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## Duration of stay in emergency department and outcomes of admitted patients

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**ABSTRACT**

**Introductions:** Duration of stay in Emergency Department (ED) is associated with negative outcomes, from increased mortality to increased duration of length of stay as inpatient. This study evaluates the length of duration of stay in ED after admission and the outcomes.

**Methods:** This was a cross sectional observational study conducted at Patan Hospital, a tertiary care teaching hospital of Patan Academy of Health Sciences. All the patients presenting to ED and getting admitted from 21<sup>st</sup> July to 4<sup>th</sup> August 2014 were enrolled in the study. Primary outcomes were hospital mortality, length of hospital stays (days) and secondary outcome was rate of transfer of inpatient to ICU or step down for higher care.

**Results:** There were total 178 admissions form ED during the study period. Length of hospital stay increased with the increased duration spent in ED ( $p=0.004$ ). The mortality group also had increased duration of stay in ED with mean duration of 23.23 hours. Increased duration of stay in ED after admission was also directly related to increased inpatient higher care transfers and thus prolonged hospital length of stay.

**Conclusions:** Increased duration of stay in ED after admission was associated with increased hospital stay, increased mortality and increased inpatient transfer for higher care.

**Keywords:** boarding time in emergency department, ICU, outcome of hospital admission, stay in emergency

## INTRODUCTIONS

Duration of stay (boarding time) of admitted patients in the emergency department (ED) contributes to lower quality of care, reduced timeliness of care, and reduced patient satisfaction.<sup>1</sup> Access block and consequent ED overcrowding constitute the greatest threat to quality emergency care. Inadequate hospital bed or high occupancy rate results in the delayed transfer of patients from ED to an appropriate in-hospital bed, particularly medical and surgical wards and ICUs.<sup>2-4</sup>

Blocking ED bed by admitted patients consumes nurse and physician time and disturbs the physician's ability to see more patients. The concern is that due to competing demands by other patients and general system overload, patient staying in emergency do not receive the same level of care that they would in inpatient beds.<sup>5</sup> So, this study is designed to see the relation between the duration of stay in ED with outcomes of admitted patients and triage category of patients.

## METHODS

This is a cross sectional observational study which was conducted at Patan Hospital Emergency Department from 21st July to 4th August 2014. Duration of stay in ED (boarding time) was defined as the interval between calling in the admission and physically leaving the ED. All patients who have been admitted through emergency department were included. Patients referred from emergency department to other hospitals for further care, admitted in emergency department by other care and subsequently discharged, mortality in emergency department and less than 14 years of age were excluded.

Data was extracted from ED nursing record book. Patient's hospital number, patient details, time of arrival to emergency, admission diagnosis, and time dispatched to ward was recorded from the book. Orientation to emergency department doctor, was given to do triage of patient and note time when consultation was made during the study period

Likewise concerning department doctors were also informed to note time in the admission form when decision to admit was made. So, time was noted at

four points: arrival of patient at the emergency department, noted by registration officer; time at which consultation has been sent was noted by emergency

department doctor; patient admission time was noted by concerned department doctor; patient dispatch time to ward was noted by nursing staff. Triage officer and examining doctor in emergency department did triage category. The ED triage categories were done according to acuity, defined by Australasian triage system.

Outcome of patient was analyzed by extracting patient record file and defined as discharge, mortality and need of higher care as inpatient. Length of stay was calculated as the interval between admission and hospital discharge, calculated as the number of midnights between transfers from the ED and discharge from hospital. For the purposes of the study, transfer from the ED was taken as the start of the admission. Primary outcomes were hospital mortality, length of hospital stay (days); and secondary outcome was rate of transfer of inpatient to ICU or step down for higher care.

Data was analyzed using SPSS 16.0. Ratio and frequencies were used for primary and secondary outcome. Chi square and T-test were applied as needed. Ethical approval was taken from Institutional Review Committee of Patan Academy of Health Sciences.

## RESULTS

The total number of patients visiting ED during the study period was 1835, male 828 (45.12%) and female 1007 (54.88%). Among the total visits, 178 (9.7%) resulted in hospital admissions (Table 1). Thirty patients who required admission were referred to other centers because of unavailability of service or beds in the critical care units and were excluded from the study. The mean age of patients getting admitted was 45.71 year, range 14 to 106 year. Out of 178 admitted patients, 112 were female and 66 male; male female ratio was 1:1.7. Patients from Lalitpur district were 83 (46.6%) where the hospital is situated; 41 (23.1%) from the adjoining Kathmandu and Bhaktapur districts; and 54 (30.3%) from out of the valley. The admissions comprised 22 (12.4%) of triage category-1, 68

(38.2%) category-2, and 69 (38.8%) category-3, while 19 patients were managed without triaging. Internal Medicine department admissions were 105 (58.9%). Sepsis was diagnosed in 27 (15.2%) admissions.

Psychiatric and Otorhinolaryngology had the least number of admissions through ED with both having

2 (1.1%) of total admissions. Out of total 178 admissions, 168 (94.4%) got discharged, 3 (1.3%) discharged on request and 7 (3.9%) had mortality in the hospital (Table 2). Among all patients admitted to the ward, 18 (10.1%) required transmission to the higher care units specially to step down or ICU, (Table 3, 4).

**Table 1. Timeline of patients (178) admitted through emergency department (ED)**

Time	N	Min	Max	Mean
Arrival ED to consult (H)	167	0.05	16.6	5.7
Consult to admission (H)	173	0.25	22.5	5.6
Adm to transfer to ward (H)	176	0.25	45.8	8.0
Total stay in ED (H)	177	1.03	67.4	18.1
Length of hospital stay (Day)	175	1.00	42.0	7.3

**Table 2. Outcome of admission patients and boarding time in ED**

Outcome		Length of hospital stay (Day)	Total duration stayed in ED (Hour)	Arrival to consult in ED (Hour)	Time from consult to admission (Hour)	Admission to transfer to ward (Hour)
Discharge	Mean	6.6	17.5	5.6	5.1	8.2
	N	135	136	127	132	136
Discharge on request	Mean	5.0	25.0	4.0	5.4	15.4
	N	3	3	3	3	3
Mortality	Mean	4.8	23.2	6.4	8.7	8.0
	N	7	7	7	7	7
P value		0.04	0.4	0.4	0.7	0.3

**Table 3. Relation between boarding time in emergency department and requiring high care in ICU or step down**

Requiring High Care	Length of hospital stay (Day)	Total duration stayed at emergency (Hour)	Time from arrival to consult (Hour)	Time from consult to admission (Hour)	Time from admission to transfer to ward (Hour)
No	6.5461	17.7827	5.5296	5.174	8.362
Yes	10.5588	19.8514	6.6294	7.3857	6.3169
P value	0.002	0.3	0.1	0.02	0.2

**Table 4. Relation between transfer to high care ward (ICU, step down) and time to consult**

Transferred for higher care	Time from arrival to consult (Hour)	Time from consult to admission (Hour)	Time from admission to transfer to ward (Hour)	Total duration stayed at emergency (Hour)	Length of hospital stay (Hour)
Not transferred	5.6106	5.6031	7.8647	17.8338	6.7134
Transferred	6.9322	5.7550	8.7778	21.3544	12.6667
P value	0.1	0.9	0.6	0.2	0.0

In sub group analysis of male vs female as per length of stay and outcomes were as follows: Mortality (8.5 vs 4.8 hours), high care (9.12 vs 12.04 hours), discharge on request (2 vs 6.5 hours) and in discharge (7.16 vs 6.2 hours). This was statistically significant (p=0.04). In sub group analysis of triage category 1 vs 2 vs 3 as per length of stay and outcomes were as follows: Mortality

(10 vs 6 vs 2 hours), high care (10 vs 11 vs 12 hours), and in discharge (8.6 vs 7.3 vs 6.2 hours). This was statistically significant (p=0.04). Only triage category 3 had discharge on request and mean time was 5 hours.

## DISCUSSIONS

Our result suggests long time to consult (5.7 hours in average) and time to admission (5.6 hours) and time to ward (8 hours), leading to poor outcome as measured by increased rate of in-hospital higher care transfers and mortality. This is however not statistically significant. The lack of statistical significance is likely due to small sample size of higher care or mortality. However, the study has shown important relation with length of stay. This result demonstrates that there is significant delay for the patients to reach their respective departments leading to the delay in the management of patients. When patients spend a lot of time in the ED, their inpatient evaluation and treatment doesn't typically start until they actually get to a respective ward; so the delays in treatment they experience might contribute to longer overall hospitalization for these patients.

Among the mortality group, total duration stayed in ED was much higher (23.2 hours). In previous studies, the author has used the definition of delay as stay > 8 hrs.<sup>6-9</sup> If we use the same definition of delay, majority of our patients exceed that time and had delays in their management. In this study, 6 out of 7 mortalities had stay > 8 hrs. It is unlikely that the delays of more than 8 hours will be just because of patient complexity alone, rather the delay of this magnitude would be caused at least in part by system factors, and possible delay on quality care delivery.

Specific studies and actions are necessary to understand and deal with the problems of long waiting times and access block. For example, discharge time of patients from the ward and system of clearing beds (late ward rounds etc.). This reflects that for the time being, we should have at least ED length of stay targets as studies have shown that this would have great impact on system process like more efficient use of resources and ED overcrowding.<sup>3</sup>

Overcrowding in ED caused by access blockage will make it difficult to find appropriate areas to manage new patients.

This study has not seen the financial aspect, but we can easily make out that possibly a longer hospital stay and increased rate of in-hospital transfers for higher care means increased financial burden to the patients too, and increased use of limited resources. This is also the fact that the patients held in the ED do not generate additional revenue to the institution rather occupy ED bed and exhaust nursing and ED physician time.<sup>10</sup>

Current research suggests that factors external to the ED, such as hospital bed availability, laboratory turnaround, specialist consultation availability and elective surgery schedules may be more important in determining ED throughput than internal bottlenecks such as ED staff availability and bed shortages.<sup>6,7,11,12</sup> There is strong evidence suggesting that initiatives to avoid the duration of hospital admission such as transit lounges, observation wards, multidisciplinary team interventions, additional ED staffs have produced positive effects, while ED expansion on its own without addressing other bottlenecks in the hospital has not been demonstrated to have significant effect on length of stay.<sup>13-18</sup>

Efforts to reduce the duration of stay in ED may improve outcomes of ED patients who are admitted to the hospital. Any measure taken to decrease the access block will lead to decreased financial burden, morbidity and mortality.

This is however a single centered study and is difficult to generalize to all the hospitals. All the data have been generated after reviewing the patients' charts and record books; and thus, the data are not real time study. The study is also of short duration with limited available data thus cannot predict the outcomes in other times of the year when the patients flow is very high or low.

## CONCLUSIONS

Longer duration of stay in ED, after a consult has been made, had higher inpatient mortality, higher rates of inpatient high care

transfers and longer duration of stay in the hospital.

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