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Factors Affecting Length of Stay in Pediatric Emergency Department in a Teaching Hospital in Saudi Arabia

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ABSTRACT

Background: Decreasing the number of Emergency Department patient visits for treatment, especially in non-urgent cases, is an international healthcare goal. The same applies for pediatric emergency rooms where the utilization of ED is much more than adults. **Objective:** We aim to measure the length of stay for all pediatric patients and examine the factors influencing it. **Methods:** A retrospective chart review study was conducted at the pediatric ED of King Fahd Hospital in the Eastern Province of Saudi Arabia. The study included all patients presented to the pediatric ED, between January 1, 2018, and December 31, 2018, aged from 1 day to < 14 years old. Data included patient's age, sex, season in which the patient presented in, chief complaint, time of presentation, and whether admission to the hospital ward was collected. **Results:** The total number of patients was 37,613. The median LOS was 100, interquartile range (IQR) = 53 – 272 minutes. Male pediatric patients were (55.12%). Among all patients, (32.04%) were toddlers, followed by school aged children (25.05%). The ER received more patients during the winter months followed by summer (32.92% and 24.72%, respectively). Fever was the most common complaint for all patients combined. For prolonged LOS patients, the most common complaints were respiratory related (23.44%). Pre-school children and school aged children were found to have a 5.49% and a 7.93% increased LOS when compared to toddlers (95% CI = 2.52 – 8.53, and 95% CI = 5.01 – 10.93, respectively). Summer was associated with a statistically significant increased LOS (% change = 28.92, 95% CI = 25.53 – 32.40). Morning shift was found to have a 7.89% increased LOS when compared to the evening shift. The highest increase in LOS was attributed to haematology related complaints (% change = 108.32, 95% CI = 85.69 – 133.71). **Conclusion:** Several pediatric LOS predicting factors have been identified; morning arrival, and presentation during summertime. Systemic factors such as staffing, and infrastructure can be modified and may affect the length of stay of patients. The implementation of these strategies and the evaluation of their impact on the length of stay in the pediatric emergency department require further investigation.

Keywords: Emergency Department, Pediatrics, Length of Stay, Outpatient Care, Ambulatory Care.

1. BACKGROUND

Emergency medicine and access to Emergency department (ED) is provided to everyone, twenty-four hours a day seven days a week, irrespective of their specific complaint. It is a rich speciality for research in different areas due to its unique formation, patient utilization characteristics and link to other in-hospital and outpatient medical services (1, 2).

Decreasing the number of ED patient visits for treatment, especially in non-urgent cases, is an international healthcare goal (3). The same applies for pediatric emergency rooms where the utilization of ED is much more than adults (3). In the USA, pediatric patients ED visit utilization accounts for more than 23% of all ED visits annually (4). Local studies in Saudi Arabia have reported the utilization rate of pediatric ED to be as high as 32% in the capital, Riyadh (5).

Emergency department's success and utilization are measured through specific performance indicators i.e. KPI's. These KPI's are developed and followed up routinely to benchmark ED locally and internationally. Some of the most widely used KPI's are standard of care treatment, return visits to ED, patient satisfaction, staff safety and length of stay in ED (6).

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Media and politics play a major role in attention provided to healthcare, especially ED healthcare utilization, as it may be the first pillar on which the nation's healthcare depend. Examples of challenges that face ED services all around the world are very similar and include staff shortage, rising costs, and insufficient hospital processes. All these factors directly and indirectly affect ED utilization and day to day practices (6, 7).

Globally and locally, most ED pediatric visits are of non-urgent nature (8, 9). Complaints as common as low-grade fever and upper respiratory tract infection comprise the vast majority of cases (5). Reports of nonurgent cases in local ED's were as high as 75% in some studies but mostly ranging between 30 to 50% (10-12).

Many factors may influence the length of stay in ED. Some of these factors were reported to be shift times i.e., night arrival vs. day shift, the need for radiology or subspecialty consultations, and the waiting time for inpatient hospitalization (4, 8)

As a direct results of overutilization and occupancy with non-urgent cases, Emergency departments worldwide overflow with patients and suffer from prolonged length of stay and prolonged waiting time (13). Things are no different here in Saudi Arabia, where ED still serve as a crucial point of access to care (14). Despite ongoing efforts by the ministry of health (MOH) and other governmental sectors to decrease the load on ED's by introducing urgent care facilities in primary healthcare centres almost everywhere, culture change and strict laws must be applied to achieve such goals (15).

2. OBJECTIVE

Our study aims was to measure the length of stay in minutes for all pediatric patients and examine the factors influencing it.

3. PATIENTS AND METHODS

Study design and setting

This retrospective chart review study was conducted at the pediatric ED of King Fahd Hospital (KFHU) of the Imam Abdulrahman Bin Faisal University in the Eastern Province of Saudi Arabia. Ethical approval was obtained from the institutional review board of the university.

The Pediatric ED contains 7 observation beds, 2 examination rooms, 1 triage room, a waiting area, and a minor surgical room. Major trauma cases are treated in the resuscitation room. Pediatric ED is supported by pharmacy, radiology services, and the ability to refer the patient for admission as needed. The ED staff are made up of six qualified pediatric emergency consultants and eight pediatric specialists devoted to emergency coverage. This is in addition to rotating pediatric program residents in different levels, one every month. The initial triage in the registration area is done by a qualified nurse while the pediatric ED triage is done by the assigned pediatric nurse and the rotating residents. The ER staff work in three shifts to cover the 24 hours, these are the morning shift (8:00 am-16:00 pm), the evening shift (16:00 pm-00:00 am), and the night shift (00:00 am-8:00 am). To cover the needs in the morning and night shifts, there

are two to four physicians, and two to four nurses except for the evening shift where there is a minimum of three physicians. Some shifts also involve rotating interns and students for training and teaching purposes.

Study population

The study included all patients presented to the pediatric ED, between January 1, 2018 and December 31, 2018, aged from 1 day to < 14 years old. According to the hospital's policy, the Pediatrics department is responsible for patients in this age group range.

Data collection

A structured data collection sheet to collect data from the patient's electronic medical records was used. Data included patient's age, sex, season in which the patient presented in, chief complaint – as reported by the caregiver and categorised by the involved system, which shift received the patient, and whether admission to the hospital ward was collected. These variables were chosen based on the study objectives as well as the literature and availability of the data.

Statistical analysis

Analyses commenced with data management. Age groups were categorised as neonates (<29 days), infants (29 days < 1 years), toddlers (>1 year – 3 years), pre-schoolers (> 3 years – 6 years), schoolers (> 6 years – 12 years) and adolescents (>12 years – 14 years). Nationality was collapsed into either Saudi or Non-Saudi, and the seasons were grouped as Winter (December, January, February), Spring (March, April, May), Summer (June, July, August), and Autumn (September, October, November). The shift in which the patient came into the ER was categorised as the morning shift (8:00 am-16:00 pm), evening shift (pm 16:00-00:00 am), and night shift (am 00:00-8:00 am). Triage system implemented in the hospital was according to CTAS in which I is for resuscitation, II for emergent, III for urgent, IV for less urgent, and V for non-urgent (16).

The main outcome was measured as Length of Stay (LOS) in minutes, and hence the minimum LOS was 1 minute, and the maximum was 720 minutes (equal to 12 hours). Patients with a LOS of above 12 hours were excluded, and those recorded as zeros were also removed. Descriptive statistics of the continuous outcome are presented as median and interquartile range (IQR), and for categorical variables the frequencies and percentages were reported. The analyses were twofold, the main part concerned all patients with a LOS of < 12 hours (720 minutes), and the second part was a subgroup analysis of patients with a non-prolonged LOS, defined as patients with a LOS of < 6 hours (360 minutes), and patients with a prolonged LOS, defined as patients with a LOS of 6-12 hours (361 -720 minutes).(2) Since the outcome variable was highly positively skewed, a log-transformed multivariate linear regression was used, and the percent change in LOS was given along with its 95% confidence intervals (CIs) and P-values. Choice of inclusion of variables into the models were based on both a Directed Acyclic Graph of associations and P-values of bivariate analyses which were obtained through both Kruskal-Wallis and Mann Whitney U tests. Model diag-

nostics were checked to assure assumptions of the regression analyses were appropriately held. All analyses were performed in Stata Software Version 15 (17).

4. RESULTS

Overall patient characteristics

The total number of patients after exclusion of patients with a recorded zero for LOS and patients with a LOS of > 720 minutes was 37,613 pediatric patients. The median LOS was 100, IQR = 53 – 272 minutes. For the subgroup analyses of the non-prolonged LOS patients, the median LOS was 85, IQR = 46 – 165 minutes, and for the prolonged LOS patients, the median was 495, IQR = 423 – 596 minutes. Figure 1 shows the distribution of the three LOS cut-off points examined.

Table 1 gives detailed frequencies of all variables included in the study. Males comprised a higher percentage of patients than females. Among all patients, 32.04% were toddlers, followed by school aged children (25.05%), while neonates only made up less than 1% of all patients. The ER received more patients during the winter months followed by summer (32.92% and 24.72 respectively). For all patients, as well as for patients with non-prolonged LOS, most ER visits were at the evening hours and the least were at night. However, for the patients with a prolonged LOS, most ER visits were in the morning and the least were at night. With regards to the complaint of the patient, fever was the most common complaint for all patients combined, as well as for patients with a non-prolonged LOS at the ER (27.12% and 28.20% respectively), but for prolonged LOS patients, the most common complaints were respiratory related (23.44%).

Predictors of length of stay among all patients

Gender was not found to be a significant predictor in this sample of pediatric patients. Pre-school children and school aged children were found to have a 5.49% and a 7.93% increased LOS when compared to toddlers, and this increase was statistically significant (95% CI = 2.52 – 8.53 and 95% CI = 5.01 – 10.93 respectively). A similar increase in LOS was observed for non-Saudis which was statistically significant (% change = 9.39, 95% CI = 5.34 – 13.60). Summer was associated

with a statistically significant increased LOS (% change = 28.92, 95% CI = 25.53 – 32.40), while Autumn was associated with a statistically significant decreased LOS of -19.22% (95% CI = 21.62 – -16.74) when compared with Winter. Morning shift was found to have a 7.89% in-

Characteristics	All patients, N (%) 37,613 (100.00)	Non-prolonged <6 hours LOS, N (%) 31,048 (100.00)	Prolonged 6-12 hours, N (%) 6,565 (100.00)
Sex			
Male	20,733 (55.12)	17,076 (55.00)	3,657 (55.70)
Female	16,880 (44.88)	13,972 (45.00)	2,908 (44.30)
Age group			
Neonates	329 (00.87)	265 (00.86)	64 (00.97)
Infants	5,511 (14.65)	4,636 (14.93)	876 (13.33)
Toddlers	12,052 (32.04)	10,094 (32.51)	1,958 (29.82)
Pre-schoolers	7,715 (20.51)	6,333 (20.40)	1,382 (21.05)
Schoolers	9,423 (25.05)	7,634 (24.59)	1,789 (27.25)
Adolescents	2,583 (06.87)	2,086 (06.72)	497 (07.57)
Nationality			
Saudis	34,742 (92.37)	28,792 (92.73)	5,950 (90.63)
Non-Saudis	2,871 (07.63)	2,256 (07.27)	615 (09.37)
Season			
Spring	9,449 (25.12)	7,757 (24.98)	1,692 (25.77)
Autumn	6,483 (17.24)	5,604 (18.05)	879 (13.39)
Winter	12,383 (32.92)	10,349 (33.33)	2,034 (30.98)
Summer	9,298 (24.72)	7,338 (23.63)	1,960 (29.86)
Shift			
Morning	10,855 (28.86)	7,316 (23.56)	3,539 (53.91)
Evening	19,868 (52.82)	17,192 (55.37)	2,676 (40.76)
Night	6,890 (18.32)	6,540 (21.06)	350 (05.33)
Triage			
I	6 (00.02)	6 (0.02)	-
II	9 (00.02)	4 (0.01)	5 (00.08)
III	1,062 (02.82)	867 (02.79)	195 (02.97)
IV	26,311 (69.95)	21,660 (69.76)	4,651 (70.85)
V	10,225 (27.18)	8,511 (27.41)	1,714 (26.11)
Complaint			
Fever	10,201 (27.12)	8,756 (28.20)	1,445 (22.01)
Cardiology	58 (00.15)	53 (00.17)	5 (00.08)
Dental	190 (00.51)	164 (00.53)	26 (00.40)
Dermatology	1,459 (03.88)	1,185 (03.82)	274 (04.17)
Endocrine	179 (00.48)	148 (00.48)	31 (00.47)
ENT	2,439 (06.48)	2,049 (06.60)	390 (05.94)
Genitourinary	287 (00.76)	230 (0.74)	57 (00.87)
Gastroenterology	5,739 (15.26)	4,713 (15.18)	1,026 (15.63)
Haematology	295 (00.78)	212 (00.68)	83 (01.26)
Ophthalmology	827 (02.20)	665 (02.14)	162 (02.47)
Musculoskeletal	319 (00.85)	241 (00.78)	78 (01.19)
Neurology	382 (01.02)	310 (01.00)	72 (01.10)
Respiratory	9,368 (24.91)	7,829 (25.22)	1,539 (23.44)
Surgery	297 (00.79)	220 (00.71)	77 (01.17)
Toxicology	333 (00.89)	285 (00.92)	48 (00.73)
Trauma	4,082 (10.85)	3,090 (09.95)	992 (15.11)
Others	1,185 (03.08)	898 (02.89)	260 (03.96)

Table 1. Descriptive statistics of pediatric patients who presented to Pediatric ER between 1st of January 2018 and 31st of December 2018. N (%): number (percentage), ENT: Ear-Nose-Throat speciality.

creased LOS when compared to the evening shift, whereas the night shift found a decreased LOS by -39.93%, both of which were statistically significant at the 0.001 level ($P < 0.001$). Triage I patients had a very highly statistically significant decreased LOS (-73.97%) when compared to Triage IV, a similar decreased LOS was also seen for triage V (-11.67%). Inversely, triage III had a 30.19% increased LOS (95% CI = 22.27 – 38.61).

With regards to complaints, the highest increase in LOS was attributed to haematology related complaints (% change = 108.32, 95% CI = 85.69 – 133.71), followed by Endocrine complaints (5 change = 68.78, 95% CI = 45.59 – 95.67). Dental and ENT related complaints were the only ones associated with a negative percent change, however both were non-significant (Table 2).

Predictors of length of stay in the subgroup analyses of non-prolonged and prolonged LOS

In examining the regression models for the non-prolonged and prolonged LOS patients separately, similar directions in percent change may be seen for all age groups of patients, however for neonates the increased LOS is no longer significant among the non-prolonged LOS group. However, for school aged patients and adolescents in the non-prolonged LOS, the percent change was negative indicating a decreased LOS although non-significant (% change = -0.18, 95% CI = -1.09 – 0.74 and % change = -0.72, 95% CI = -2.10 – 0.69 respectively). With regards to the nationality, non-Saudis had a less pronounced albeit statistically significant increase in LOS when compared to all patients in the main multivariate analyses (% change = 5.07, 95% CI = 1.50 – 8.77). When examining non-Saudis for the prolonged LOS group of patients, a non-significant decrease is observed (% change = -0.34).

For the season, a similar statistically significant percent change was observed for the non-prolonged LOS patients, however the change became negative during the summer for the prolonged LOS patients, although non-significant (% change = -0.42, 95% CI = -1.28 – 0.45). Examining the triage categories, particularly for the prolonged LOS patients, triage III had an inverse negative percent change of 2.64% when compared to triage IV, and this change was statistically significant (95% CI = -4.61 – -0.63).

With regards to the complaints amongst the non-prolonged LOS patients, the increase in LOS for haematology related complaints was more pronounced and highly significant (% change = 111.29, 95% CI = 89.26 – 135.89). However, for the prolonged LOS patients, haematology related complaints had a decreased percent change of LOS (% change = -6.99, 95% CI = -9.84 – 04.05), This indicates that haematology patients were more likely to belong to the non-prolonged LOS, and those that were unfortunate enough to be in the prolonged LOS group were seen faster than the others (towards the 6 hour cut-off rather than the 12 hours).

Characteristics	Percent change	95% CI	P-value
Sex			
Male	Ref		
Female	-00.77	-02.75 – 01.25	0.45
Age group			
Neonates	05.61	-05.29 – 17.75	0.32
Infants	01.35	-01.82 – 04.63	0.40
Toddlers	Ref		
Pre-schools	05.49	02.53 – 08.53	< 0.001
Schoolers	07.93	05.01 – 10.93	< 0.001
Adolescents	07.03	02.51 – 11.74	0.002
Nationality			
Saudis	Ref		
Non-Saudis	09.39	05.34 – 13.60	< 0.001
Season			
Spring	01.92	-00.77 – 04.68	0.16
Autumn	-19.22	-21.62 – -16.74	< 0.001
Winter	Ref		
Summer	28.92	25.53 – 32.40	< 0.001
Shift			
Morning	07.89	05.42 – 10.42	< 0.001
Evening	Ref		
Night	-39.93	-41.55 – -38.26	< 0.001
Triage			
I	-73.97	-88.22 – -42.48	0.001
II	52.88	-19.87 – 191.69	0.19
III	30.19	22.27 – 38.61	< 0.001
IV	Ref		
V	-11.67	-13.76 – -09.53	< 0.001
Complaint			
Fever	Ref		
Cardiology	06.25	-17.74 – 37.24	0.64
Dental	-05.27	-17.86 – 09.25	0.45
Dermatology	03.95	-01.57 – 09.78	0.16
Endocrine	68.78	45.59 – 95.67	< 0.001
ENT	-01.17	-05.47 – 03.32	0.60
Genitourinary	47.03	30.89 – 65.17	< 0.001
GI	20.47	16.61 – 24.45	< 0.001
Haematology	108.32	85.69 – 133.71	< 0.001
Ophthalmology	03.22	-03.80 – 10.75	0.37
Musculoskeletal	41.71	26.89 – 58.27	< 0.001
Neurology	21.61	09.78 – 34.72	< 0.001
Respiratory	08.32	05.33 – 11.41	< 0.001
Surgery	38.94	23.94 – 55.76	< 0.001
Toxicology	04.29	-06.52 – 16.35	0.45
Trauma	38.36	33.32 – 43.59	< 0.001
Others	30.70	22.99 – 38.89	< 0.001

Table 2. Multivariate model of predictors of length of stay in minutes of all pediatric patients who presented to pediatric emergency department.

Also, for Dermatology and Ophthalmology related complaints, the subgroup analyses for the prolonged LOS patient results indicate that they were more likely to be seen later (% change = 2.05, 95% CI = 0.22 – 3.90 and % change = 3.25, 95% CI = 0.93 – 5.62 respectively). Figure 2 shows an illustrative comparison of the percent change between the main multivariate regression model and the subgroup analyses.

Factors Affecting Length of Stay in Pediatric Emergency Department in a Teaching Hospital in Saudi Arabia

Characteristics	Non-prolonged > 6 hours LOS			Prolonged 6 < 12 hours		
	Percent change	95% CI	P-value	Percent change	95% CI	P-value
Sex						
Male		Ref			Ref	
Female	-01.03	-02.80 – 00.77	0.26	-0.01	-0.69 – 0.67	0.96
Age group						
Neonates	07.69	-02.44 – 18.87	0.14	-3.15	-6.46 – 0.28	0.07
Infants	01.60	-01.24 – 04.51	0.27	-0.66	-1.76 – 0.46	0.25
Toddlers		Ref			Ref	
Pre-schools	04.56	1.93 – 07.25	0.001	0.15	-0.82 – 1.12	0.76
Schoolers	07.67	05.05 – 10.35	<0.001	-0.18	-1.09 – 0.74	0.70
Adolescents	07.53	03.42 – 11.80	<0.001	-0.72	-2.10 – 0.69	0.31
Nationality						
Saudis		Ref			Ref	
Non-Saudis	05.07	01.50 – 08.77	0.005	-0.34	-0.149 – 0.82	0.56
Season						
Spring	-02.06	-4.38 – 00.31	0.08	-0.70	-1.60 – 0.21	0.13
Autumn	-20.35	-22.45 – -18.20	<0.001	-0.94	-2.04 – 0.17	0.09
Winter		Ref			Ref	
Summer	22.78	19.85 – 25.78	<0.001	-0.42	-1.28 – 0.45	0.34
Shift						
Morning	-34.39	-35.83 – -32.92	<0.001	33.49	32.56 – 34.43	<0.001
Evening		Ref			Ref	
Night	-34.78	-36.27 – -33.25	<0.001	11.07	09.34 – 12.83	<0.001
Triage						
I	-65.74	-82.04 – -34.62	0.001	-	-	-
II	37.80	-37.43 – 203.47	0.42	-3.10	-14.23 – 9.47	0.61
III	43.20	35.31 – 51.55	<0.001	-2.64	-4.61 – -0.63	0.01
IV		Ref			Ref	
V	-10.71	-12.59 – -8.78	<0.001	-0.08	-0.90 – 0.74	0.84
Complaint						
Fever		Ref			Ref	
Cardiology	36.99	10.13 – 70.40	0.005	-1.23	-12.58 – 11.59	0.84
Dental	-5.52	-16.62 – 07.07	0.37	1.63	-3.72 – 07.28	0.55
Dermatology	-4.85	-09.41 – -0.05	0.04	2.05	0.22 – 03.90	0.02
Endocrine	83.27	60.52 – 109.25	<0.001	2.74	-2.26 – 08.00	0.28
ENT	-5.24	-08.91 – -01.42	0.008	1.19	-0.40 – 02.80	0.14
Genitourinary	45.61	31.00 – 61.85	<0.001	1.22	-2.44 – 05.02	0.51
GI	17.36	14.00 – 20.82	<0.001	-0.59	-1.71 – 00.54	0.30
Haematology	111.29	89.26 – 135.89	<0.001	-6.99	-9.84 – -04.05	<0.001
Ophthalmology	-6.32	-12.11 – -0.15	0.04	3.25	0.93 – 05.62	0.006
Musculoskeletal	25.28	12.98 – 38.92	<0.001	-1.94	-5.01 – 01.23	0.22
Neurology	15.63	05.41 – 26.83	0.002	3.27	-0.13 – 06.78	0.05
Respiratory	6.31	03.70 – 08.98	<0.001	0.49	-0.52 – 01.50	0.34
Surgery	20.06	07.78 – 33.73	0.001	-1.74	-4.83 – 01.45	0.28
Toxicology	1.67	-07.68 – 11.98	0.73	-3.15	-6.97 – 00.83	0.11
Trauma	21.69	17.60 – 25.91	<0.001	-0.34	-1.49 – 00.82	0.56
Others	19.18	12.70 – 26.03	<0.001	0.69	-1.17 – 02.58	0.46

Table 3. Subgroup analyses showing multivariate linear models of pediatric patients with a length of stay of ≤ 6 hours and length of stay of > 6 hours.

5. DISCUSSION

Several institutions have examined the possible factors influencing the length of stay (LOS) for patients in emergency departments (ED) (18-20), but to the best of our knowledge, this is the first study to report the factors that are associated with a prolonged LOS of a

pediatric emergency department of a teaching hospital in Saudi Arabia. The result of this study reveals several patient-associated parameters including age, presenting complaint, and triage category; and external parameters including the season and the time of presentation. Currently, there is no consensus on the definition of pro-

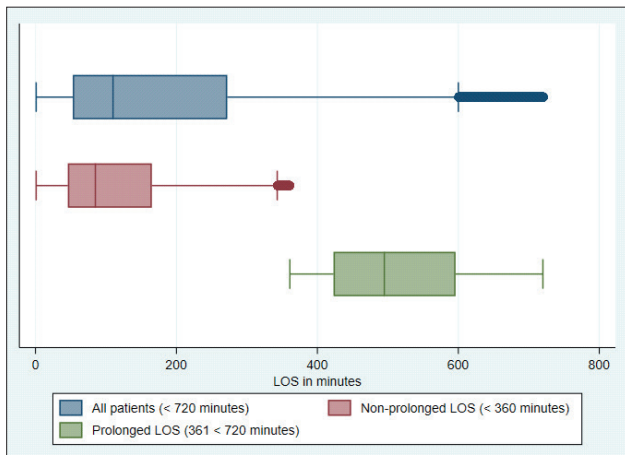


Figure 1. The distribution of the Length of Stay variable measured in minutes, for all patients, patients with a non-prolonged Length of Stay and patients with a prolonged Length of Stay.

patients require eligibility reviews according to their insurance categories.

In our study, the registered ED visits were highest during winter; however, this increase in number of registered patients did not result in significantly more patients with prolonged LOS. Hofer and Saurenmann have found a similar result in which winter was associated with more patients but did not result in increased LOS. (24) We found that ED visits during summer were associated with more prolonged LOS, which contrasts the general tendency in the literature. A plausible explanation is that our ED is in a teaching hospital where many of the staff are academic and have their annual leave during summer vacation leading to a shortage in staffing in certain specialties.

Another predictive factor for prolonged LOS was ED visits during the morning shift, even though fewer ED patient visits occurred during morning shifts compared to evening shifts. Various studies suggest that variations

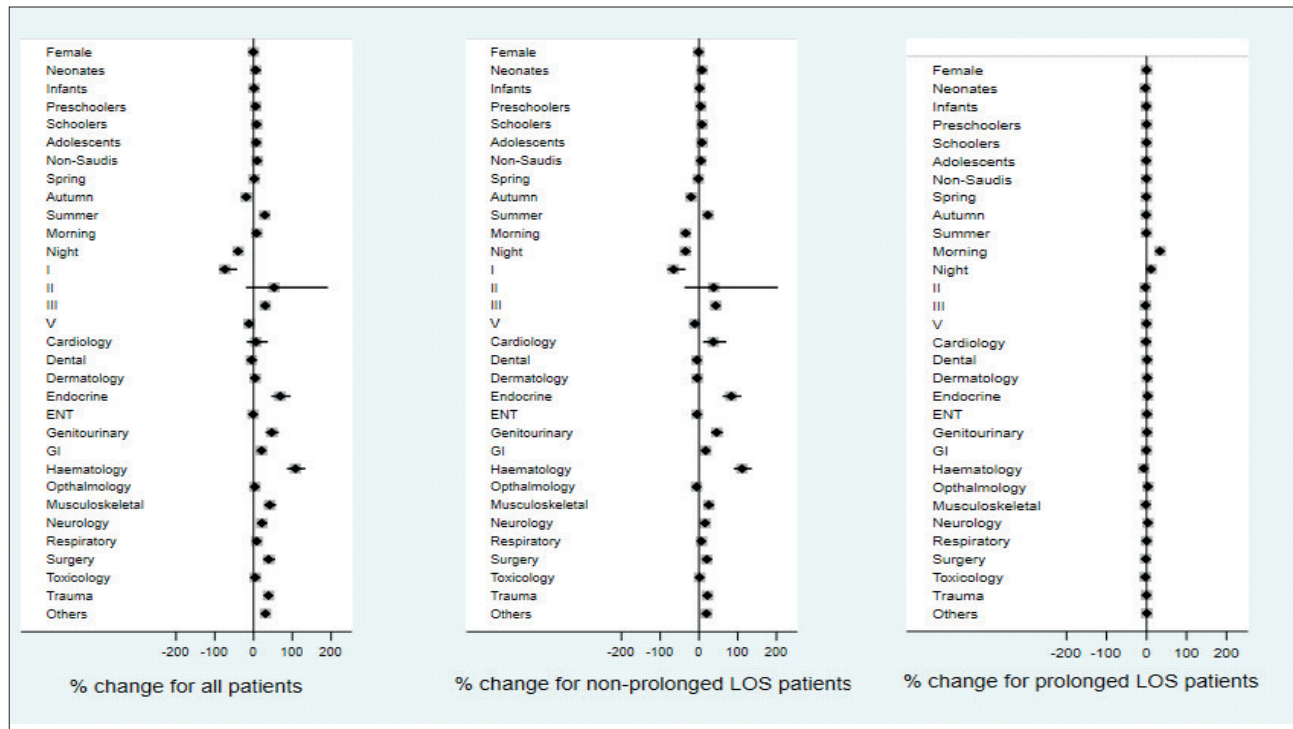


Figure 2. Differences in the percent change and 95% confidence intervals of LOS of patients in the main and subgroup analyses.

longed ED-LOS. We chose 6 hours cut-off to be more consistent with many studies that used a similar cut-off value so that the comparison of results becomes easier and more accurate. (21-23)

Our study found that younger children (less than 4 years) were less likely to be associated with prolonged LOS. Hofer and Saurenmann also described a similar result in which children less than 2 years were less likely to have a prolonged ED-LOS; they attributed this finding to their lower triage score. (24) This study showed that sex is not a predictor of prolonged LOS. This is similar to Mohamed Mosaad (25), and Dada and Sule (26) studies. The present study also shows that non-Saudi patients were more likely to experience a prolonged LOS, this is likely due to administrative reasons, as many of these

in staffing and organizational processes during morning shifts may contribute to reduced throughput (22, 24, 27-29).

Our data showed that, patients presenting with hematology-related complaints were more likely to experience a prolonged LOS. This is likely due to the high-prevalence of chronic hematological conditions such as Sick-cell disease in the Eastern Province of Saudi Arabia which frequently presents to hospital with vaso-occlusive crises requiring hydration & analgesia or fever requiring blood investigations and septic workup. Similarly, a study by Gravel et al found that chronic complex conditions, such as congenital heart disease or cystic fibrosis, had longer LOS in PEDs compared to patients without these conditions (30) In contrast, several studies

have found that respiratory-related complaints were the most common predictive factor for prolonged LOS (24-26, 31). In the present study, the most common presenting complaint among the prolonged LOS patients were related to respiratory complaints but did not result in a statistically significant increase of their LOS compared to other conditions in the prolonged LOS group.

Similar to other studies (24, 27, 30), our data showed a correlation between higher triage acuity levels and prolonged LOS in which urgent and emergent patients who were assigned to 'Canadian Triage Acuity Scale' levels of 3 and 2, had 30% and 52% more prolongation of their LOS, respectively. This shows that one of the key factors that influence LOS in PEDs is the severity of illness of the patient. Children with more severe conditions typically require more extensive diagnostic testing, interventions, and monitoring, which leads to an increased LOS.

Limitations of the study

There are several limitations of this study. System-level predictor variables of PED-LOS, such as hospital capacity, bed availability, delays in imaging or other diagnostic procedures, and staffing were not covered in this analysis. Hospital that are operating at or near capacity have limited ability to admit patients from the PED, leading to a prolonged LOS for patients requiring admission. The impact of physician referrals from primary health care or other specialties to the PED was also not measured. The complexity and severity of patients' illnesses was not effectively analyzed. CTAS triage levels were used as a proxy measure to severity of presentations; however, the validity of this purpose may be questioned, and triage levels may be interpreted differently in other hospitals (27,32) Additionally, the results of this study are subjective to the unique characteristics of our local ED and the national health system, which may limit the comparability of results from other studies conducted in other countries.

6. CONCLUSION

Several pediatric LOS predicting factors have been identified, including, morning arrival, and presentation during summertime. One possible approach to manage these factors is to ensure that the ED has sufficient staffing and that patients are processed quickly to facilitate efficient patient flow. Extended length of stay in the emergency department has been shown to have a negative impact on patient safety and satisfaction, making it a research priority to develop preventative measures. Systemic factors such as staffing, and infrastructure can be modified and may affect the length of stay of patients who are admitted. The implementation of these strategies and the evaluation of their impact on the length of stay in the pediatric emergency department require further investigation.

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- **Patient Consent Form:** Waved due to the nature of the study.

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