



Determinants of Prolonged Length of Stay in Emergency Department Among Admitted Patients of a Tertiary Care Hospital of KPK, Pakistan

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Declaration

Authors' Contribution

All authors equally contributed to the study and approved the final manuscript

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ABSTRACT

Background: Emergency department (ED) length of stay (LOS) is an important indicator of healthcare quality and emergency department efficiency. These all lead to long stays (LOS) which can cause poor patient outcomes, delayed patient management, increasing costs of healthcare and overcrowding. Emergency department congestion is further compounded because of scarce medical facilities, excess of patients, in developing countries, such as Pakistan. **Objective:** To calculate average Emergency Dept's (ED) length of stay (LOS) in admitted patients and to find the associated factors for length of stay (LOS) in the ED of Lady Reading Hospital. **Methodology:** The study was performed cross-sectional based in Emergency Department of Lady reading Hospital, Peshawar in 6-month duration from October 23rd, 2024 to April 23rd, 2025. The non-probability consecutive sampling technique was used to include a total of 385 admitted patients over 18 years. Have been excluded patients with trauma cases and pregnancy related cases. The data were collected by using a proforma of structured data to collect the information, which involved demographic information and factors that might be associated with extended LOS. SPSS 24 was used to analyze data. **Results:** The mean time spent in the emergency department was 8.7 ± 3.6 hours. The most significant determinants were due to a failure of availability of inpatient beds (63.1%), ED crowding (60%), more than 4 hours spent on the ED floor (56.9%), delay to lab investigations (55.6%) and delay to specialist consultations (50.9%). Significant correlations with prolonged LOS included delays in investigations, delay in boarding, overcrowding, and delay in availability of bed space, with $p < 0.05$ for each ($p < 0.05$). **Conclusion:** Long Wait period at the EDs is a significant health care problem in the tertiary care hospitals of KP. The principal contributing factors were due to the lack of beds, overcrowding, delaying investigations, and long delay in boardings. A planned management strategy within the hospital and a better patient flow system must be in place to decrease the congestion in the ED and enhance the patient's clinical outcomes

INTRODUCTION

The emergency department (ED) is one of the most vital aspects of a health-care system, offering patients rapid medical evaluation and treatment for acute conditions and life-threatening emergencies. Emergency departments are the first port of call for many people needing urgent health care treatment and have a key role to play in delivering prompt interventions to minimise morbidity and mortality. In the last thirty years, the utilization of the services of the EHS product has risen markedly throughout the world thanks to the population growth, urban development, increasing incidence of chronic diseases and the scarcity of general healthcare centers. Which has been a significant strain on EDs, especially in low and middle income countries where resources to support EDs are often scarce [1, 2, 3].

Length of stay (LOS) at the emergency department (ED) is often used as a quality and efficiency measure of ED care providers [4, 5, 6]. LOS is defined as the total time from the patient's arrival at the ED to discharge, admission or transfer to another level of care [7, 8, 9, 10]. However, prolonged LOS is a frequent issue in hospitals, which is known to be associated with overcrowding, delayed patient management, higher health care expenses, and poor clinical performance [11, 12, 13]. Evidence has demonstrated that a longer emergency department (ED) length of stay can adversely impact treatment delays, hospital acquired infections and mortality, particularly for severely ill patients who need rapid medical attention.

Growing crowding in emergency departments is now an important public health issue all over the world [14, 15]. Crowding is when the capacity for emergency department (ED) patient care falls short of the demand for these

services [16, 17, 18]. The reasons behind crowding can be attributed to inflow of patients, lack of hospital beds, lack of hospital staff, investigation delay, long consultation time and boarding of inpatients in the emergency room [19, 20]. Boarding is the practice of patients who were admitted to hospital being left long periods of time in the ED after hospitalisation was already decided for them [21, 22]. This phenomenon has negative effects on patient flow, decreases the number of available beds for the patients that will be transferred to the ward and has a significant impact on the prolonged LOS [23, 24].

A variety of international research studies have found factors to be associated with longer ED durations. Laboratory investigation delay, lack of radiology imaging, specialist consultation delay in developed and developing countries, availability of inpatient facilities, overcrowding have been found to be significant predictors of increased LOS in both developed and developing countries. Furthermore, certain patient characteristics, such as severe illness, critical illness, and multiple comorbidities, and advanced age are likely to contribute to longer duration of stay at the ER [25]. These determinants are crucial for the healthcare administrators and policymakers to make healthcare systems more effective and efficient, while enhancing the care of patients attending an ED [26, 27].

Extended wait time in the ED also has an impact on patient satisfaction, in addition to the burden on healthcare providers and hospital systems [28]. Research shows that EDs with high turnover are linked to late treatment, more medical mistakes, worse quality of patient care and death. In addition, longer LOS exacerbates health care costs by making maximum use of resources and failure to manage the patient flow efficiently [29, 30]. Hence, it is imperative to determine factors associated with long LOS for planning to improve the emergency care delivery and hospital overcrowding [31].

It is evident that in Pakistan, the emergency departments of tertiary care hospitals are plagued with huge workloads, with less infrastructure, very few health care professionals, and insufficient numbers of beds as well. Though the burden on emergency services has increased, there is limited local research done on factors associated with increased emergency department (ED) time in Khyber Pakhtunkhwa (KPK) [32, 33]. The shortage of evidence makes it difficult for healthcare institutions to adopt evidence-based approaches to the enhancing ED performance and outcomes of patients within their EDs [34].

One of the biggest tertiary care teaching hospital of Khyber Pakhtunkhwa, which consists of Lady Reading Hospital, has been serving patients from different parts of the province as well as neighbouring areas. The hospital's emergency department suffers from an excessive number of seriously ill patients on a daily basis and waits are often long extending there overcrowding. With the high burden of patients and shortage of bed space in the wards, patients who are admitted to hospital may be held in the ED for long periods of time before being moved to inpatient wards. This circumstance may impact the quality of care and have negative implications for patient's outcomes.

Thus the present study aims to find the mean length of stay in Emergency Department (ED) of admitted patients

and the factors associated with increased Length of Stay (LOS) among the admitted patients in ED of Lady Reading Hospital Peshawar. This study could be a beneficial local evidence for health care administration and policy makers to review and formulate strategies to achieve efficient flow of patients, decrease crowding, and ensure the quality of emergency care services in the tertiary care centres of Pakistan.

METHODOLOGY

This will be a Cross section study carried at one of the largest tertiary care hospitals of Khyber Pakhtunkhwa Khyber Emergency Department: (Lady Reading Hospital). The study period would start from 23rd October 2024 to 23rd April 2025 after accepting the approved synopsis by College of Physicians and Surgeons Pakistan (CPSP). This research is focused on ways to estimate the average length of stay (LOS) for all patients who were admitted to the ED and to understand the factors that affect a longer LOS.

A cross-sectional study design will be used to evaluate the factors associated with long time spent in the ED of the patients who are admitted with a medical emergency. Patients that successfully go through the ED will form the study population. Sample size of 385 has been calculated using the help of OpenEpi sample size calculation with the consideration of the population size of Khyber Pakhtunkhwa from 2023 census at 95% confidence interval and a 5% margin of error. The sampling technique used will be non-probability consecutive sampling with all eligible patients who are seen at the clinic during the study period being sampled consecutively until the required number of samples is collected.

Adults (aged 18 years or older) of either sex with prolonged length of stay in the ED will be entered into the study. A prolonged LOS will be considered to be staying in the emergency department for over 6 hours from their arrival until moving to the ward. Trauma related conditions or pregnant patients complaining will not be considered for enrollment in the study. In addition, patients or attendants refusing to provide informed consent will also be excluded.

Approval by the hospital ethical review committee will be obtained and data will begin once approval is granted. The patients who will come with emergency scenario in the Lady Reading Hospital - Emergency Department, Peshawar will be targeted by trained Data collectors and Principal investigator. After informing patients of the purpose and procedures of the study, written informed consent will be obtained from the patient or attendant. All participants will be treated confidentially and anonymously throughout the study.

A structured study proforma, including two sections for data collection will be used. Demographic and clinical data such as age, gender, co-morbidity, triage category, how they come into the hospital, and their admission reasons will be entered in the first section. Demographic and clinical data will be entered in the first section including hospital admission reason, how they came to be in the hospital, comorbidities, age, and gender. The second section will be a quantitative assessment of contributing factors that help explain longer ED LOS such as delay in lab investigations, imaging, specialist consultations, ED bed availability, overcrowding, and boarding time. The doctor

or nurse on duty in the emergency department, responsible for the patient will complete this section.

The operational definitions will be the same for the entire study. Length of stay (LOS) in the ED will be recorded as the total time after arrival in the ED until the patient was transferred to the inpatient ward. Boarding shall mean patients that stay in the ED for more than four hours following the decision to admit and/or transfer. The definition of crowding will be based on the idea that the need for emergency services will be greater than the resources available for patient care within the emergency department.

The data that is collected will be processed and analyzed with Statistical Package for Social Sciences (SPSS) version 24. Numerical variables will be reported as median (interquartile range) if they are not normally distributed (as determined using the Shapiro-Wilk test) and mean ± SD if they are normally distributed. Descriptive statistics for categorical variables including gender, triage and the causes of extended LOS will be expressed as frequencies and percentages. Fisher's exact test or the chi-square test will be used to assess the association among categorical variables. The results will be made available as tabular, graphical and graphical presentation. The p value will be deemed statistically significant at < 0.05.

RESULTS

There were 385 admitted patients who attended the Emergency Department of Lady Reading Hospital with medical emergencies. The mean age of the subjects was 46.8 ± 17.2 years. Among the study participants, 228 (59.2%) were males and 157 (40.8%) were females. Among patients admitted to the ED, the mean (SD) length of stay (LOS) in the ED was 8.7(3.6) hours. Many patients had increased length of stay due to both system related and patient related issues.

Table 1
Demographic Characteristics of Study Participants (n=385)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
18-30	82	21.3
31-45	104	27.0
46-60	119	30.9
>60	80	20.8
GENDER		
MALE	228	59.2
FEMALE	157	40.8
RESIDENCE		
URBAN	149	38.7
RURAL	236	61.3

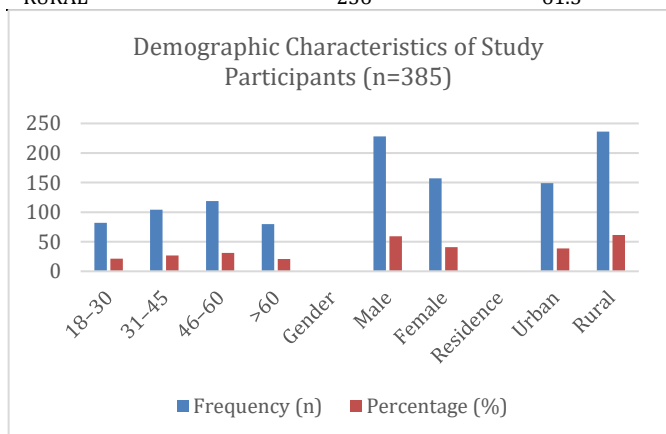


Table 2
Clinical and Emergency Department Characteristics

Variable	Frequency (n)	Percentage (%)
Triage category		
Critical	146	37.9
Urgent	171	44.4
Non-urgent	68	17.7
Mode of arrival		
Ambulance	133	34.5
Private transport	252	65.5
Time of presentation		
Morning shift	112	29.1
Evening shift	154	40.0
Night shift	119	30.9

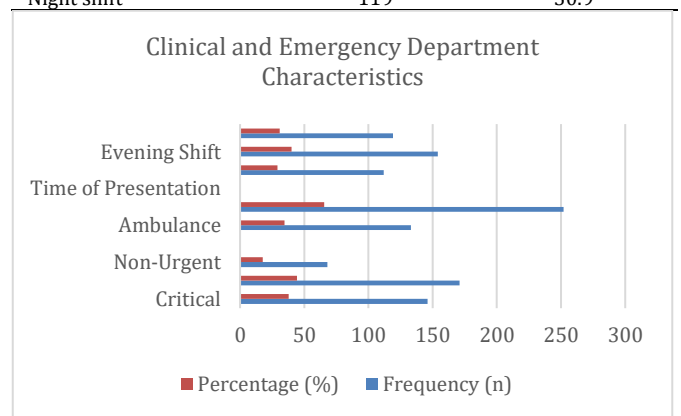


Table 3
Determinants of Prolonged Length of Stay in the Emergency Department

Determinants	Frequency (n)	Percentage (%)
Delay in laboratory investigations	214	55.6
Delay in specialist consultation	196	50.9
Non-availability of beds	243	63.1
Delay in radiological imaging	158	41.0
Overcrowding in ed	231	60.0
Boarding >4 hours	219	56.9
Multiple comorbidities	147	38.2

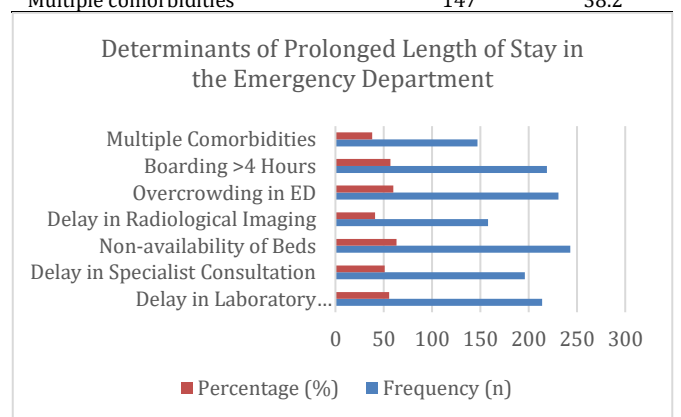


Table 4
Association Between Determinants and Prolonged LOS (>6 Hours)

Variable	Prolonged los n (%)	P-value
Delay in laboratory investigations	176 (82.2)	0.001
Delay in specialist consultation	159 (81.1)	0.003
Non-availability of beds	201 (82.7)	<0.001
Overcrowding in ed	188 (81.4)	0.002
Boarding >4 hours	194 (88.6)	<0.001

Patients experiencing delayed laboratory investigations, prolonged boarding time, emergency department overcrowding, and non-availability of inpatient beds

showed a statistically significant association with prolonged emergency department length of stay.

DISCUSSION

The present study aimed to assess the factors associated with long emergency department length of stay (LOS) in admitted patients in the ED of Lady Reading Hospital (LRH). The mean LOS in this study was 8.7 ± 3.6 hours, which is longer than the recommended duration of visit in the ED. The results of this study are consistent with prior international research, which found LOS to be related to overcrowding, delayed investigations, and fewer beds available in the hospital inpatient setting [4, 5, 11].

In total, the male participants made up the bulk of the study participants, 59.2%. The results are similar to those observed in studies that detailed characteristics and predictors for use of emergency departments and length of stay that indicate demographic characteristics, such as sex distribution, are commonly reported in the populations of an ED [34]. The male predominance may be due to an increased burden of occupational and environmental risk factors in males and these differences in healthcare seeking behaviour.

Non-availability of inpatient beds was the top factor observed in this study that contributes to extended LOS (63.1%). This is supported by reports that a lack of beds is a major driver of ED crowding and delays in admission of patients to inpatient wards [6, 22], with longer LOS and reduced movement efficiency resulting from this.

Another major factor that was associated with the longer LOS in the present report was overcrowding in the ED. 60% of patients reported delays due to overcrowding. The challenges of ED crowding have been reported in the literature as a worldwide health problem, a phenomenon caused by the growing volume of patients, low resource levels and suboptimal organizational processes within the ED [14, 16]. In tertiary centres such as Lady Reading Hospital this may lead to high patient numbers that do not match available resources with the consequent boarding and increased waiting times.

Prolonged LOS was also highly correlated with delay in laboratory investigations and consultations with a specialist. The laboratory turnaround time was delayed in over half of the patients and 50.9% of patients had a delay in specialist patient review. These results align with research which identified ED process delays, including delays in diagnosing and consulting patients, that added significantly to the length of time patients were staying in

the emergency department and to poor flow efficiency in the ED [20, 25].

In this study, extended LOS was found to be significantly correlated with boarding more than 4 hours after the admits decision. This discovery supports prior work demonstrating that boarding of admitted patients has a significant impact on delayed care delivery, emergency department congestion and poor clinical outcomes [21, 23].

The results of this study indicate that there is a need to create interventions at the administrative and healthcare system level to decrease the LOS in the ED. Several methods can help to improve inpatient bed management and to achieve more efficiency in staffing, reducing overcrowding and providing better services in the emergency, such as labour, radiation services optimisation and adoption of structured patient flows improvement methods [30, 31, 32]. In addition, periodic tracking of LOS indicators can help hospital managers to detect areas of inefficiency and enhance the provision of services.

Overall, this study yields valuable local insights into factors associated with prolonged emergency department (ED) stay in a tertiary care hospital of Khyber Pakhtunkhwa, Pakistan. Findings might inform policy makers and healthcare administrators in designing specific interventions to better streamline and enhance the efficiency of the ED.

CONCLUSION

The present study was concluded as prolonged emergency Department (ED) length of stay is a significant problem in the Emergency Department (ED) of Lady Reading Hospital. The mean LOS exceeded the recommended time (apparently due to delays in patient management and transfer). The significant factors identified to be associated with an increased LOS were non-availability of inpatient beds, overcrowding in the emergency room, the delay in laboratory investigations, the delay in consultation with specialists, and boarding time > 4 hours. These have a negative impact on patient flow, patient care and all aspects of ED efficiency. However, addressing these challenges with the use of better bed management systems, higher staffing levels, quicker diagnostics and inter-department team work coordination could help mitigate the crowding of ED beds and improve a patient's outcome. More multicenter studies are recommended to explore other determinants and to look at effective intervention strategies in Pakistan.

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