EVALUATION OF FACTORS THAT INFLUENCE PROLONGED EMERGENCY DEPARTMENT STAY AMONG ADMITTED PATIENTS IN UNIVERSITI KEBANGSAAN MALAYSIA MEDICAL CENTRE

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Abstract:

Emergency department (ED) stay is defined as the period seen by ED doctors to the time of ward admission. In this study, prolonged ED stay is the length of stay (LOS) for more than 6 hours. This study was carried out to assess the factors influencing prolonged ED stay among admitted patients in Universiti Kebangsaan Malaysia Medical Centre (UKMMC).

Data was collected retrospectively from medical records. A total of 662 cases of admission to the ward through ED were taken from 1st January 2016 to 30th June 2016 in UKMMC. Patients with incomplete data and those admitted through outpatient clinic and Patient Admission Centre (PAC) were excluded.

The median length of stay in ED was 6 hours. There were 280 (42.3%) patients with prolonged ED LOS. Medical department had the maximum median and paediatrics department had the minimum median ED LOS which was 8 hours and 3 hours respectively. The median referral time for patient with prolonged ED stay was 2 hours and 39 minutes, whereas for patient with ED stay of less than 6 hour was 1 hour and 35 minutes. A total of 31 patients (4.68%) out of 662 patients required ICU admissions. Among these, 21(67.74%) patients had prolonged ED stay. Ethnicity and race significantly affected LOS in the ED ($P < 0.001$). Consultation by ED doctors and referred doctors averaged at 55.87 (SD = 104.47) minutes and 141.94 (SD = 111.99) minutes respectively.

The result of this study serves as the basis for further research to minimize ED LOS. Despite the average hospital bed occupancy rate (BOR) of 61.22% to 65.24%, waiting time for

admission from the emergency department is still prolonged. Consultation time by doctors can be shortened and more efficient use of hospital beds are recommended.

Keywords: Bed Occupancy, Patient Admissions, Delay, Emergency Medicine

Introduction

Emergency department (ED) is the frontline medical care provider of a hospital. It functions on a 24-hour basis and offers emergency services to a wide range of cases. Overcrowding of ED has been an international phenomenon and prolonged ED stay has become the reason of dissatisfaction among patients. According to previous studies, ward overcrowding has been the primary cause of ED overcrowding as almost half of the inpatients are admitted through ED. Hence, the aim of the study is to assess the factors influencing prolong ED stay among admitted patients in PPUKM. Prolonged ED stay is defined as the duration of more than 6 hours from consultation by ED doctors to ward admission

The objective of this study is to determine the length of stay (LOS) of patients in the emergency department. It also studies the factors which could influence the length of stay such as demographic background, specialty involved, time of ED doctor's consultation, time of referral team consultation, triage, ICU admission and average hospital bed occupancy rate (BOR). It was hypothesized that high hospital bed occupancy rate led to a prolonged ED stay as stated in literature worldwide.

Materials and methods

This was a retrospective study, which is conducted by obtaining data from patients' medical record in ED UKMMC. Patients who visited ED from 1st January 2016 to 30th June 2016 were enrolled. We excluded patients with incomplete medical record and those admitted through outpatient clinic and Patient Admission Centre (PAC). This was a universal sampling method, in which we included all patients within the specific time that fulfilled the inclusion and exclusion criteria.

The following clinical data were collected from medical records: demographic data, ED LOS, type of cases, referral time and necessity for ICU admission. ICU included patients who are admitted to General ICU (GICU), Renal ICU (RICU) Pediatrics ICU (PICU) and Neonatal ICU (NICU). Besides that, bed occupancy rate (BOR) was obtained from Health Information Department of UKMMC.

Data were computerized and analyzed using statistical package for social sciences (SPSS) version 20.0. Chi square test of association was used to determine LOS for all patients and different type of specialty.

Results

Table 1: Baseline characteristics of patients with prolonged length of stay in the emergency department, *n* = 662.

Variables		**ED LOS ≤ 6 hours, *n* (%)**	**ED LOS > 6 hours, *n* (%)**	**Total, *n* (%)**	***X*^{2} statistic (df)**	***P*-value**
Age (Year)	0-12	114 (17.2)	8 (1.2)	122 (18.4)		
	13-30	57 (8.6)	32 (4.8)	89 (13.4)		
	31-50	54 (8.2)	57 (8.6)	111 (16.8)	87.70 (4)	<0.001
	51-70	89 (13.4)	100 (15.1)	189 (28.5)		
	>70	68 (10.3)	83 (12.5)	151 (22.8)		
Gender	Male	232 (35.5)	168 (25.4)	400 (60.4)		
	Female	150 (22.7)	112 (16.9)	262 (39.6)	0.04 (1)	0.849
Race	Malay	231 (34.9)	121 (18.3)	352 (53.2)		
	Indian	21 (3.2)	28 (4.2)	49 (7.4)		
	Chinese	104 (15.7)	108 (16.3)	212 (32.0)	20.40 (3)	<0.001
	Others	26 (3.9)	23 (3.5)	49 (7.4)		
Triage	1	80 (12.1)	87 (13.1)	167 (25.2)		
	2A	104 (15.7)	78 (11.8)	182 (25.5)		
	2B	110 (16.6)	85 (12.8)	195 (29.5)	20.49 (4)	<0.001
	3	76 (11.5)	26 (3.9)	102 (15.4)		
	Others	12 (1.81)	4 (0.6)	16		

There were 31216 patients admitted to the ward through ED during the study period. Of those, 662 patients (2.12%) were selected (Table 1). A total of 30554 (97.9%) patients were excluded due to incomplete medical records. Of 662 patients, 280 patients (42.4%) have prolonged ED length of stay and 381 patients (57.6%) have ED length of stay less than 6 hours. Patient's age and ethnicity are significantly associated with ED length of stay ($P < 0.001$). However, gender ($P = 0.849$), does not significantly associated with ED length of stay. The median length of stay in ED was 6 hours (Interquartile range (IQR) = 4 hours to 9 hours). The minimum ED length of stay (LOS) was 20 minutes whereas the maximum ED LOS was 41 hours.

Table 2: Type of specialty involved among admitted patients by length of stay, $n = 662$.

Type of Specialty	**ED LOS ≤ 6 hours, *n* (%)**	**ED LOS > 6 hours, *n* (%)**	**Number of patients, *n* (%)**	**X^2 statistic (df)**	***P*-value**
Medical	107 (16.2)	184 (27.8)	291 (44.0)	126.1 (5)	<0.05
Surgery	82 (12.4)	54 (8.2)	136 (20.5)		
Orthopaedic	51 (7.7)	25 (3.8)	76 (11.5)		
Oncology	17 (2.6)	4 (0.6)	21 (3.2)		
Psychiatry	8 (1.2)	5 (0.8)	13 (2.0)		
Paediatric	117 (17.7)	8 (1.2)	125 (18.9)		

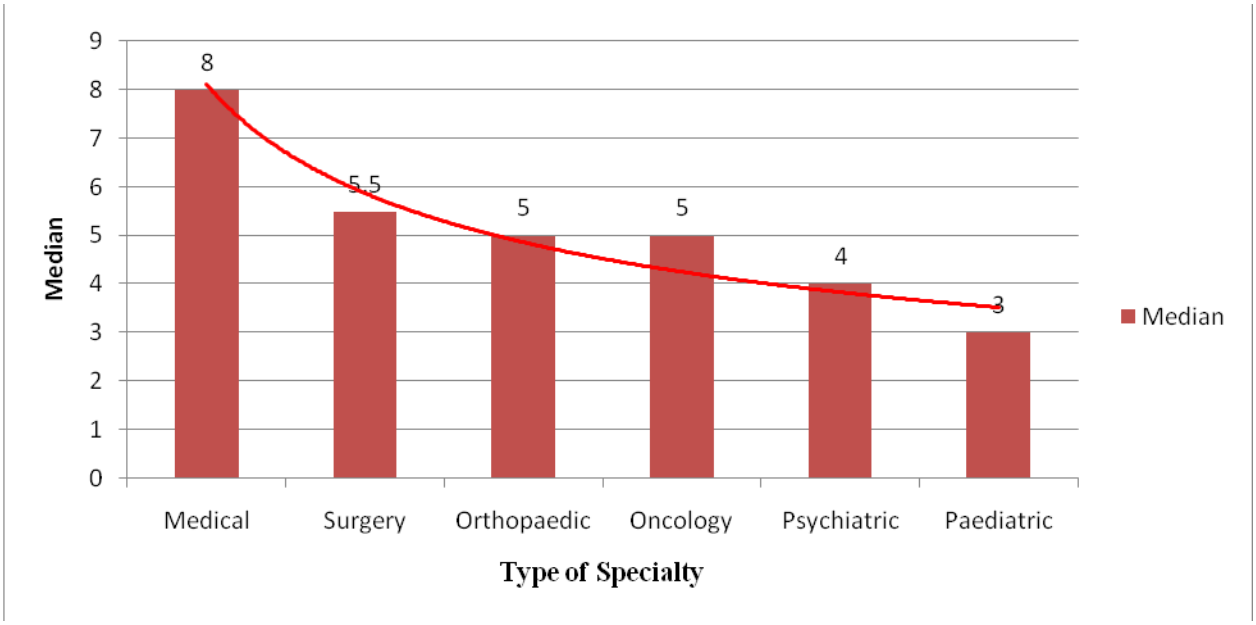

Figure 1: Median ED LOS across type of specialty.

The medians of ED length of stay were different across categories of type of specialty involved. Medical department has the maximum median and paediatrics department has the minimum median length of stay in ED which was 8 hours (IQR = 6 hours to 12 hours) and 3 hours (IQR = 2 hours to 5 hours) respectively. Meanwhile, median length of stay for other specialty were for surgery was 6 hours (IQR = 4 hours to 8 hours), orthopaedics was 5 hours (IQR = 3 hours to 7 hours), oncology was 5 hours (IQR= 4 hours to 6 hours) and psychiatry was 4 hours (IQR = 4 hours to 7 hours) (Figure 1). There is a statistical significant difference of the proportion of patients staying longer than 6 hours in the Emergency Department in patients admitted under the different specialties ($P < 0.001$) (Table 2).

The median referral time, or time seen by ED doctors prior to referral for patient with ED stay of less than 6 hour was 1 hour and 35 minutes (IQR = 45 minutes to 2 hour 23 minutes). On the other hand, the median referral time for patient with prolonged ED stay was 2 hours and 39 minutes (IQR = 1 hour 59 minutes to 4 hours 10 minutes) with maximum of 11 hours and minimum of 0 minutes. Average time by ED doctors prior to referral was 55.87 minutes (SD = 104.47). Average time taken from referral to specific

team to admission was 141.94 (SD = 111.99). Minimum referral time was 0 and maximum was 870 minutes.

A total of 31 patients (4.7%) out of 662 patients require ICU admissions. Among these, 21(67.7%) patients have prolonged ED stay. The minimum length of stay is 1 hour whereas the maximum LOS is 28 hours. Necessity for ICU admission is significantly associated with ED length of stay (P = 0.003).

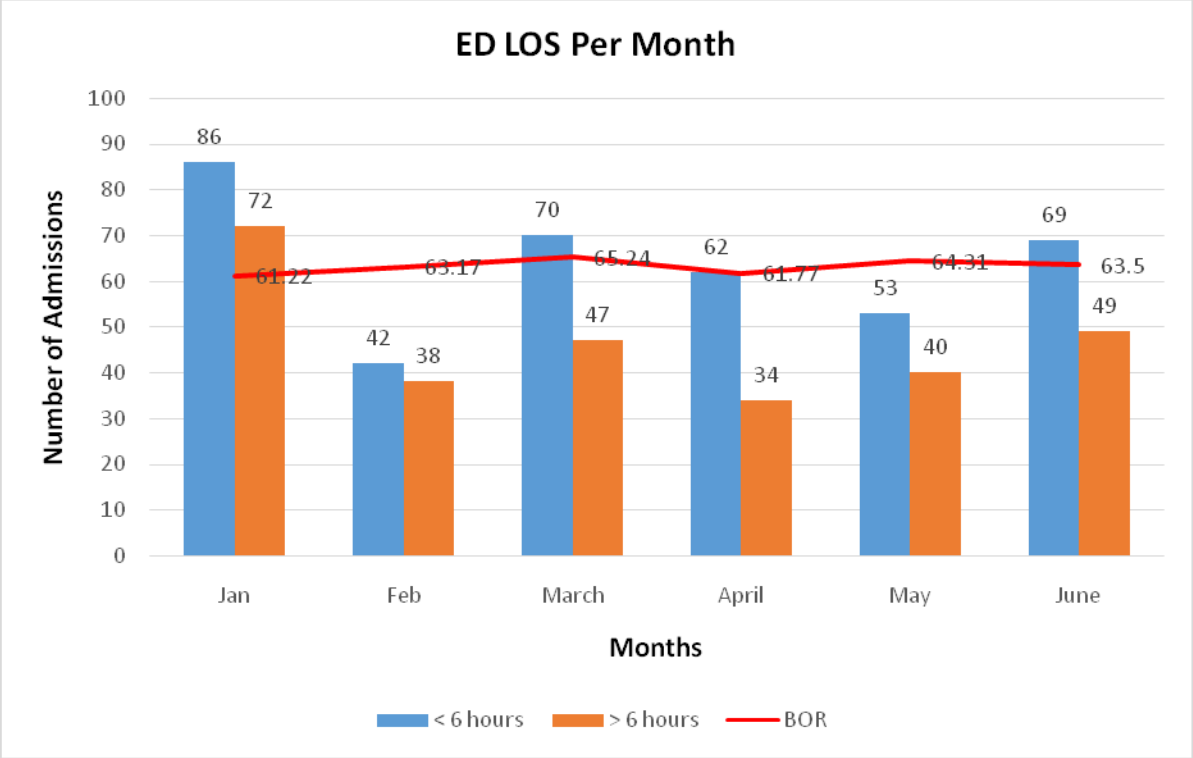

Figure 2: Bed occupancy rate (BOR) vs length of ED stay (LOS) in percentage.

The average BOR per month and average rate of admission per day ranging from 61.22% to 65.24% and from 33.2% to 40.3% respectively, which remains plateau throughout the study period (Figure 2).

Discussion

Based on our collection of data set and descriptive analysis, the median for ED LOS is 6 hours which is similar to the study done

by Seyed Mohammad et al. (2017). The mean and standard deviation for ED LOS is 7 and 5 hours respectively. In this study, median is used as the cut-off point for prolonged ED LOS in preference to mean as the data is not normally distributed. Two independent factors were found to be major reason for prolonged ED length of stay which were the type of specialty involved and lack of inpatient beds. Medical department has the longest LOS while paediatrics department has the shortest LOS.

From 280 patients who have prolonged ED LOS, there were 184 (65.71%) from medical, 54 (19.28%) from surgical, 8 (2.86%) from paediatrics, 25 (8.93%) from orthopaedics, 5 (1.79) from psychiatry and 4 (1.43%) from oncology departments.

Medical department has median LOS of 8 hours in contrast to paediatrics department of 3 hours. This was most probably due to difference in BOR in these cases, which was 82.60% and 62.44% for medical and paediatrics cases respectively. This is in contrast to study done by Scott Krall et al. (2009) which demonstrated that increased hospital occupancy especially for medical and surgical departments contribute to increase LOS for admitted patients in the ED when hospital occupancy reaches 92% and above. In addition, according to statistic report by Ministry of Health Malaysia in 2012, BOR above 85% will indicate hospital congestion and overcrowding. However, ED LOS is prolonged even though the BOR for UKMMC is less than 85%.

Medical department has the maximum LOS of 41 hours. In this case, 39 years old Indian male presented with symptomatic anemia. Multiple investigations and referrals were done to identify the cause of presenting illness. This may contributes to maximum LOS as stated in this case. Meanwhile, paediatrics department has the minimum LOS of 20 minutes among all the cases since this case did not required investigation.

In this study, it is shown that throughout the study period the BOR has remained plateau which is no longer affected by the number of admitted patients as seen in March and April (Figure 2). This will lead to ED overcrowding which will eventually results in prolong ED stay. Thus, it is necessary to combat this issue by increasing bed availability.

Among patients that required ICU admission, there were a total of 21 (67.74%) out of 31 patients who had prolonged ED stay. However, the results did not represent

the whole ICU cases due to data insufficiency.

The median referral time for those with prolonged ED stay has only one hour delay compared to those stay less than 6 hours. The maximum referral time for those with prolonged ED stay was 11 hours and 6 hours for the other group of patients. Mean consultation by ED doctors was 55.87 minutes. This is due to multiple investigations done by ED doctor especially imaging procedures before being referred to primary team doctor. This is similar to study done by Sreekala et al. (2015). Besides that, it can be due to transfer of patient to observation ward before definite decision can be made.

There is also statistical significance in the assignment of triage (Table 1). Surprisingly the most urgent triage which were triage 1, 2A and 2B which needed urgent attention had a higher percentage of LOS >6 hours then the non-urgent triage 3. It can be deduced in which choice of admission is more selective to the stable patients, where unstable patients were asked by the referred team to stabilize them in ED prior to admission.

Limitation

The study is retrospective and has the potential errors including incomplete data collection as the data was collected from the carbon copy of ED UKMMC, while the complete data was recorded online through the system. The reason why out of 31216 records, only 2.12% was selected was due to no records of time of admission in the ED record notes. As the patient was referred to other specialty in the emergency department, medical records were written on continuation papers, only records time of seen by the respective team. Records can be improved by adding a column that needs to be filled such as time of admission. We could not study time interval from the time decision is made until the patient is admitted to the ward because the time admitted was not stated. Furthermore monthly BOR was only available instead of daily which may affect the accuracy of the result.

Conclusion

It can be concluded that the hypothesis was incorrect; length of stay (LOS) in ED did not correlate with hospital bed occupancy rate. Increasing hospital beds would not help to decrease ED LOS because is still prolonged even though BOR has yet to reach its maximum. The in hospital beds use should

be optimized, as the average BOR rovers around 60-70% only. Since medical patients consists of the most patients with prolonged ED stay, a more efficient lodger system in which medical patients can be placed in other wards. A computerized system should be implemented to review which ward has a low BOR that can be utilized for lodging medical patient. Earlier referral should be done by emergency department staff and referral should be done following clinical judgment, not investigation results. Referral team should take shorter time to review the patients, considering these patients has been reviewed prior by the emergency doctors. Agreement between the ED staff and the specialty referred should be made in which blood and unnecessary radiological investigation should not delay prompt referral. Nonetheless, further research is required to establish solution regarding this matter.

Conflict of Interest

None.

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References

1. Krall, S., O'Connor, R. E., & Maercks, L. (2009). Higher Inpatient Medical Surgical Bed Occupancy Extends Admitted Patients' Stay. *Western Journal of Emergency Medicine*, *10*(2), 93–96.
2. Talleshi, Z., Hosseininejad, S. M., Khatir, G., Bozorghi, F., Gorji, A. M. H., &Gorji, M. A. H. (2014). The effect of new emergency program on patient length of stay in a teaching hospital emergency department of Tehran. *Nigerian Medical Journal : Journal of the Nigeria Medical Association*, *55*(2), 134–138.
3. Hosseininejad, S. M., Aminiahidashti, H., Pashaei, S. M., GoliKhatir, I., Montazer, S. H., Bozorgi, F., &Mahmoudi, F. (2017). Determinants of Prolonged Length of Stay in the

Emergency Department; a Cross-sectional Study. *Emergency*, *5*(1), e53.

4. Anon. 2013. Making space at hospitals. *The Star Online*, 13 December.
5. Sreekala P, Arpita Dan, Elizabeth M Varghese (2015). Patient Waiting Time in Emergency Department. *International Journal of Scientific and Research Publications*, 5(5), 8-10