Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol.13, (2024)
https://www.jneonatalsurg.com

OPEN ACCESS

Emergency Department Length of Stay and Its Association with Patient Outcomes

Dr Zahid Ullah Khan[1], Dr Khalil Ullah[2], Dr Abdul Wahab[3], Dr Asif Khan[4], Dr Asif Khan[5], Dr Rustam Khan[6]

[1]Assistant Professor, Emergency Medicine Department, MTI-LRH Peshawar, Pakistan.

[2]Assistant Professor, Emergency Medicine Department, MTI-LRH Peshawar, Pakistan.

[3]Medical Officer, Emergency Medicine Department, MTI-LRH Peshawar, Pakistan.

[4]Medical Officer, Emergency Medicine Department, MTI-LRH Peshawar, Pakistan.

[5]Postgraduate Resident, Emergency Medicine Department, MTI-LRH Peshawar, Pakistan.

[6]Postgraduate Resident, Emergency Medicine Department, MTI-LRH Peshawar, Pakistan.

Corresponding author:

Dr Khalil Ullah

Assistant Professor, Emergency Medicine Department, MTI-LRH Peshawar, Pakistan.

Email ID : drkhalilkakakhel@gmail.com

Cite this paper as: Dr Zahid Ullah Khan, Dr Khalil Ullah, Dr Abdul Wahab, Dr Asif Khan, Dr Asif Khan, Dr Rustam Khan (2024) Emergency Department Length of Stay and Its Association with Patient Outcomes.Journal of Neonatal Surgery, 13, 2151-2156

ABSTRACT

Background: Prolonged emergency department length of stay (ED-LOS) has been linked to poor clinical outcomes as well as is one of the most important measurements of emergency department crowding. This relationship can be made clear to enhance patient safety and efficiency of care.

Objective: The aim of the study was to assess the relationship of ED-LOS and patient outcome, including in-hospital mortality, ICU admission, hospital length of stay, and 7-day ED revisits, in a tertiary care hospital of Peshawar, Pakistan.

Methods: The Emergency Department of Lady Reading Hospital between June 2023 and December 2023 was used to conduct a prospective observational study. Adults (18 and above) presenting to the ED were recruited. ED-LOS, demographic information, comorbidities, and triage desegregations were documented. The comparison of outcomes was carried out through descriptive statistics, chi-square tests, and multivariate logistic regression to identify free associations.

Results: The median ED-LOS of 824 patients was 5.6 hours (IQR 3.29.4). Standard ED-LOS in excess of 8 hours was also significantly linked with in-hospital mortality (AOR 4.36), ICU admission (AOR 3.78), and 7-day ED revisits (AOR 2.89) ($p < 0.001$ all).

Conclusion: Long ED-LOS is an important factor that predisposes poor outcomes. The efficient management of the patient flow, bed management, and identification of the time when care should be escalated can optimize patient safety and decrease avoidable morbidity.

Keywords: *Emergency department; Length of stay; Mortality; ICU admission; Patient outcomes*

1. INTRODUCTION

Emergency departments (EDs) have become a crucial part of the healthcare system in the recent past and offer quick evaluation and remedy to patients suffering various acute and life-threatening conditions. In the last twenty years, however, ED crowding; as well as a long length of stay (ELS) at the emergency department have become key global problems, including patient safety and quality of care [1, 2]. The concept of ED-LOS as a time interval between patient registration/triage and physical discharge of the ED is widely accepted, and it has already turned into a primary performance indicator of emergency services [3, 4].

Long ED-LOS is widely accepted as the measure of system inefficiency and is directly related to ED crowding [5]. Crowding can be described as the situation in which the demand of emergency services is higher than the capacity of an ED to deliver timely services, and this may be because of the reason of: limited inpatient beds, shortages in staffing, delays in diagnostic or consultation services [6, 7]. Such a setting can cause delays in patient evaluation, treatment and disposition which can result in poor clinical outcome and decreased patient satisfaction [8].

Extensive literature has shown that an increased ED-LOS correlates with undesirable outcomes in a wide range of patients. The evidence that exists regarding high-income nations indicates prolonged ED stay is associated with high mortality, ICU hospitalization, hospital length of stay, and high incidence of hospital-acquired complications [9, 10]. Among critically ill patients, transfer delays between the ED and the ICU have been linked to delay in the commencement of life saving interventions that are time sensitive, such as antibiotics, fluid replacement, and ventilatory support (component of life-saving) [11, 12].

In addition to mortality and critical care use, longer-ED-LOS has an implication on other healthcare quality domains. Longer hospital stays have been associated with rising levels of patients who leave without being attended to, decreased adherence to clinical guidelines and low patient satisfaction scores [13, 14]. Moreover, the ED-LOS is also linked to higher hospitalized costs and consumption of resources, which adds more weight to strained already overloaded health care systems [15].

Although a significant portion of evidence is based in North America, Europe, and Australia, data on ED crowding in low- and middle-income countries (LMICs) is somewhat limited, and the ED crowding is frequently more egregious and constrained in these regions [16]. High patient volumes, capacity issues in ICU and insufficient staff, as well as delays in diagnostic services in LMIC environments, may strengthen the adverse effect of long ED-LOS on patient outcomes [17]. Specifically, the delivery of emergency care in Pakistan is highly challenging, and huge tertiary hospitals act as referral centres to huge catchment areas and often exceed capacity [18].

Lady Reading Hospital (LRH) in Peshawar is a large tertiary care hospital in Khyber Pakhtunkhwa and has a large number of presentations of emergencies who come to the hospital both by the city and by the countryside. ED must also deal with a wide range of cases, such as trauma, medical emergencies, and patients who are in critical conditions and in need of immediate stabilization and specialized care [19]. In this high-pressure environment, it is expected that ED-LOS can be long and has significant consequences regarding patient outcomes [20]. Nevertheless, there is a dearth of evidence on the correlation between ED-LOS and clinical outcomes generated locally in Pakistan.

The role of ED-LOS in patient outcomes in this context is critical to understanding policy and quality improvement initiatives. Determining the size of risk in long ED stays can assist the hospital administrators and clinicians prioritize interventions like improved triage systems, early senior physician engagement, quicker diagnostic paths, and more effective inpatient bed administration.

Thus, the current research has been developed to test the hypothesis of the connection between emergency department length of stay and patient outcomes in the short-run in a tertiary care hospital in Peshawar. This study will seek to make a contribution that can inform patient flow and improve the quality and safety of emergency service delivery in Pakistan and other LMICs by presenting evidence-based results that would be applicable in informing strategies to address the problem of patient flow.

2. METHODOLOGY

The work was a prospective observational study carried out in the Emergency Department of Lady Reading Hospital, Peshawar, the 3rd-line care and teaching hospital and the large referral center of Khyber Pakhtunkhwa. The analysis lasted between June 2023 and December 2023. The main goal was to determine the correlation between emergency department length of stay (ED-LOS) and short-term patient outcomes.

They included all adult patients over the age of 18 years that attended the emergency at any point in the period of study and needed to be medically assessed. Brought dead patients, left against medical advice patients as well as those with incomplete records were excluded. A consecutive sampling was used to enroll eligible patients after initial triage and stabilization. The Institutional Review Board of Lady Reading Hospital did the ethical approval and patients or their legal surrogates provided informed consent.

ED length of stay was considered to be the duration of time period between patient registration in the ED to physical service out of the department, by discharge, ward or ICU admission, or by referral. ED-LOS was divided into three levels including 0-4 hours, 4-8 hours and above 8 hours. A structured proforma was used to gather data on demographics, presenting complaints, triage category, comorbidities, investigations conducted, consultations requested, and disposition.

In-hospital mortality, ICU admission requirement, and 7 days revisit to the emergency department were identified as primary outcome measures. Secondary outcomes were total length of stay and complications in hospital. Patients were tracked in the ED presentation and discharged or died. Data were put in and analyzed with the help of SPSS version 26. Continuous variables were described in terms of mean/SD or median with inter quartile range and categorical variables as frequencies and percentages. ANOVA or KruskalWallis tests (when there were continuous variables in comparisons) and chi-square tests (when there were categorical variables in comparisons) were used to perform comparisons across the ED-LOS categories. The independent relationship between prolonged ED-LOS and adverse patient outcomes was established through multivariate logistic regression analysis, taking into account the possible confounding factors (age, sex, triage acuity, and comorbidity). Any p-value below 0.05 was regarded as being significant.

3. RESULTS

The enrolled number of 824 patients was conducted between the study period June 2023 and December 2023. The average age was 46.8 +/-17.9 years, and 472 (57.3) of them were male. The median ED length of stay (ED-LOS) was 5.6 hours (IQR 3.2 9.4). The total patients with ED-LOS 4–8 hours (294, 35.7%), ED-LOS 38 or longer hours (212, 25.7%), and ED-LOS 4 or less hours (318, 38.6%) were 212, 294, and 318 respectively.

Extended ED-LOS was closely linked with increased in-hospital deaths, ICU admissions, hospital stay, and an increment in the rate of revisits that occurred after seven days.

Table 1. Baseline Characteristics of Study Population (n = 824)

Variable	Total n (%)
Age (years)	
≤40	294 (35.7)
41–60	316 (38.3)
>60	214 (26.0)
Gender	
Male	472 (57.3)
Female	352 (42.7)
Triage Category	
Resuscitation	146 (17.7)
Urgent	418 (50.7)
Non-urgent	260 (31.6)
Comorbidities	
Hypertension	338 (41.0)
Diabetes mellitus	294 (35.7)
Chronic kidney disease	98 (11.9)
Ischemic heart disease	124 (15.0)

Table 2. ED Length of Stay Categories

ED-LOS Category	Frequency (n)	Percentage (%)
≤4 hours	318	38.6
4–8 hours	294	35.7
>8 hours	212	25.7

Figure 2. ED Length of Stay Categories

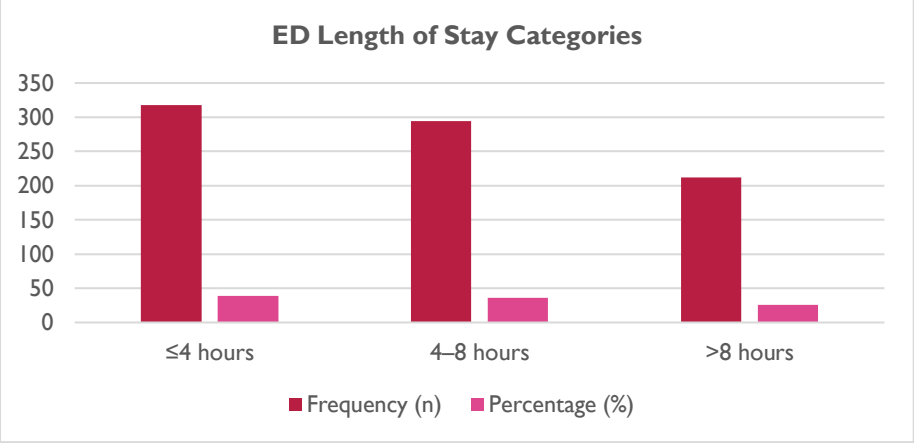


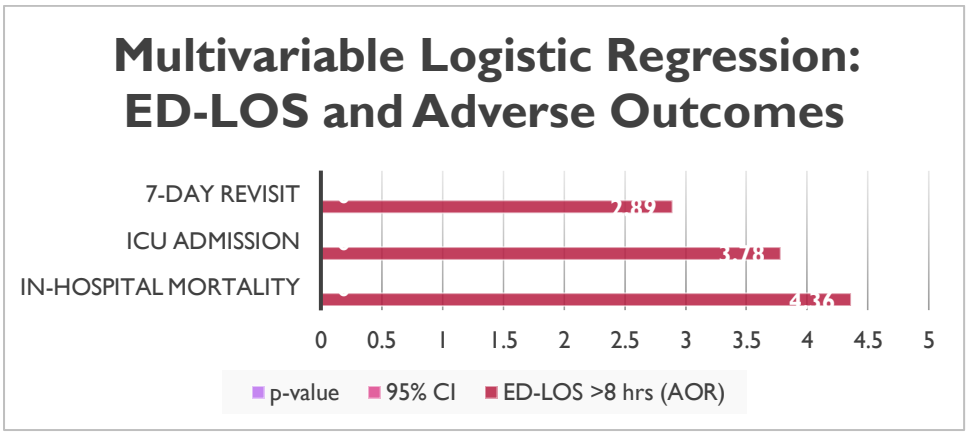
Table 3. Patient Outcomes by ED Length of Stay

Outcome	≤4 hrs (n=318)	4–8 hrs (n=294)	>8 hrs (n=212)	p-value
In-hospital mortality	8 (2.5%)	14 (4.8%)	28 (13.2%)	<0.001
ICU admission	22 (6.9%)	38 (12.9%)	62 (29.2%)	<0.001
7-day ED revisit	18 (5.7%)	32 (10.9%)	36 (17.0%)	<0.001
Mean hospital LOS (days)	4.2 ± 2.1	6.8 ± 3.4	10.6 ± 4.9	<0.001

Table 4. Multivariable Logistic Regression: ED-LOS and Adverse Outcomes

Outcome	ED-LOS >8 hrs (AOR)	95% CI	p-value
In-hospital mortality	4.36	2.01–9.46	<0.001
ICU admission	3.78	2.31–6.18	<0.001
7-day revisit	2.89	1.67–5.02	<0.001

Figure 4. Multivariable Logistic Regression: ED-LOS and Adverse Outcomes



Prolonged ED length of stay (>8 hours) was independently associated with significantly higher mortality, ICU admission, hospital length of stay, and short-term ED revisits.

4. DISCUSSION

This research shows that long-term emergency department length of stay (ED-LOS) is positively and significantly related to poor patient outcomes, such as higher in-hospital mortality, high ICU bed hospitalization, length of stay, and adverse short-term revisits. The results are consistent with the increasing international evidence that ED crowding and patient throughput delays are unfavorable to the quality and safety of emergency care.

The result showed that patients with ED-LOS over eight hours increased the risk of in-hospital mortality by more than four times. Likewise, in comparable cohort studies in the United States and Europe, extended ED stay was associated with diagnosis delays, treatment initiation delays, and delayed decisive actions on discharges [21]. Long ED waiting bays also interrupt monitoring and access to special care, especially among the critically ill patients.

The elevated requirement of ICU admission by patients with long ED-LOS in our research is in line with the previous literature. Research has indicated that critical patient ED boarding is related to deterioration of physiological functions and increased ICU mortality [22]. Delayed transfer to the ICU may lead to delayed delivery of time sensitive interventions, which include antibiotics, fluid replacement, and ventilatory support.

We have also found high associations between longer ED-LOS and longer hospital length of stay. This can be indicative of a higher level of illness as well as ineffective management systems in the hospital beds. Other like-minded findings, who demonstrated that a longer stay in the ED was conditionally linked to a longer inpatient stay and higher medical expenses [14,15].

The increased 7-day readmission rate of patients with long ED-LOS can indicate that a longer stay can lead to diminished discharge quality and subsequent care. While this may be the case, patients that stay within overcrowded ED setting might be less fully counseled, pending investigations, and fragmentation of follow up planning [23]. This emphasizes the significance of not just high throughput, but also orderly discharge procedures.

In developing and high-middle-income nations such as Pakistan, ED-LOS may have an even stronger effect due to the lack of ICU organizational capacity, the high patient load, and the lack of flexible personnel. Lady reading hospital is a key referral institution and system-wide redundancy of the bed and expert consultation probably drives up EDs. To clear these problems, the hospital needs to optimize its flows on a hospital-wide scale, increase its triage, and increase their critical care capacity.

Strengths and Limitations

The positives of this study include its prospective nature and the adequacy of the assessment conducted on clinically relevant outcomes. Nonetheless, it is constrained by the fact that it is single center and this can influence generalizability. Also, staffing ratios and diagnostic delays among other unmeasured confounders could not be entirely controlled.

Implications

One of the quality improvement targets should be to reduce ED-LOS. Early involvement of senior physicians, fast-track systems, better bed management, and prompt transfers to the ICU can be beneficial interventions that can contribute to better patient outcomes in numerous ways.

5. CONCLUSION

Long emergency department length of stay (ED-LOS) has a strong correlation with poor patient outcomes, such as a higher level of in-hospital mortality, higher rate of ICU admission, hospital stay, and short-term revisions. The patients whose ED-LOS exceeded eight hours were at considerably increased risk of such outcomes representing the critical importance of timely assessment, initiation of treatment, and assignment. This result highlights the need to have efficient patient flow, an early intervention by the senior clinician, and easy access to diagnostic and inpatient resources to minimize the risks of a long stay in the ED. Targeted interventions to maximize ED processes, optimize bed management and maximize critical care in resources-limited situations such as in Pakistan are mandatory. Applying formalized risk stratification and process enhancements could minimize preventable morbidity and mortality, enhance quality of care, and enhance delivery of emergency healthcare.

REFERENCES

[1] Savioli G, Ceresa IF, Gri N, Bavestrello Piccini G, Longhitano Y, Zanza C, Piccioni A, Esposito C, Ricevuti G, Bressan MA. Emergency department overcrowding: understanding the factors to find corresponding solutions. Journal of personalized medicine. 2022 Feb 14;12(2):279.

[2] Pearce S, Marr E, Shannon T, Marchand T, Lang E. Overcrowding in emergency departments: an overview of

reviews describing global solutions and their outcomes. Internal and Emergency Medicine. 2024 Mar;19(2):483-91.
[3] Pearce S, Marchand T, Shannon T, Ganshorn H, Lang E. Emergency department crowding: an overview of reviews describing measures causes, and harms. Internal and Emergency Medicine. 2023 Jun;18(4):1137-58.
[4] Sartini M, Carbone A, Demartini A, Giribone L, Oliva M, Spagnolo AM, Cremonesi P, Canale F, Cristina ML. Overcrowding in emergency department: causes, consequences, and solutions—a narrative review. InHealthcare 2022 Aug 25 (Vol. 10, No. 9, p. 1625). MDPI.
[5] Franklin BJ, Vakili S, Huckman RS, Hosein S, Falk N, Cheng K, Murray M, Harris S, Morris CA, Goralnick E. The inpatient discharge lounge as a potential mechanism to mitigate emergency department boarding and crowding. Annals of Emergency Medicine. 2020 Jun 1;75(6):704-14.
[6] Smalley CM, Simon EL, Meldon SW, Muir MR, Briskin I, Crane S, Delgado F, Borden BL, Fertel BS. The impact of hospital boarding on the emergency department waiting room. JACEP Open. 2020 Oct 1;1(5):1052-9.
[7] Samadbeik M, Staib A, Boyle J, Khanna S, Bosley E, Bodnar D, Lind J, Austin JA, Tanner S, Meshkat Y, de Courten B. Patient flow in emergency departments: a comprehensive umbrella review of solutions and challenges across the health system. BMC Health Services Research. 2024 Mar 5;24(1):274.
[8] Boulain T, Malet A, Maitre O. Association between long boarding time in the emergency department and hospital mortality: a single-center propensity score-based analysis. Internal and emergency medicine. 2020 Apr;15(3):479-89.
[9] Wessman T, Ärnlöv J, Carlsson AC, Ekelund U, Wändell P, Melander O, Ruge T. The association between length of stay in the emergency department and short-term mortality. Internal and emergency medicine. 2022 Jan;17(1):233-40.
[10] Moon S, Kim T, Park H, Kim H, Shin J, Park YS, Wang G. Effect of emergency physician-operated emergency short-stay ward on emergency department stay length and clinical outcomes: a case-control study. BMC Emergency Medicine. 2023 May 12;23(1):47.
[11] Kim, J. S., Seo, D. W., Kim, Y. J., Jeong, J., Kang, H., Han, K. S., ... & Kim, W. Y. (2020). Prolonged length of stay in the emergency department and increased risk of in-hospital cardiac arrest: a nationwide population-based study in South Korea, 2016–2017. Journal of Clinical Medicine, 9(7), 2284.
[12] Burgess L, Ray-Barruel G, Kynoch K. Association between emergency department length of stay and patient outcomes: a systematic review. Research in Nursing & Health. 2022 Feb;45(1):59-93.
[13] Jones PG, Mountain D, Forero R. Emergency department crowding measures associations with quality of care: a systematic review. Emergency Medicine Australasia. 2021 Aug;33(4):592-600.
[14] Ramzee AF, El-Menyar A, Asim M, Kanbar A, Ahmed K, Daoud B, Mathradikkal S, Kloub A, Al-Thani H, Rizoli S. The impact of emergency department length of stay on the outcomes of trauma patients requiring hospitalization: a retrospective observational study. World Journal of Emergency Medicine. 2023;14(2):96.
[15] Rybarczyk MM, Ludmer N, Broccoli MC, Kivlehan SM, Niescierenko M, Bisanzo M, Checkett KA, Rouhani SA, Tenner AG, Geduld H, Reynolds T. Emergency medicine training programs in low-and middle-income countries: a systematic review. Annals of Global Health. 2020 Jun 16;86(1):60.
[16] Werner K, Kak M, Herbst CH, Lin TK. Emergency care in post-conflict settings: a systematic literature review. BMC emergency medicine. 2023 Apr 1;23(1):37.
[17] Jackson M, Cairns T. Care of the critically ill patient. Surgery (oxford). 2021 Jan 1;39(1):29-36.
[18] Liao PH, Chu W, Ho CS. An analysis of waiting time for emergency treatment and optimal allocation of nursing manpower. InHealthcare 2022 Apr 28 (Vol. 10, No. 5, p. 820). MDPI.
[19] Goel NN, Durst MS, Vargas-Torres C, Richardson LD, Mathews KS. Predictors of delayed recognition of critical illness in emergency department patients and its effect on morbidity and mortality. Journal of intensive care medicine. 2022 Jan;37(1):52-9.
[20] Nesbitt J, Mitarai T, Chan GK, Wilson JG, Niknam K, Nudelman MJ, Cinkowski C, Kohn MA. Effect of emergency critical care nurses and emergency department boarding time on in-hospital mortality in critically ill patients. The American Journal of Emergency Medicine. 2021 Mar 1;41:120-4.
[21] Soltani M, Batt RJ, Bavafa H, Patterson BW. Does what happens in the ED stay in the ED? The effects of emergency department physician workload on post-ED care use. Manufacturing & Service Operations Management. 2022 Nov;24(6):3079-98..