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Alshimaa Wagdy Alashker
Gharbia Directorate for Health
Affairs, Ministry of Health,
Egypt

Abdel-Aziz Farouk El Deib
Public Health, Department of
Social and Preventive Medicine,
Faculty of Medicine, Tanta
University, Tanta, Egypt

Nihal Salah Shihab
Public Health, Department of
Social and Preventive Medicine,
Faculty of Medicine, Tanta
University, Tanta, Egypt

Barriers to patient flow in the main emergency health facilities of Tanta city, Gharbia governorate

Alshimaa Wagdy Alashker, Abdel-Aziz Farouk El Deib and Nihal Salah Shihab

Abstract
Background: Patient flow reflects the ability of the healthcare system to serve patients quickly and efficiently as they move through stages of care. This study was carried out to determine length of stay (LOS) and duration of each stage of patient flow process inside the main emergency health facilities, identify barriers to patient flow, and assess patient satisfaction with the provided care.
Methods: This is a cross-sectional study that included 420 patients attending the emergency departments (ED) of Tanta University Hospital and Elmenshawy General Hospital from September 2021 to September 2022. Data were collected using the predesigned questionnaire sheet.
Results: Main barriers to patients' flow were large number of relatives (30.2%), shortage of medical supplies (29.3%), and non-finding triage system (38.8%). Delay regarding total LOS of acuity level 2, 3 and 4. Statistically significant negative correlations were found between the patients' satisfaction score and the total final score of satisfaction and the registration time, disposition time, and the consultations time.
Conclusions: The main barriers impacting the patients' flow in the ED were large number of relatives, shortage of medical supplies, non-applicated triage system. Maintained patient flow with delay regarding total LOS of acuity level 2, 3 and 4. The overall waiting time, and the quality of services in the emergency room were the main points of patients' dissatisfaction in this study.

Keywords: Barriers, patient flow, main emergency, health facilities, gharbia governorate, patient satisfaction

Introduction
Patient flow provides an overview about the healthcare system's capacity to effectively and expeditiously manage cases as they go through different phases of care. The flow obstruction could lead to longer waiting times, thus impacting the quality of healthcare negatively [1].

Inefficient patient flow management within hospitals could result in negative healthcare outcomes, involving higher re-admissions, mortality rates as well as crowdedness [2]. Such an over crowdedness could impact the patients' experience, leading to prolonged waiting times times, longer hospital stays, diversion of ambulances to other medical facilities, delayed discharges, as well as patient boarding. Moreover, cases would have to leave without receiving adequate medical attention [3].

Within the emergency department the term "triage" indicates within the emergency department the term "triage" indicates he techniques utilized to promptly evaluate the severity of patients' injuries or illnesses upon their admission, determine priorities, and allocate each case to the ideal treatment place [4]. The emergency department triage is aimed at categorizing cases according to their conditions' urgency, ensuring that each patient receives prompt treatment. Emergency departments (ED) globally utilizes several triage systems, with the five-level triage instruments being universally recognized as the gold standard in emergency care [5].

According to Canadian Institute for Health Information, in 2010– 2011, the overall mean length of stay (LOS) within the ED reached around 4.4 hours. Furthermore, 90% of visits were completed in 8 hours [6].

Regarding a study in Egypt there is a lack of research to achieve the quality of service provided by Egyptian hospitals and investigation of patient perceptions and expectations of the services provided by public and private hospitals in Egypt, which is necessary to understand the relationship between quality of care and use of health services. According to this study the patients of the Egyptian public hospitals are less satisfied than the patients of

Corresponding Author:
Alshimaa Wagdy Alashker
Gharbia Directorate for Health
Affairs, Ministry of Health,
Egypt

the private hospitals, where he justified that private hospitals make a profit through strong marketing and marketing strategies [7].

According to a prior study performed within a tertiary private referral hospital in Egypt, the hospital was timely in meeting target durations for each category of (CTAS) and recommended that the hospital should start developing a triage system [8].

Patient satisfaction represents a crucial indicator that is often utilized for assessing the health care quality. Adverse experiences in the emergency department could significantly impact all aspects of patient satisfaction [9].

The aim of this work was to improve quality of health care services and to determine LOS and duration of each stage of patient flow process inside the main emergency health facilities, identify barriers to patient flow and assess patient satisfaction with the provided care.

Patients and Methods
This cross-sectional study was carried out on 420 patients aged more than 18 years old, both sexes, attending ED in the morning shift of both hospitals (Tanta University Hospital and Elmenshawy General Hospital). The study was done from September 2021 to September 2022 after approval from the Ethical Committee Tanta University Hospitals, Tanta, Egypt. An informed written consent was obtained from the patients.

Exclusion criteria were cases that died at arrival, mass casualty defined by Mistovich *et al*. [10], as any incident in which emergency medical services resources such as personnel and equipment are overwhelmed by the number and severity of casualties and cases referred to emergency department to have non-emergency services e.g.: dressing change, ECG request from outpatient department.

Data were collected by direct interview with observation through a pre-designed questionnaire that was developed in English.

Validation of questionnaire (Content and face validity):
It was revised by a panel of 3 experts in public health and community medicine to test its validity.

Pilot study: It was carried out on 42 patients (10% of calculated sample size) before starting data collection with the following objectives: [To test and evaluate the suitability of the questionnaire, to estimate the time needed for filling the questionnaire, to explore the potential obstacles that might be met with during the execution of the study, to assess reliability, the questionnaire revealed that the items were suitable and easy to be filled by the researcher, the time needed to fulfill each questionnaire ranged from 10-15 minutes, the pre-test responses were not included in the final analysis and reliability: Test-re-test: Alpha Cronbach`s reliability was 0.80.

Data were collected using the predesigned questionnaire which included 4 sections:

Section 1
All participants were subjected to history taking related to age, gender, residence, occupation, educational level, economic level, and marital status.

Section 2
Assessment [arrival area, acuity level, outcome and patient flow steps' durations, date and time of arrival, arrival area, acuity level based on the Canadian Triage and Acuity Scale (CTAS) [11], duration of registration by determining time of arrival to time of initial nursing assessment, duration of

nursing assessment by determining time of initial nursing assessment to time of initial physician assessment, duration of physician assessment by determining time of initial physician assessment to time of physician decision, duration of disposition by determining time of physician decision to time of patient disposition, duration of investigations required (Lab and Radiology) and duration of consultations].

Section 3
Assessment of barriers to patient flow in emergency department according to major categories of fishbone diagram [12]: [assessment of reasons for delay in the process by observation and patient interview and any other reasons that appeared during the study, people related causes: (Unavailable physician, shortage of physician numbers, low physician experience, unavailable specialist, shortage of nursing staff, low nursing experience, non-urgent visits, large number of relatives, process related causes (Needing multiple consultation and multiple investigations), materials related causes: (Lack of communication services, no bed available, lack of some medication or medical supplies), equipment related causes: (Unavailability of some radiology investigations and some Laboratory investigation), management related causes (Triage system not applicable) and environment related causes (All emergency department services not in the same place).

Section 4
The validated questionnaire of "Brief Emergency Department Patient Satisfaction Scale (BEPSS)" was used [13]. The questionnaire consists of five parts which includes: Part I: Patients` satisfaction toward emergency department staff (6 items), part II: Patients` satisfaction toward emergency department environment (3 items), part III: Physician care satisfaction (4 Items), part IV: General patient satisfaction (5 items) and part V: Patient's family satisfaction (2 items). Percentages and mean score were calculated for each satisfaction item. Degree of satisfaction were four degrees (Completely disagree, mildly disagree, mildly agree, completely agree).

Sample Size Calculation
Using Epi Info program version 7.2.1.0. The sample size was calculated as follows: 15 days * 200 patients * 6 months = 18,000 in Elmenshawy General Hospital, and 15 days * 400 patients * 6 months = 36,000 in Tanta University Hospital. At 95% confidence level, 5% margin of error and based on the expected patients' attendance rate at the morning shift in the two hospitals, and a 50% expected frequency of the delay in patient's flow (the frequency was reported with great variability in different literatures, from 20% up to 67 [14, 15]. So, the calculated sample from Elmenshawy General Hospital was 140 patients and the needed sample from Tanta University Hospital was 280 patients.

Statistical analysis
Data went through a statistical analysis utilizing SPSS v27 (IBM©, Chicago, IL, USA). The Shapiro-Wilks test as well as histograms were utilized for assessing the normality of the data distribution. Quantitative parametric data were displayed as mean as well as standard deviation (SD) then went through analysis utilizing ANOVA (F) test with post hoc test (Tukey). Quantitative non-parametric data were displayed as median as well as interquartile range (IQR) then went through analysis utilizing Kruskal-Walli's test

with Mann Whitney-test to compare each group. Qualitative variables were displayed as frequency and percentage (%) then went through analysis utilizing the Chi-square test. Spearman rank correlation equation for non-normal variables/non-linear monotonic relation. A two tailed P value of less than 0.05 was deemed to exhibit a statistical significance.

Results

In this study patients were recruited from two hospitals: Tanta University Hospital 280 (66.7%) and Elmenshawy General Hospital 140 (33.3%) patients. The patients' ages ranged from 18 to 87 years, with the highest percentage in the age group of 20-<40 (40%). There was a rather equal distribution according to sex with 200 (47.6%) were males and 220 (52.4%) were females. More than two thirds of the patients were rural residents 299 (71.2%) and were married 281 (66.9%). A little below half of the patients 203 (48.3%) were of secondary school education. As for work, more than one third were housewives 152 (36.2%) and the least were students 29 (6.9%). Slightly higher than half of the patients were having enough income (232 (55.2%). most patients attended the hospitals before 12 o'clock PM 351 (83.6%), and the least number of attendants were on Friday 40 (9.5%). Most of the patients were received in the emergency 153 (36.4%) and the surgery 149 (35.5%) departments. The median of registration time was 4 minutes. The median of duration of nursing assessment was 0 minutes, while the duration of physician's assessment was 4 minutes. The median of patients was disposed in a duration was12 minutes and underwent investigation was 11 minutes. The median of consultation time was 0 minutes. Overall, the median of total stay in the ED was 45.5 minutes. Less urgent and non-urgent cases constituted most of the attending patients (111 (26.4%), 182 (43.3%), respectively). Regarding the patients' outcome, about two thirds of the patients were discharged 278 (66.2%). A rather equal number of patients were referred 68 (16.2%) and admitted 69 (16.4%). A few of patients were LWBS by doctors 5 (1.2%). Unavailable physician was reported by 49 (11.7%) of the patients, shortage of physician numbers was reported by 106 (25.2%) of the patients, low physician experience was reported by 52 (12.4%) of the patients, and unavailable specialist was reported by 65 (15.5%) of the patients. Concerning the nursing staff, 87 (20.7%) of the patients described shortage of nursing staff and 23 (5.5%) described low nursing experience to be the barriers for patients' flow. Non-urgent visits and large number of relatives were reported by 116 (27.6%) and 127 (30.2%) of the patients, respectively, whereas needing multiple consultations and needing multiple investigations were described as the barriers by 39 (9.3%) and 54 (12.9%) of the patients, respectively. Concerning the hospitals' services, shortage of communication services was reported by 1 (0.2%) patient, no available beds was reported by 46 (11.0%) patients, shortage of some medication or medical supplies was reported by 123 (29.3%) patients, unavailability of some radiology investigations was reported by 4 (1%) patients, unavailability of some laboratory investigations was reported by 49 (11.7%) patients, emergency department services not in the same place was reported by 15 (3.6%) patients, and non-finding triage system was reported by 163 (38.8%) patients. Table 1

Table 1: Socio-demographic characteristics, arrival circumstances, flow time duration, clinical characteristics, and barriers to patients' flow of the studied participants

		N=420
Hospital name	Tanta University Hospital	280 (66.7%)
	Elmenshawy General Hospital	140 (33.3%)
Participant age (years)		48 (35-63.5)
<20		27 (6.4%)
20-<40		168 (40.0%)
40-<60		121 (28.8%)
>60		104 (24.8%)
Sex	Male	200 (47.6%)
	Female	220 (52.4%)
Residence	Rural	299 (71.2%)
	Urban	121 (28.8%)
Marital status	Divorced	3 (0.7%)
	Married	281 (66.9%)
	Single	84 (20.0%)
	Widow	52 (12.4%)
Educational level	University or higher	132 (31.4%)
	Secondary school	203 (48.3%)
	Read and write	51 (12.1%)
	Illiterate	34 (8.1%)
Occupation	Employee	83 (19.8%)
	Housewife	152 (36.2%)
	Student	29 (6.9%)
	Unemployed	35 (8.3%)
	Worker	121 (28.8%)
Income	Enough	232 (55.2%)
	Enough and saving	54 (12.9%)
	Not enough	134 (31.9%)
Arrival circumstances		
Time of arrival	Before 12 o'clock PM.	351 (83.6%)
	After 12 o'clock PM.	69 (16.4%)
Day of arrival	Saturday	59 (14.0%)
	Sunday	43 (10.2%)
	Monday	59 (14.0%)

	Tuesday	91 (21.7%)
	Wednesday	62 (14.8%)
	Thursday	91 (21.7%)
	Friday	40 (9.5%)
Arrival area	Emergency rooms	153 (36.4%)
	Internal medicine	65 (15.5%)
	Orthopedics	53 (12.6%)
	Surgery	149 (35.5%)
Flow time duration		
Duration of registration		4 (3-5)
Duration of nursing assessment		0 (0-4)
Duration of physician assessment		4 (3-8)
Duration of disposition		12 (6-21)
Duration of investigations		11 (0-27)
Duration of consultations		0 (0-7)
Overall hospital stay length		45.5 (28-68)
Clinical characteristics		
Acuity level	Level 1: Resuscitation.	0 (0.0%)
	Level 2: Emergent.	72 (17.1%)
	Level 3: Urgent.	55 (13.1%)
	Level 4: Less urgent.	111 (26.4%)
	Level 5: Non urgent.	182 (43.3%)
Patients' outcome	Discharged	278 (66.2%)
	LWBS	5 (1.2%)
	Referred	68 (16.2%)
	Admitted	69 (16.4%)
Unavailable of physician		49 (11.7%)
shortage of physician numbers		106 (25.2%)
Low physician experience		52 (12.4%)
Unavailable of specialist		65 (15.5%)
shortage of nursing staff		87 (20.7%)
Low nursing experience		23 (5.5%)
Non urgent visits of other patients		116 (27.6%)
Large number of relatives		127 (30.2%)
Needing multiple consultations		39 (9.3%)
Needing multiple investigations		54 (12.9%)
Shortage of communication services		1 (0.2%)
No available beds		46 (11.0%)
shortage of some medication or medical supplies		123 (29.3%)
Unavailability of some radiology investigations		4 (1.0%)
Unavailability of some laboratory investigations		49 (11.7%)
Emergency department services not in the same place		15 (3.6%)
Triage system applicability		163 (38.8%)

Data are presented as frequency (%) or median (IQR). LWBS: Left without being seen.

Only 1.4% of patients in grade II acuity were delayed in the observed time to doctor. Otherwise, no delayed cases in observed time to doctor were shown. Regarding the total LOS, the percentage of delay was 5.6% in grade II, 5.5% in grade III, 0.9% in grade IV, and 0% in grade V. Table 2

Table 2: Assessment of the flow time according to the acuity level

Acuity	Target time to doctor	Observed time to doctor	% of delayed patients
II (n = 72)	Within 15 m in 95% of patients	5 (3-9)	1.4%
III (n = 55)	Within 30 m in 90% of patients	5 (3-9)	0.0%
IV (n = 111)	Within 60 m in 85% of patients	5 (3-8)	0.0%
V (n = 182)	Within 120 m in 80% of patients	6 (3-9)	0.0%
Acuity	Target overall LOS	Observed overall LOS	% of delayed patients
II (n = 72)	Within 360 m in 95% of patients	78 (54-90)	5.6%
III (n = 55)		58 (36.5-79)	5.5%
IV (n = 111)	Within 240 m in 95% of patients	46 (32-63.5)	0.9%
V (n = 182)		78 (24-51)	0.0%

Data are presented as median (IQR). LOS: Length of Stay.

There was a statistically significant lower percentage of patients in describing unavailable physicians to be the barrier in Tanta University Hospital, low nursing experience and non-urgent visits ($p<0.05$). On the other hand, a statistically significant higher percentage of patients in Tanta University Hospital described the unavailability of some laboratory investigations ($p<0.001$) and non-application of triage system ($p<0.001$). No statistically significant differences were found between the two hospitals regarding the rest of barriers. Table 13 shows comparison between the two included hospitals in the satisfaction scores. There was a statistically significant higher scores of patients' satisfaction in Tanta University Hospital toward general practice ($p<0.001$) and family satisfaction (p=0.02). The total scores also were significantly higher (p=0.041). Table 3

Table 3: Comparison between the two hospitals regards barriers to patients' flow, patients' satisfaction score

	Elmenshawy General Hospital	Tanta University Hospital	P
Unavailable physician	34 (24.3%)	15 (5.4%)	<0.001*
Shortage of physician numbers	47 (33.6%)	59 (21.1%)	0.005*
Low physician experience	34 (24.3%)	18 (6.4%)	<0.001*
Unavailable specialist	28 (20.0%)	37 (13.2%)	0.070
Shortage of nursing staff	27 (19.3%)	60 (21.4%)	0.609
Low nursing experience	12 (8.6%)	11 (3.9%)	0.049*
Non urgent visit	56 (40.0%)	60 (21.4%)	<0.001*
Large number of relatives	58 (41.4%)	69 (24.6%)	<0.001*
Needing multiple consultations	17 (12.1%)	22 (7.9%)	0.154
Needing multiple investigations	15 (10.7%)	39 (13.9%)	0.354
Shortage of communication services	0 (0.0%)	1 (0.4%)	0.479
No available beds	14 (10.0%)	32 (11.4%)	0.659
Shortage of some medication or medical supplies	42 (30.0%)	81 (28.9%)	0.820
Unavailability of some radiology investigations	0 (0.0%)	4 (1.4%)	0.306
Unavailability of some laboratory investigations	6 (4.3%)	43 (15.4%)	<0.001*
Emergency department services not in the same place	3 (2.1%)	12 (4.3%)	0.265
Triage system applicability	32 (22.9%)	131 (46.8%)	<0.001*
Total score	13.96±1.7	14.5±1.7	0.003*
Patients' satisfaction score			
Patients` satisfaction toward emergency services	17 (12-18)	17 (12-19)	0.854
Patients` satisfaction toward emergency department	7 (6-9)	7 (6-10)	0.117
Patients` satisfaction toward the emergency staff	13 (8-16)	13 (12-16)	0.204
Patients` satisfaction toward general practice	15 (10-16)	15 (12-19)	<0.001*
Patients` family satisfaction	6 (5-7)	8 (6-8)	0.020*
Total score	59 (46-64)	60 (49-69)	0.041*

Data are presented as mean± SD or median (IQR) or frequency (%). *Significant p value <0.05.

Patients` satisfaction toward emergency services is presented in Table 4. The highest percentage of patients mildly agreed that nurses cared about my treatment (39%), informed them about the remaining of the treatment (32.9%), attended to them patiently (44%), and relieved them of pain well (33.6%). Also, most of them mildly agreed that the behaviour of the admission staff was suitable (45.5%). The median of total score was 17. More than half of the patients mildly or completely agreed that the environment of the emergency room was calm and quiet (32.4% and 20.2%, respectively), the emergency room was well equipped (43.6% and 21.9%, respectively), and the environment of the emergency room was hygienic (42.4% and 16%, respectively). The median of total score was 8. The highest percentage of patients completely agreed that the physician told them about their explanation about the remaining of treatment was enough (44.8%), and their behaviour was respectful (54.5%), they attended to them patiently (44%), and spent a sufficient time in examination (42.9%). The median of total score was 13. Near half of the patients completely, or mildly disagreed that the waiting time before admission process was appropriate (20.7% and 30.5%, respectively), and satisfied with the quality of services in the emergency room (25.5% and 24%, respectively), while the highest percentage of patients mildly agreed that the waiting time before seeing the doctor was appropriate (39%), they would recommend this hospital to my acquaintances (44%), and that the emergency room of this hospital is well functioning (42.9%). The median of total score was 15. Near half of the patients completely, or mildly disagreed that family can spend an appropriate amount of time besides the patient (20.7% and 30.5%, respectively), while the highest percentage of patients mildly agreed that the family of the patient are respected in this hospital (39%). The median of total score was 8. Table 4

Table 4: Patients` satisfaction toward emergency services, emergency department, the physician, general practice and patients` family satisfaction

	Completely disagree	Mildly disagree	Mildly agree	Completely agree
Emergency Services				
Nurses care about my treatment	84 (20%)	80 (19%)	164 (39%)	92 (21.9%)
Nurses inform me about the remaining of the treatment	87 (20.7%)	128 (30.5%)	138 (32.9%)	67 (16.0%)
Nurses attended to me patiently	56 (13.3%)	82 (19.5%)	185 (44.0%)	97 (23.1%)
Nurses relieved me of the pain well	107 (25.5%)	101 (24.0%)	141 (33.6%)	71 (16.9%)
Admission staff guided me appropriately	72 (17.1%)	75 (17.9%)	180 (42.9%)	93 (22.1%)
The behavior of the admission staff was suitable	74 (17.6%)	54 (12.9%)	191 (45.5%)	101 (24.0%)
Total score	17 (12-18)			
Emergency Department				
The environment of the emergency room was calm and quiet	96 (22.9%)	103 (24.5%)	136 (32.4%)	85 (20.2%)
Emergency room was well equipped	67 (16.0%)	78 (18.6%)	183 (43.6%)	92 (21.9%)
The environment of the emergency room was hygienic	81 (19.3%)	94 (22.4%)	178 (42.4%)	67 (16.0%)
Total score	8 (6-9)			
Physician				
The physician told me about my treatment course	24 (5.7%)	58 (13.8%)	144 (34.3%)	194 (46.2%)
The behavior of the physician was respectful	20 (4.8%)	41 (9.8%)	130 (31.0%)	229 (54.5%)
The physician's explanation about the remaining of treatment was	37 (8.8%)	74 (17.6%)	121 (28.8%)	188 (44.8%)

enough				
The physician spent a sufficient time examining me	49 (11.7%)	64 (15.2%)	127 (30.2%)	180 (42.9%)
Total score	13 (11-16)			
General practice				
The waiting time before seeing the doctor was appropriate	84 (20%)	80 (19%)	164 (39%)	92 (21.9%)
The waiting time before admission process was appropriate	87 (20.7%)	128 (30.5%)	138 (32.9%)	67 (16.0%)
I would recommend this hospital to my acquaintances	56 (13.3%)	82 (19.5%)	185 (44.0%)	97 (23.1%)
I am satisfied with the quality of services in the emergency room	107 (25.5%)	101 (24.0%)	141 (33.6%)	71 (16.9%)
The emergency room of this hospital is well functioning	72 (17.1%)	75 (17.9%)	180 (42.9%)	93 (22.1%)
Total score	15 (11-17)			
Patients` family satisfaction				
The family of the patient are respected in this hospital	84 (20%)	80 (19%)	164 (39%)	92 (21.9%)
Family can spend an appropriate amount of time besides the patient	87 (20.7%)	128 (30.5%)	138 (32.9%)	67 (16.0%)
Total score	8 (6-8)			

Data are presented as median (IQR) or frequency (%).

Regarding socio-demographic and clinical characteristics, there was a statistically significant difference was found between the patients' residence with higher satisfaction in urban residents (p=0.012). Patients' arrival characteristics showed non-significant differences according to the time of arrival, day of arrival (p=0.59) and the arrival area (p=0.6). Table 16 showed a comparison of the total satisfaction score according to the patients' clinical characteristics. A statistically significant difference was found only according to the patients' outcome ($p<0.001$). Pair-wise comparison revealed that statistically higher scores were reported by the discharged patients compared to the admitted and to those who were LWBS ($p<0.001$). Table 5

Table 5: Comparison of the total satisfaction score according to the patients' socio-demographic, arrival, and patients' characteristics

		N=420	**P**
Participant age (Years)	<20	61 (49-69)	0.843
	20-<40	59 (45-68)	
	40-<60	60 (50-69)	
	>60	60 (48-68)	
Sex	Male	60 (48-68)	0.448
	Female	60 (48-68)	
Residence	Rural	59 (48-66)	0.012*
	Urban	60 (50-71)	
Marital status	Divorced	52 (50-53)	0.498
	Married	60 (47-68)	
	Single	60 (53-68)	
	Widow	58 (40-69)	
Educational level	University or higher	60 (49-68.5)	0.313
	Secondary school	60 (49-57.5)	
	Read and write	55 (44-63)	
	Illiterate	63 (55-69)	
Occupation	Employee	60 (53-74)	0.148
	Housewife	60 (49-66.5)	
	Student	60 (52-62)	
	Unemployed	60 (40-66)	
	Worker	57 (45-66)	
Income	Enough	60 (47-69)	0.900
	Enough and saving	59 (55-62)	
	Not enough	60 (49-68)	
Arrival circumstances			
Time of arrival	Before 12 o'clock PM.	60 (46-68)	0.146
	After 12 o'clock PM.	60 (53-69)	
Day of arrival	Saturday	57 (42-62)	0.590
	Sunday	59 (50-67)	
	Monday	60 (52-68.5)	
	Tuesday	60 (45-68)	
	Wednesday	60 (46-66)	
	Thursday	60 (53.5-69)	
	Friday	60 (45-72.5)	
Arrival area	Emergency rooms	57 (48-68)	0.600
	Internal medicine	59 (49-69)	
	Orthopedics	60 (50-66)	
	Surgery	60 (44-67)	
Clinical characteristics			
	Level 2: Emergent.	56 (47.5-64)	0.179
	Level 3: Urgent.	56 (54-60)	
	Level 4: Less urgent.	60 (52-69)	
	Level 5: Non urgent.	60 (44-69)	
Patients' outcome	Discharged	60 (53-69)	<0.001*

	LWBS	20 (20-20)	
	Referred	55.5 (40.5-60.5)	
	Admitted	58 (45-63)	
	P1=0.002*, P2=0.032*, P3=0.652		

Data are presented as median (IQR) or frequency (%). *Significant p value <0.05, LWBS: Left without being seen.

The patients' age and flow time showed a significant negative correlation were found between the total final score and the registration time (p=0.01), disposition time (p=0.009), and the consultations time (p=0.036). These findings denote that the patients' satisfaction increased when the registration time, the disposition time, and the consultation time decreased. Table 6

Table 6: Correlation of the total satisfaction score with the patients' age and flow time

| | Total satisfaction score | |
	rhz	p
Age	0.016	0.745
Registration time	-0.126	0.01*
Nursing assessment time	-0.068	0.162
Physician assessment time	-0.011	0.816
Disposition time	0.127	0.009*
Investigations time	0.052	0.288
Consultations time	-0.102	0.036*
LOS	-0.058	0.235

rho: Spearman's correlation test, *: statistically significant, LOS: Length of stay.

Discussion
Demand for health care is rising because of changing demographics and increasing multi-morbidity. Hospitals, meanwhile, are struggling with capacity constraints, insufficient productivity and increasing financial deficits [16]. In the current study, the most described barrier for the patients' flow was the absence of triage system (38.8%). Triage is a brief intervention that aims to risk stratify patient presentations and prioritize them accordingly as a way of allocating limited resources, such as staff and physical space based on their clinical need [17]. In support to our findings, the Sweden study of Oredsson et al. [18] stated that some studies showed absence of triage system with varying degrees, and that utilizing the triage nurse to request investigations, such as blood tests and X-rays, has been shown to be associated with earlier diagnosis, shorter waiting times and faster patient throughput in the ED.

Other barriers reported by the participants in this study reflected shortage in the healthcare system such as shortage of some medication or medical supplies, physician numbers, and unavailable specialist, unavailable physician, shortage of communication services like phone, unavailable bed, lack of some radiology investigations, lack of some laboratory investigations. Although it seems that there were enough physicians, especially in Tanta University Hospital ED, the majority were internship and not residents or ED specialists. These data were supported by the Sweden systematic review conducted by Åhlin et al. [16] reported that a lack in services and capacity cannot always be compensated for by innovative and efficient working methods, and that the insufficient capacity is a factor hampering the patient flow.

Other barriers in the present study were the high percentage of patients with large number of relatives, non-urgent visits, low physician experience, low nursing experience, needing multiple consultations, needing multiple investigations, and that the emergency department services not in the same place. In agreement with this study, Beckett et al. [19] expressed that the shortage of nurses, and low experience have always been a significant barrier for patient flow.

In this study, assessment of the patients' satisfaction toward emergency services revealed that the more than one third of patients satisfied towards nursing services. Also, near half of them mildly agreed that the behaviour of the admission staff was suitable. In accordance with our study, the recent study conducted by Abbas et al. [20] stated that about one-third of patients thought that nurses spend enough time with them, and during this emergency room visit nurses treated them with courtesy and respect.

This study showed that more than half of the patients mildly or completely agreed that the environment of the emergency room was calm and quiet, the emergency room was well equipped, and the environment of the emergency room was hygienic. Unlike our findings, a study from Iran conducted by Reihani et al. [21] showed a lowest satisfaction towards pleasantness of the waiting area.

In this context, the present study demonstrated that the highest percentage of patients completely agreed that the physician told them about their explanation about the remaining of treatment was enough, and their behaviour was respectful, their attended to them patiently, and spent a sufficient time in examination. Similarly, Abbas et al. [20] found that 39.2% of the patients agreed that doctors spend enough time with patient.

Near half of the patients completely, or mildly disagreed that the waiting time before admission was appropriate (20.7% and 30.5%, respectively), while approximately forty percentage of patients mildly agreed that the waiting time before seeing the doctor was appropriate. In agreement with this finding, King et al. [22] reported that 36.4% of patients reported waiting time in ED as a point of non-satisfaction.

In this context, assessment of the patients' satisfaction towards the overall ED services in this study showed that near half of the patients completely, or mildly disagreed that they were satisfied with the quality of services in the emergency room (25.5% and 24%, respectively), nonetheless, the highest percentage of patients mildly agreed that they would recommend this hospital to my acquaintances (44%), and that the emergency room of this hospital is well functioning (42.9%). These findings exhibit that the ED resources in terms of the equipment and the proper handling ED staff; nurses or physicians, was appropriate, but shortage was evident in the quality of service. This shows a potential area of weakness, and the hospital management should work in this area to improve the quality of care. In line with these findings, Abbas et al. [20] found that overall patient satisfaction regarding ED services was less than half of the patients, and about half of the patients stated that they would recommend our institution ED to their friends and family.

Analysis of the association of different patients' sociodemographic characteristics with the patients' satisfaction demonstrated that only the patient's residence affected satisfaction with a statistically significant higher satisfaction in urban residents. The lower satisfaction in rural residents could be explained by the problems of inaccessibility and lack of facilities, our finding is supported by the study of Reihani et al. [21] found that urban residents somewhat have higher satisfaction rate.

A statistically significant difference was found only according to the patients' outcome with statistically higher scores were reported by the discharged patients compared to

the admitted, those who were LWBS, and the referred patients. Also, statistically higher scores were reported by the referred patients and the admitted patients compared to those who were LWBS.

Concerning the flow time duration, statistically significant negative correlations were found between the total final score and the registration time, disposition time, and the consultations time. These findings denote that the patients' satisfaction increased when the registration time, the disposition time, and the consultation time decreased. Consistent with our study, other studies' findings also indicated that there is a reverse correlation between patient satisfaction and waiting time. Those who waited longer were less satisfied as described in the Iranian studies of Zohrevand et al. [23] and Reihani et al. [21].

This study was done to explore the barriers to patient flow inside the main emergency health facilities of Tanta city together with patient satisfaction of the provided service. This will help in planning for different interventions to improve the quality of care in those settings.

Limitations of this study included that the sample size was relatively small. The study was in a single centre. So, we recommended that there is urge need for application of a triage system that help to stratify patients in a rapid organized method that reduce the department crowdedness, improve the flow time by decreasing duration of each stage and total length of stay, implementation of strategies that help to decrease crowdedness in the emergency department including limitation of the relative numbers to be one relative only and provide a calm hygienic environment, efforts to provide the EDs with sufficient resources in terms of nurses and physician staff, and medical supplies, increase number of provided training courses to low experience physicians and nurses and assessment of physicians and nurses satisfaction.

Conclusions
Maintained patient flow with delay regarding total LOS of acuity level 2, 3 and 4. The main barriers impacting the patients' flow in the ED were large number of relatives, shortage of some medication or medical supplies, non-applicated triage system, non-urgent visits, shortage of physician numbers, and shortage of nursing staff. The main patients' dissatisfaction points were the overall waiting time, and the quality of services in the emergency room. Rural residents showed less satisfaction towards ED services. Patients' satisfaction increased when the registration time, the disposition time, and the consultation time decreased.

Conflict of Interest
Nil.

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