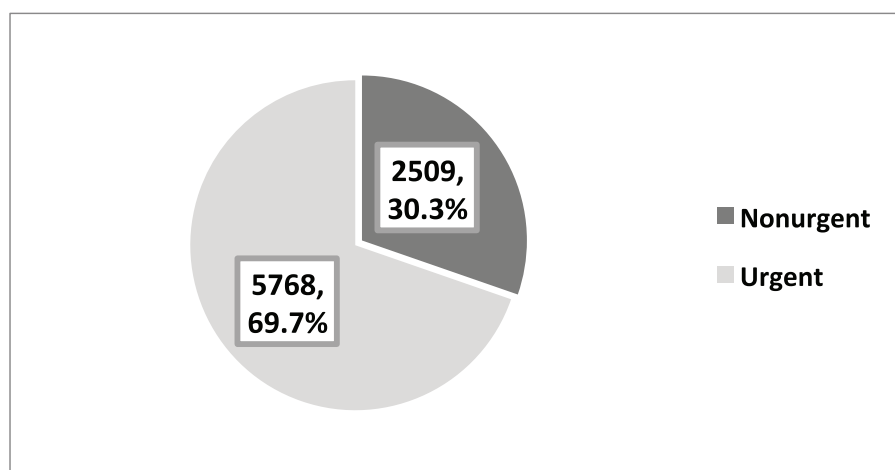
Figure 1. Distribution of ED visits (May 9, 2019, to August 21, 2019), KAMC, Makkah.

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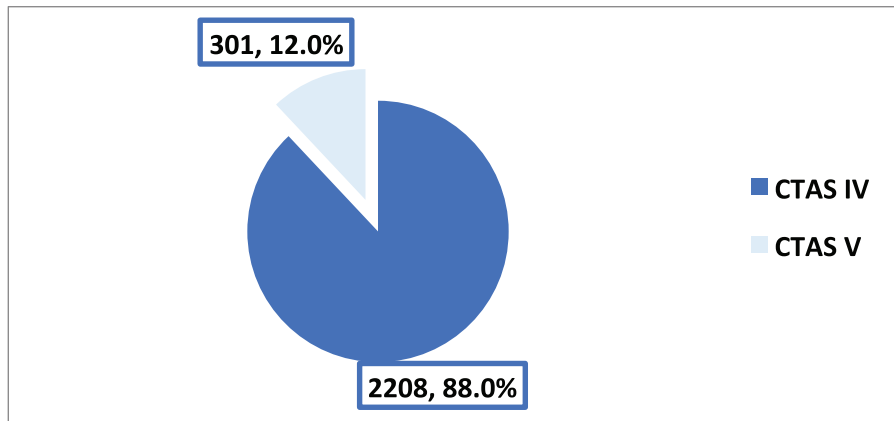
Figure 2. Distribution of ED visits (non-urgent cases) (May 9, to August 21, 2019), KAMC, Makkah.

Table 3. Practice-related characteristics of non-urgent ED visits.

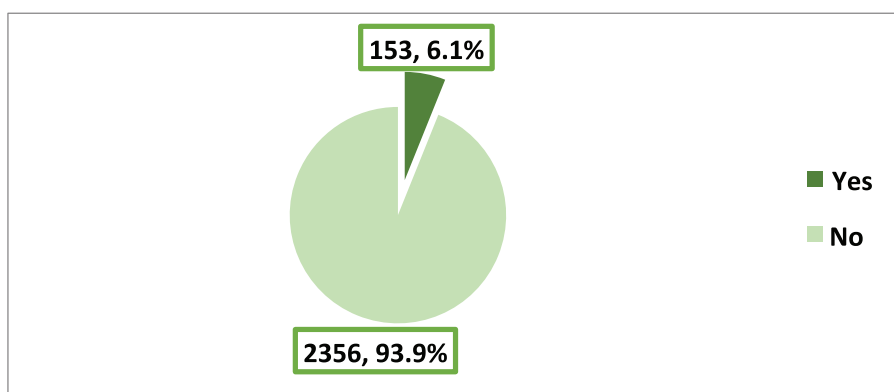| Waiting time (minutes)	
Range	1-541
Mean ± SD	53.65 ± 55.55
Disposition	
Discharged (*n*; %)	2,320; 92.5
Admission to ward (*n*; %)	149; 5.9
Discharged against medical advice (*n*; %)	40; 1.6
Revisit within 72 hours	
No	2,368; 94.4
Yes	141; 5.6
Second disposition	
Not applicable (No revisit) (*n*; %)	2,368; 94.3
Discharged (*n*; %)	129; 5.1
Admission to ward (*n*; %)	11; 0.4
Admission to critical care (*n*; %)	1; 0.03

Figure 3. Rate of admission of non-urgent ED visits.

vital signs were not associated with admission for non-urgent ED visits, as shown in Table 6.

Multivariate logistic regression analysis revealed that female patients were 48% less likely to be admitted than male patients (AOR: 0.52, 95% CI: 0.36-0.74), $p < 0.001$. Patients who presented with nausea/vomiting had an almost double chance for admission compared to those without such presentation (AOR: 2.03, 95% CI: 1.09-3.79), $p = 0.025$. However, patients who presented with the common cold were 72% less likely to be admitted than their counterparts (AOR: 0.28, 95% CI: 0.090.90), $p = 0.032$. Patients who presented with a history of HTN had a 2.39-fold chance for admission compared to those without HTN (AOR: 2.39, 95% CI: 1.68-3.40), $p < 0.001$. Cancer patients had a 3-fold higher chance of admission than those without cancer (AOR: 3.02, 95% CI: 2.11-4.32), $p < 0.001$. Patients who presented with RRs
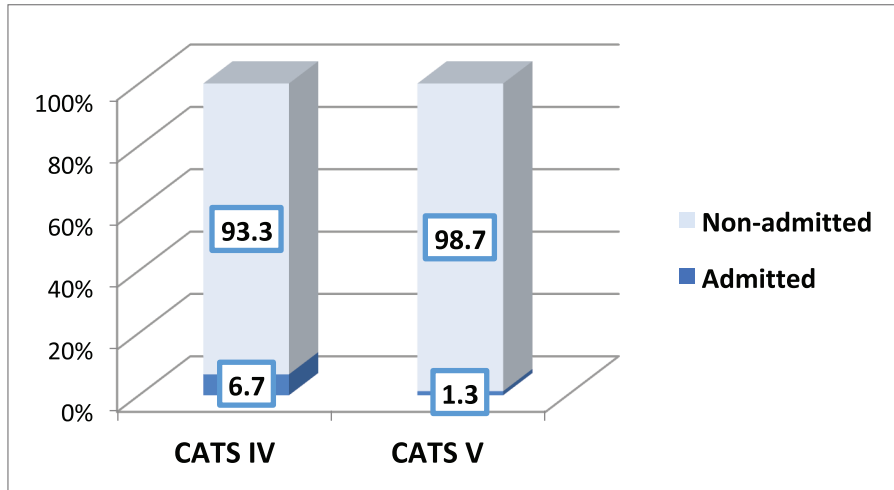
Figure 4. Comparison between CATS IV and CATS V categories regarding the rate of admission of non-urgent ED visits.

Table 4. Association between history of chronic illnesses among non-urgent ED visits and their admission.

Characters	Non-admitted	Admitted	*p* value
	n (%)	*n* (%)	
Diabetic mellitus (*n* = 2,509)			
No (*n* = 1,850)	1,765 (95.4)	85 (4.6)	<0.001
Yes (*n* = 659)	591 (89.7)	68 (10.3)	
HTN (*n* = 2,509)			
No (*n* = 1,779)	1,702 (95.7)	77 (4.3)	<0.001
Yes (*n* = 730)	654 (89.6)	76 (10.4)	
IHD (*n* = 2,509)			
No (*n* = 2,133)	2,014 (94.4)	119 (5.6)	0.009
Yes (*n* = 376)	342 (91.0)	34 (9.0)	
Oncology (*n* = 2,509)			
No (*n* = 1,965)	1,878 (95.6)	87 (4.4)	<0.001
Yes (*n* = 544)	478 (87.8)	66 (12.2)	
On chemotherapy (*n* = 2,509)			
No (*n* = 2,197)	2,078 (94.6)	118 (5.4)	<0.001
Yes (*n* = 313)	278 (88.8)	35 (11.2)	

exceeding 20/minutes were more likely to be admitted than those with RRs ≤20/minutes (AOR: 4.88, 95% CI: 1.45-16.40), *p* < 0.001. Patient age, waiting time, history of DM, IHD, being on chemotherapy, and having back pain were not significantly associated with admission after controlling for confounding effects (Table 7).

Patients with CATS4 were more likely to be referred than those in the CATS5 category (9.6% *vs.* 0.8%), *p* = 0.014 (Table 8).

There was no statistically significant difference between CATS4 and CATS5 regarding history of revisiting the ED. Table 9.

Discussion

Overcrowding and long waiting times are the main problems of EDs worldwide, and Saudi Arabia is no exception. Among the reasons for the overcrowding and long waiting time are the non-urgent cases that do

not need to be managed in the ED. Additionally, non-urgent cases consume the resources of the ED and consequently delay the management of urgent cases and lead to increased mortality [10,11]. Non-urgent cases, according to CTAS, need further consideration to avoid escaping cases who need admission. Therefore, the present study was conducted to determine the percentage of admission for patients with levels IV and V according to CTAS and to identify the factors predicting admission. In accordance with an earlier Canadian study [12], the present study revealed that non-urgent cases (classes IV and V, according to CTAS) compromised almost 30% of ED visits. However, this figure is much less than that reported in the USA (7.5%) [13]. In Korea, a 51.6% rate of non-urgent visits to the ED was reported [14]. In a systematic review, Durand et al. (2011) reported that the rate of non-urgent visits to the ED ranged between 4.8% and 90% with an average of 32% [15]. This variation in the rate of non-urgent ED visits could be attributed to cultural differences between countries, personal

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Table 5. *Association between chief complaints among non-urgent ED visits and their admission.*

Chief complaint	Non-admitted n (%)	Admitted n (%)	p value
Abdominal pain			
No (n = 2,140)	2,013 (94.1)	127 (5.9)	0.410*
Yes (n = 369)	343 (93.0)	26 (7.0)	
Fever			
No (n = 2,262)	2,122 (93.8)	140 (6.2)	0.564*
Yes (n = 247)	234 (94.7)	13 (5.3)	
Common cold			
No (n = 2,291)	2,141 (93.5)	150 (6.5)	<0.001**
Yes (n = 218)	215 (98.6)	3 (1.4)	
Cough			
No (n = 2,299)	2,153 (93.6)	146 (6.4)	0.080*
Yes (n = 210)	203 (96.7)	7 (3.3)	
Lower limb pain			
No (n = 2,313)	2,173 (93.9)	140 (6.1)	0.745*
Yes (n = 196)	183 (93.4)	13 (6.6)	
Nausea/vomiting			
No (n = 2,380)	2,240 (94.1)	140 (5.9)	0.052*
Yes (n = 129)	116 (89.9)	13 (10.1)	
Headache			
No (n = 2,358)	2,212 (93.8)	146 (6.2)	0.439*
Yes (n = 151)	144 (95.4)	7 (4.6)	
General body ache			
No (n = 2,400)	2,257 (94.0)	143 (6.0)	0.170*
Yes (n = 109)	99 (90.8)	10 (9.2)	
Flank pain			
No (n = 2,404)	2,258 (93.9)	146 (6.1)	0.804*
Yes (n = 105)	98 (93.3)	7 (6.7)	
Eye problems			
No (n = 2,448)	2,297 (93.8)	151 (6.2)	0.270**
Yes (n = 61)	59 (96.7)	2 (3.3)	
Back pain			
No (n = 2,428)	2,276 (93.7)	152 (6.3)	0.036**
Yes (n = 81)	80 (98.8)	1 (1.2)	
Diarrhea			
No (n = 2,445)	2,296 (93.9)	149 (6.1)	0.555**
Yes (n = 64)	60 (93.7)	4 (6.3)	
Dizziness			
No (n = 2,471)	2,320 (93.9)	151 (6.1)	0.588**
Yes (n = 38)	36 (94.7)	2 (5.3)	
Burning micturition			
No (n = 2,486)	2,335 (93.9)	151 (6.1)	0.414**
Yes (n = 23)	21 (91.3)	2 (8.7)	
Lower limb edema			
No (n = 2,459)	2,309 (93.9)	150 (6.1)	0.636**
Yes (n = 50)	47 (94.0)	3 (6.0)	
Ear pain			
No (n = 2,478)	2,325 (93.8)	153 (6.2)	0.140**
Yes (n = 31)	31 (100)	0 (0.0)	
Other chief complaints			
No (n = 1,620)	1,531 (94.5)	89 (5.5)	0.088*
Yes (n = 889)	825 (92.8)	64 (7.2)	

*Chi-square test.
**Fischer exact test.

Table 6. *Association between vital signs among non-urgent ED visits and their admission.*

Vital signs	Non-admitted n (%)	Admitted n (%)	p value
Systolic BP (n = 2,497)			
<90 (n = 5)	4 (80.0)	1 (20.0)	
90-120 (n = 819)	765 (93.4)	54 (6.6)	0.334*
>120 (n = 1,673)	1,575 (94.1)	98 (5.9)	
Diastolic BP (n = 2,496)			
<80 (n = 1,668)	1,558 (93.4)	110 (6.6)	
80-90 (n = 646)	516 (95.2)	31 (4.8)	0.261*
>90 (n = 182)	170 (93.4)	12 (6.6)	
HR (n = 2,488)			
<60 (n = 52)	47 (90.4)	5 (9.6)	
60-100 (n = 2,194)	2,066 (94.2)	128 (5.8)	0.261*
>100 (n = 242)	223 (92.1)	19 (7.9)	
RR (n = 2,434)			
12-20 (n = 2,418)	2,278 (94.2)	140 (5.8)	0.001**
>20 (n = 16)	12 (75.0)	4 (25.0)	
Temperature (n = 2,334)			
<36 (n = 99)	92 (92.9)	7 (7.1)	
36-38 (n = 2,182)	2,055 (94.2)	127 (5.8)	0.769*
>38 (n = 53)	49 (92.5)	4 (7.5)	
O^2 saturation (n = 2,450)			
≤90 (n = 4)	4 (100)	0 (0.0)	
>90 (n = 2,446)	2,302 (94.1)	144 (5.9)	
Mean arterial BP (n = 2,444)			
≤65 (n = 7)	7 (100)	0 (0.0)	0.659**
>65 (n = 2,437)	2,296 (94.2)	141 (5.8)	

*Chi-square test.
**Fischer exact test.

Table 7. *Predictors of admission of non-urgent ED visits: results of multivariate logistic regression analysis.*

	B	SE	AOR (95% CI)	p-value
Gender				
Male (n = 1,234)[a]			1.0	-
Female (n = 1,275)	−0.664	0.185	0.52 (0.36-0.74)	<0.001
Nausea/vomiting				
No (n = 2,380)[a]			1.0	0.025
Yes (n = 129)	0.710	0.317	2.03 (1.09-3.79)	
Common cold				
No (n = 2,291)[a]			1.0	0.032
Yes (n = 218)	−1.270	0.593	0.28 (0.09-0.90)	
HTN				
No (n = 1,779)[a]			1.0	<0.001
Yes (n = 730)	0.872	0.180	2.39 (1.68-3.40)	
Oncology				
No (n = 1,965)[a]			1.0	<0.001
Yes (n = 544)	1.104	0.183	3.02 (2.11-4.32)	
RR				
12-20 (n = 2,418)[a]			1.0	0.010
>20 (n = 16)	1.584	0.619	4.88 (1.45-16.40)	

[a]Reference category.
B = Slope.
SE = Standard error.

Table 8. Association between non-urgent ED visit category and history of referral.

Characters	Total	Non-referred	referred	p value*
	n = 2,509	n = 2,248	n = 260	
CTAS 4	2,208 (88.0)	1,967 (78.4)	241 (9.6)	
CTAS 5	301 (12.0)	282 (11.2)	19 (0.8)	0.014

*Chi-square test.

Table 9. Association between non-urgent ED visit category and history of revisiting ED.

Characters	Total	Non-revisited	Revisited	p value*
	n = 2,509	n = 2,368 (94.4)	n = 141 (5.6)	
Revisit				
CTAS 4	2,208 (88)	2,086 (83.1)	122 (4.9)	
CTAS 5	301 (12.0)	282 (11.2)	19 (0.8)	0.578

*Chi-square test.ç

characteristics of patients, and the nature of the healthcare system in different countries. The application of CTAS is not as safe as the only criteria for triaging patients in the ED (12). In the present study, the rate of admission of non-urgent ED visits was 6.1%, and this rate was higher among class CATS IV than CATS patients (6.7% *vs.* 1.3%). A slightly lower rate was reported in a study carried out recently in Korea [14] (5.5%); however, seven patients were admitted to the Intensive Care Unit (ICU). On the other hand, a higher rate was reported in other studies carried out in Taiwan (12.5%) [4] and Singapore (30.2%) [15], and a comparable rate (7.3%) was obtained from an earlier Canadian study [12]. In a more recent Canadian study carried out by Lin and Worster [16], the rate of admission of CATS V patients was 1.6%, which is comparable to our finding (1.3%). In the USA, the rate of admission of non-urgent cases was relatively low (4.4%); however, out of them, 16.2% required ICU admission [13]. From the aforementioned studies, including the present study, it is concluded that non-urgent cases, according to triage, sometimes have reason to come to the ED. Some of them were hospitalized and even admitted to intensive care units. Males were more likely to be admitted than female patients in the current study. This agrees with what has been observed in other studies carried out in Taiwan [4] and Korea [14]. This finding could be explained by the nature of males, as they usually do not visit ED unless there is something serious.

The present study revealed that patients who presented with nausea/vomiting were more likely to be admitted. The same has been observed in a study carried out in Canada by Hayward et al. [17], , whereas those who presented with the common cold were less likely to be admitted. In Taiwan [4], patients who presented with skin swelling/redness were more likely to be admitted. The difference between studies could reflect the difference in the perception of the seriousness of different presenting symptoms in different countries.

Patients who presented with a history of HTN or cancers were more likely to be admitted, as those patients may present in the ED with unclear symptoms and signs and are regarded as non-urgent cases through CATS classification.

Concerning vital signs, patients who presented with RRs exceeding 20/minutes in the current survey were more likely to be admitted. However, other findings were reported from other studies. In Taiwan [4], patients who presented with a HR greater than 100/minutes or fever were more likely to be admitted. In Korea [14], tachycardia (HR > 100 per minutes), a respiration rate > 20 per minutes and fever (body temperature > 38°C) were significant predictors of admission. Again, the variation between studies could reflect the difference in the perception of the seriousness of vital signs in different countries.

In the bivariate analysis in the current study, patients aged over 60 years were more likely to be admitted. However, after controlling for the confounding effect in multivariate analysis, this significant effect disappeared. This could be because elderly people usually have a number of underlying chronic diseases, and they may visit the ED with unclear clinical presentation [18]. In other studies performed in Taiwan [4], Canada [16,17], Singapore [15], and Korea [14], an age over 65 years was a significant predictor for admission, even after controlling for confounding effects. Therefore, special attention should be given to elderly patients visiting EDs during triage. Some authors suggested the application of a new category for patients aged over 65 years as a modification to CTAS in an attempt to identify those who require hospitalization [19,20]

The arrival of patients by ambulance was a significant predictor for admission in Taiwan [4], Singapore [15], and Canada [16]. However, this factor was not investigated in the present study, since we obtained our information from electronic medical records, and they did not include such information.

In the present study, shift time was not related to admission. However, in Korea [13], patients with evening visits were more likely to be admitted.

Conclusively, it has been reported that predictors for admission of non-urgent cases differ from region to region according to cultural background as well as demographic and clinical characteristics of the patients [21]

Conclusion

Strengths and limitations of the study

This study is the first of its kind in our region and to our knowledge, it could have great value in predicting non-urgent cases needing admission and making CATS safer. However, it has a few important limitations that should be addressed. First, this study was carried out in a single center and is limited by the type of patients seen in KAMC. Therefore, the findings cannot be generalized over the entire population in Saudi Arabia. Second, depending on medical records, information in collecting data is subjected to bias depending on the accuracy and completeness of record information.

Implications and recommendations

Based on the study results, care should be paid by nursing staff during the CATS classification of ED visits to make it safer. A further multicenter study including patients from other health-care disciplines is highly recommended to obtain a more comprehensive profile of the situation in Makkah.

Acknowledgment

List of Abbreviations

BP	Blood Pressure
CTAS	Canadian Triage and Acuity Scale
DM	Diabetes Mellitus
ED	Emergency Department
HR	Heart Rate
HTN	Hypertension
IHD	Ischemic heart disease
KAMC	King Abdullah Medical City
PHC	Primary Health Care
RR	Respiratory Rate
SPSS	Statistical Package for the Social Sciences

Conflict of interest
None.

Consent to participate
The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval
The study was approved by the King Abdullah Medical City Research Center. IBR approval was obtained on July 7, 2019, IBR number 19-535, IBR form is attached in the appendices. All data were collected anonymously.
All data will be saved on the researcher computer and protected with passwords for data security and confidentiality.

Author details
Abdullah Shalabi[1], Prof. Dr. Omar Alsharqi[2], Maweyah Alnujaidi[3], Rawan Alosaimy[3], Ebtehal Altalhi[4], Rozan Kashmeeri[3], Raghad Aldibane[3]
1. Emergency Medicine Consultant, King Abdullah Medical City, Makkah, Saudi Arabia
2. Department of University General Administration, Faculty of Economics and Administration King Abdulaziz University, Jeddah, Saudi Arabia
3. Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia
4. Faculty of Medicine, Taif University, Taif, Saudi Arabia.

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