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Factors influencing the length of stay in the emergency department

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Abstract

Background: Hospitals provide public access to medical care and healthcare services related to health recovery. The Ministry of Health has set a length of stay (LOS) quality standard for Cileungsi Regional Hospital at 6 hours, aiming to deliver fast and timely services to patients from their arrival at the Emergency Department (ED) until their admission to the inpatient ward.
Purpose: To determine the factors associated with the length of stay in the Emergency Department.
Method: A quantitative descriptive design with a cross-sectional method through observations conducted at Cileungsi Regional Hospital in June 2024. Sampling was carried out using random selection based on Slovin's formula, following pre-determined inclusion and exclusion criteria, resulting in 70 respondents. The independent variables in this study include severity level, nurse response time, and bed availability, while the dependent variable is the length of stay of patients.
Results: The majority of respondents were aged 46-55 years (39 respondents, 55.7%). Female respondents accounted for 52 individuals (74.3%). Most respondents had completed high school (48 respondents, 68.6%). The majority of patients had a long length of stay (52 respondents, 74.3%). Statistical tests showed that the p-values for the variables triage, response time, inpatient bed availability, patient arrival time during shifts (morning, afternoon, evening), patient arrival volume, and ancillary examination duration were all < 0.05, indicating a significant relationship with length of stay in the ED.
Conclusion: There is a significant relationship between triage, response time, inpatient bed availability, patient arrival time during shifts (morning, afternoon, evening), patient arrival volume, and ancillary examination duration with the length of stay in the ED ($p < 0.05$).

Keywordsi: Emergency Department; Factors Influencing; Length of Stay.

INTRODUCTION

Hospitals provide public access to medical care and health services aimed at patient recovery. Most patients seek treatment when their condition has deteriorated significantly, making self-care impossible (Menges, Ballouz, Anagnostopoulos, Aschmann, Domenghino, Fehr, & Puhan, 2021). The Emergency Department (ED) serves as the primary entry point for patients requiring urgent medical attention. Upon arrival at the ED, patients need immediate and appropriate care (Kelen, Wolfe, D'Onofrio, Mills, Diercks, Stern, & Sokolove, 2021). Therefore, emergency services must adhere to standardized protocols that align with the required skills and knowledge. Emergency services, which provide critical healthcare to the public, also include nursing care (Wahab, Jak, & Kodyat, 2021).

One of the most prevalent issues today is ED overcrowding, where the number of patients exceeds the department's capacity. ED overcrowding has become a global concern (Sartini, Carbone,

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Demartini, Giribone, Oliva, Spagnolo, & Cristina, 2022), affecting healthcare systems in the United States, Europe, Asia, Africa, and Australia. Excessive patient congestion poses a serious threat to patient safety, often leading to prolonged wait times, delayed treatments, and inefficiencies in triage and care delivery (Di Somma, Paladino, Vaughan, Lalle, Magrini, & Magnanti, 2015).

Indonesia is among the ASEAN countries with a high volume of emergency department visits. In 2017, the number of ED visits in Indonesia reached 4,402,205 patients (Ministry of Health of the Republic of Indonesia, 2018). Of these, 12% were referred from general hospitals, accounting for 1,033 units, while 1,319 units were referred from other hospitals. Prolonged Length of Stay (LOS) in the ED can increase the risk of adverse events, delayed administration of emergency medications, and negative impacts on patient satisfaction and hospital service quality (Bashkin, Caspi, Haligoa, Mizrahi, & Stalnikowicz, 2015).

LOS in the ED refers to the duration from a patient's arrival until their transfer to another department or discharge (Fadhilah & Dhamanti, 2024). Emergency service standards require the ability to manage life-threatening conditions in both adult and pediatric patients with a 100% success rate (Reynolds, Sawe, Rubiano, Shin, Wallis, & Mock, 2017). Emergency services must be available 24/7, and all ED personnel must hold valid certifications such as Basic Life Support (BLS), Pre-Hospital Trauma Life Support (PHTLS), Emergency Life Support (ELS), and Advanced Life Support (ALS) (Delinda, Halimuddin, & Nurhidayah, 2021). The average ED-LOS in Switzerland, France, and the United States is 5.5 hours (Ahmed, Ibro, Melkamu, Seid, & Tesfaye, 2020). While there is no national standard for LOS in Indonesia, RSUD dr. T. C. Hillers Maumere has implemented a ≥6-hour ED-LOS policy (Delinda et al., 2021).

According to the Directorate General of Health Services, the LOS standard at Cileungsi Regional Hospital is 6 hours, ensuring timely and accurate care from the moment a patient arrives at the ED until they are admitted to an inpatient ward (Ministry of Health of the Republic of Indonesia, 2018). Previous studies indicate a significant relationship between urgency level and hospital length of stay, as well as bed availability and response time with LOS (Nasochah, 2019).

One key factor affecting ED-LOS is triage accuracy, which involves sorting patients based on the severity of their condition (Fadhilah & Dhamanti, 2024). Triage prioritizes patients with critical conditions, ensuring they receive immediate medical attention. Red triage: Patients receive emergency medical intervention in the resuscitation room and may be transferred to surgery if necessary. Yellow triage: Patients are moved to observation rooms for further diagnostic tests before potential inpatient admission. Green triage: Patients are discharged or referred to outpatient services if their condition allows (Pinta, 2023).

A study found that 23% of 100 ED patients experienced LOS exceeding 6 hours (Pakpahan, Zuhriyah, & Kartikawatiningsih, 2017), while another study at Cibinong Regional Hospital reported that 45.6% of patients had an ED-LOS of less than 6 hours (Wahab et al., 2021).

Medical records from Cileungsi Regional Hospital indicate that 9,732 patients visited the ED between April and June 2024. A preliminary study conducted on June 1, 2024, through interviews and observations of 10 patients, revealed that 5 patients experienced bed shortages, while the remaining 5 had prolonged waiting times due to the need for stabilization before transfer.

The ED-LOS quality target at Cileungsi Regional Hospital is set at 6 hours, in accordance with the Hospital and Primary Healthcare Performance Indicator Dictionary by the Directorate General of Health Services, Ministry of Health. This standard aims to ensure fast, precise, and accurate care, reducing mortality and disability risks (Ministry of Health of the Republic of Indonesia, 2018).

RESEARCH METHOD

A quantitative descriptive study employing a cross-sectional approach was conducted to examine the factors influencing patient length of stay (LOS) at Cileungsi Regional General Hospital in June 2024. The sample was selected using a random sampling technique based on the Slovin formula, adhering to predefined inclusion and exclusion criteria, resulting in a total of 70 respondents. The study's independent variables include patient triage, nurse response time,

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and bed availability, while the dependent variable is the length of stay.

Primary data were collected through questionnaire responses. Triage was categorized into three levels: red triage, where patients receive immediate emergency treatment in the resuscitation room; yellow triage, where patients are transferred to a care room and undergo supporting examinations before inpatient admission; and green triage, where patients are either directed to outpatient care or discharged if their condition allows (non-emergency).

Nurse response time was classified as fast (≤5 minutes) or slow (>5 minutes). Supporting examination duration was categorized as fast (≤2 hours) or slow (>2 hours). Patient length of stay was defined as prolonged (≥6 hours) or short (<6 hours).

Data analysis involved univariate methods to present the frequency distribution of independent variables and bivariate chi-square tests to analyze relationships, given the ordinal nature of the data. Ethical approval for this study was obtained from Cileungsi Regional General Hospital under letter number: D/SP/FIKES/V/2024.

RESEARCH RESULTS

Table Characteristic of the Respondents (N=70)

Variable	Result	p-value	OR
Age (Mean±SD)(Range)(Year)	(43.142±7.181)(26-55)		
Age (n/%)			
26-35	8/11.4		
36-45	23/32.9		
46-55	39/55.7		
Gender (n/%)			
Male	18/25.7		
Female	52/74.3		
Education (n/%)			
Junior High	12/17.1		
Senior High	48/68.6		
Under Graduate	10/14.3		
Length of Stay (n/%)			
Long	52/74.3		
Short	18/25.7		
Triage (n/%)			
Emergency	51/72.9	0.004	5.972
Non-emergency	19/27.1		
Nurse Response Time (n/%)			
> 5 minutes	45/64.3	0.004	6.000
≤ 5 minutes	25/35.7		
Bed Occupancy Rate (n/%)			
High	46/65.7	0.002	6.667
Low	24/34.3		

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Variable	Result	p-value	OR
Time of Arrival (n/%)			
Morning	7/10.0	0.002	2.213
Afternoon	45/64.3		
Evening	18/25.7		
Patients' Arrival (n/%)			
Group	45/64.3	0.001	8.667
Individual	25/35.7		
Duration of Examination (n/%)			
Long	46/65.7	0.002	6.667
Short	24/34.3		

Based on the table above, most respondents are aged 46-55 years, totaling 39 (55.7%), with female respondents making up 52 (74.3%). The majority have completed their education up to high school, accounting for 48 respondents (68.6%). Regarding hospitalization duration, most respondents fall into the long-stay category, with 52 individuals (74.3%).

A significant portion of respondents (51 or 72.9%) belong to the emergency triage category. Statistical analysis reveals a p-value of 0.004 (<0.05), indicating a strong correlation between triage level and length of stay in the emergency department (ED). With an odds ratio (OR) of 5.972, patients in emergency triage are six times more likely to experience prolonged stays than those in non-emergency triage. Additionally, response times exceeding five minutes were recorded for 45 respondents (64.3%), with a p-value of 0.004, signifying a significant relationship between response time and ED length of stay. The OR of 6.000 suggests that response times longer than five minutes increase the risk of prolonged ED stays by six times compared to quicker response times.

Bed availability also plays a crucial role, with 46 respondents (65.7%) reporting full inpatient capacity. A p-value of 0.002 indicates a significant association between bed availability and ED stay duration, with an OR of 6.667. This implies that full occupancy increases the likelihood of extended stays by seven times compared to available beds. Furthermore, 45 respondents (64.3%) arrived during the afternoon shift, and statistical tests yielded a p-value of 0.002, showing a significant correlation between arrival shift and ED stay length. With an OR of 2.213, afternoon arrivals have twice the risk of experiencing prolonged stays compared to those arriving in the morning or evening shifts.

The data also highlights that 45 respondents (64.3%) arrived in groups, with a p-value of 0.001, demonstrating a significant relationship between group arrivals and ED stay length. The OR of 8.667 suggests that group arrivals have a nine times higher risk of extended ED stays compared to individual arrivals. Additionally, the duration of supporting examinations was classified as long for 46 respondents (65.7%), with a p-value of 0.002, indicating a significant link between examination duration and ED length of stay. An OR of 6.667 suggests that lengthy supporting examinations increase the risk of extended ED stays by seven times compared to those completed in under two hours.

DISCUSSION

Relationship Between Triage and Length of Stay in the Emergency Department

Based on research findings, statistical analysis yielded a p-value of 0.004 (<0.05), indicating a significant relationship between triage and length of stay (LOS). Additionally, the odds ratio (OR) was 5.972, meaning that patients categorized as emergency cases had a six times higher risk of prolonged LOS compared to non-emergency cases. These results align with previous studies, which also found a significant association between patient urgency and LOS in the Emergency Department (ED). The more critical and severe a patient's condition, the longer the required treatment (Fadhilah & Dhamanti, 2024).

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Patients with high urgency levels require intensive care and closer monitoring to stabilize their condition (Nates, Nunnally, Kleinpell, Blosser, Goldner, Birriel, & Sprung, 2016). Those needing complex medical care, urgent surgery, or frequent interventions will remain longer in the ED to ensure their overall stability, allowing for appropriate treatment and optimal recovery (Van den Heede & Van de Voorde, 2016). Furthermore, patients in higher urgency categories often present with more severe or complex medical conditions. Many suffer from severe chronic illnesses, critical diseases, or serious injuries, requiring extensive evaluation and treatment (Mira, Cuschieri, Ozrazgat-Baslanti, Wang, Ghita, Loftus, & Brakenridge, 2017).

Researchers assume that handling critically ill emergency patients necessitates long-term care and an extended recovery process, leading to prolonged ED-LOS or admission to the Intensive Care Unit. If emergency patients experience complications, their condition can deteriorate further or even result in fatality if not promptly managed. Hence, hospitals must prioritize patients based on urgency level to facilitate appropriate intervention (Kalid, Zaidan, Zaidan, Salman, Hashim, & Muzammil, 2018).

Relationship Between Response Time and Length of Stay

Research findings indicate a significant relationship between response time and LOS, with statistical tests showing a p-value of 0.004 and an OR of 6.000. This suggests that a response time exceeding 5 minutes carries a sixfold higher risk of prolonged LOS compared to a response time of less than 5 minutes. These findings are consistent with previous studies that identified a significant correlation between response time and LOS (p-value = 0.000), demonstrating that longer response times lead to longer patient stays in the ED (Indriani, Ardiyani, & Dewi, 2021).

In practice, response times in the field often fail to meet standard expectations due to several factors, including high patient influx within a short time frame, limited availability of healthcare personnel, administrative processes for patient registration.

A high patient volume within a short period can divert staff attention, reducing their efficiency in responding to emergencies (Birri, 2020). Researchers hypothesize that an imbalance between healthcare staff and patient volume contributes to delayed responses. When patient demand exceeds available resources, workload increases, leading to longer waiting times in the ED.

Relationship Between Bed Availability and Length of Stay

Research findings indicate a significant relationship between inpatient bed availability and LOS, with a p-value of 0.002 and an OR of 6.667. This suggests that full inpatient wards have a sevenfold higher risk of prolonged LOS compared to situations where beds are available. Previous studies also confirm a significant correlation between bed availability and LOS (p = 0.020), highlighting that higher occupancy rates lead to extended patient stays in the ED.

A shortage of inpatient beds can pose serious risks to patient safety. Additionally, it can increase ED-LOS, as patients may need to be transferred to less intensive wards or other inpatient units. Hospitals categorize inpatient rooms based on patient conditions, such as infection, non-infection, intensive, or general wards, to prevent cross-contamination and ensure proper patient placement (Khalaveh, Fazel, Mischkulnig, Vossen, Reinprecht, Dorfer, & Herta, 2021).

Researchers observed that although some patients reported available beds in other hospital wards, they were not immediately transferred because, they were waiting for healthcare staff decisions on discharge or inpatient transfer pending laboratory results, some patients refused to be transferred to another facility and preferred to remain in the ED overnight. Patients who decline transfer referrals contribute to ED overcrowding, leading to longer waiting times and extended LOS.

Relationship Between Arrival Shift and Length of Stay

Based on research findings, there is a significant relationship between arrival shift and LOS, with a p-value of 0.002 and an OR of 2.213. This indicates that patients arriving during the evening shift have a twofold higher risk of prolonged LOS compared to those arriving during the morning or afternoon shifts. These findings align with previous research, which also found a significant relationship between arrival shift and LOS in the ED (p-value = 0.002), suggesting

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that the evening shift increases the risk of prolonged patient hospitalization (Tamasoleng, Muharni, & Wardhani, 2023).

This is because, in the morning, patients can directly visit outpatient clinics instead of the ED, reducing morning shift arrivals. Consequently, more patients visit the ED during the evening shift compared to morning or afternoon shifts. The increased number of evening arrivals raises the likelihood of patient congestion, as patient visits peak during this period. This surge is largely attributed to a higher incidence of accidents, leading to more patients requiring emergency care (Ministry of Health of the Republic of Indonesia, 2018).

Researchers assume that during the afternoon shift, the influx of patients into the ED may result in overcrowding, especially due to staff shortages. The ED operates with only five nurses per shift, while the average daily patient influx is around 30. As a result, not all patients can be treated simultaneously, leading to staggered treatment based on the severity of their condition. Patients with life-threatening emergencies or potential disabilities should be prioritized over those with non-life-threatening conditions.

Relationship Between Arrival Volume and Length of Stay

The study found a significant relationship between patient arrival volume and LOS, with a p-value of 0.001 and an OR of 8.667. This means that group arrivals pose a ninefold higher risk of prolonged LOS compared to individual arrivals. These results are consistent with previous research, which also identified a significant correlation between arrival volume and LOS in the ED (p-value = 0.012) (Delinda et al., 2021).

When a large number of patients arrive within a short time frame, it can extend LOS, especially if hospital bed capacity is exceeded. Patients may have to wait for an available bed, particularly if intensive care or inpatient admission is required. This delay prolongs patient stays in emergency facilities. This situation violates Indonesian Ministry of Health Regulation No. 856 of 2009, which mandates that emergency patients must receive a response from ED staff within a maximum of five minutes from their arrival at the hospital entrance (Ministry of Health of the Republic of Indonesia, 2018).

Researchers hypothesize that group arrivals contribute to ED overcrowding, which in turn extends patient LOS. An imbalance between healthcare staff and patient volume is a major factor affecting prolonged stays.

Relationship Between Ancillary Examination Time and Length of Stay

The study revealed a significant relationship between the duration of ancillary examinations and LOS, with a p-value of 0.002 and an OR of 6.667. This indicates that delayed ancillary examinations increase the risk of prolonged LOS by sevenfold compared to faster examinations (under two hours). These findings align with prior studies, which also found a significant correlation between ancillary examination time and LOS (p-value = 0.008), confirming that longer examination times increase the risk of prolonged hospitalization (Fadhilah & Dhamanti, 2024).

Ancillary tests such as laboratory analysis, radiology scans, and specialist consultations play a crucial role in diagnosis and treatment planning (Birri, 2020). If these tests take too long or require complex interpretation, patients must wait until a final diagnosis is established and appropriate treatment is planned. Ancillary examinations are also essential for monitoring patient progress, assessing treatment responses, and evaluating recovery progress. However, if these examinations are delayed, necessary monitoring and evaluations are postponed, ultimately prolonging patient stays in the healthcare facility.

According to Indonesian Ministry of Health Regulation No. 129 of 2008, the standard waiting time for laboratory test results should be ≤140 minutes (2 hours 20 minutes) (Ministry of Health of the Republic of Indonesia, 2008). Researchers assume that various factors influence the speed of laboratory result processing, including, high testing volume, leading to backlogs and increased processing time, limited laboratory resources and equipment, affecting test efficiency, complexity of the tests, as more complex analyses require longer processing times.

To minimize delays, it is crucial to implement effective monitoring and management strategies to ensure optimal speed in obtaining results for timely patient care.

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CONCLUSION

There is a significant relationship between triage, response time, inpatient bed availability, patient arrival time during shifts (morning, afternoon, evening), patient arrival volume, and ancillary examination duration with the length of stay in the ED, with a p-value < 0.05.

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