Jurnal SMART Keperawatan, 2026, 13 (1), 79-85
https://ejournal.unkaha.ac.id/index.php/jskp
Received 13 March; Revised 5 May; Accepted 5 May 2026

SKJP 2026
pISSN 2301-6221; eISSN 2502-5236

ANALYSIS OF CLINICAL COMPLEXITY, HOSPITAL CAPACITY, AND INTER-UNIT COORDINATION ON LENGTH OF STAY OF PATIENTS IN EMERGENCY DEPARTMENT AT HOSPITAL

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ABSTRACT

Background: The Emergency Department (ED) is a critical service unit that serves as the primary gateway for hospital care for patients with emergency conditions. One of the quality indicators of ED services is **Length of Stay (LOS)**, which refers to the duration of time a patient remains in the ED from arrival until discharge or transfer to another unit. Prolonged LOS can lead to overcrowding, reduce the quality of healthcare services, and increase clinical risks for patients. Several factors are suspected to influence LOS in the ED, including patient clinical complexity, hospital capacity, and coordination among service units. **Objective:** This study aims to analyze the effect of clinical complexity, hospital capacity, and inter-unit coordination on patient Length of Stay in the Emergency Department of Hospital X. **Methods:** This study employed a quantitative analytic observational design using a cross-sectional approach. Data were obtained from the medical records of patients who visited the Emergency Department of Hospital X. The total sample in this study consisted of 297 respondents selected using purposive sampling. Multivariate analysis was performed using multiple linear regression to identify the most dominant factors influencing the Length of Stay (LOS) of patients in the Emergency Department, with a significance level of $p < 0.05$.. **Results:** The results showed a significant relationship between clinical complexity and patient Length of Stay in the Emergency Department (up = 0.036), hospital capacity and Length of Stay (p = 0.025), and inter-unit coordination and Length of Stay (p = 0.004). Multivariate analysis indicated that these three variables simultaneously had a significant effect on the Length of Stay of ED patients (F = 2.983; p = 0.032). **Conclusion:** Clinical complexity, hospital capacity, and inter-unit coordination significantly influence the Length of Stay (LOS) of patients in the Emergency Department, with inter-unit coordination identified as the most dominant factor contributing to prolonged LOS. Therefore, hospitals should prioritize strengthening inter-unit coordination through effective communication, integrated systems, and optimized capacity management to improve patient flow and reduce LOS.

Keywords: Clinical complexity; Emergency Department; Hospital capacity; Inter-unit coordination; Length of Stay

INTRODUCTION

The Emergency Department (ED) is a healthcare service unit that plays a strategic role in providing initial care for patients with emergency conditions. Services in the ED are required to be rapid, accurate, and well-coordinated in order to prevent deterioration in patients' conditions that may lead to death or disability (Burkholder & Calvello, 2019).

One of the important indicators used to evaluate the performance of ED services is Length of Stay (LOS), which refers to the duration of time a patient remains in the ED from arrival until being transferred or discharged. Prolonged LOS may lead to overcrowding and decreased quality of care (Alshaikh et al., 2020). Several factors influence LOS, including patient-related and system-related factors. Clinical complexity, such as severity of illness and comorbidities, has been shown to significantly increase LOS due to the need for more extensive diagnostics and monitoring (Miazgowski & Pakulski, 2023). Various studies have shown that the

duration of LOS in the ED is influenced by several factors, both related to patient conditions and the hospital service system. Patient clinical complexity, such as disease severity, comorbidities, and the need for complex diagnostic examinations, can increase the time required for patient management in the ED. In addition, hospital capacity, including the availability of inpatient beds, the number of healthcare personnel, and supporting medical facilities, also plays an important role in determining the efficiency of patient flow. When hospital capacity is unable to accommodate the number of incoming patients, the process of transferring patients from the ED to other units may experience delays.

Another factor that influences the duration of patient stay in the ED is coordination among hospital service units. The management of emergency patients involves multiple units such as laboratories, radiology departments, pharmacy services, and inpatient wards. Ineffective coordination among these units may result in delays in examinations, diagnosis establishment, and patient transfer processes. Consequently, this situation can increase patient waiting time and prolong LOS in the Emergency Department.

Hospital capacity also plays a critical role. Limited availability of inpatient beds and healthcare resources can delay patient transfer from the ED, a phenomenon known as boarding (Wretborn et al., 2020) Therefore, a comprehensive analysis is needed to identify the factors influencing patient Length of Stay in the ED so that appropriate strategies can be developed to improve service effectiveness. In addition, inter-unit coordination is essential in ensuring efficient patient flow. Poor coordination among laboratory, radiology, pharmacy, and inpatient units may delay diagnosis and treatment processes(Min et al., 2023).

Based on these issues, this study aims to analyze the influence of clinical complexity, hospital capacity, and inter-unit coordination on Length of Stay (LOS) of patients in the Emergency Department of Hospital X, South Tangerang. The results of this study are expected to contribute to the development of emergency department service management strategies in order to improve service quality and the efficiency of hospital healthcare systems.

METHOD

This study employed a quantitative research design with an analytic observational approach using a cross-sectional method. This approach was used to analyze the relationship between clinical complexity, hospital capacity, and inter-unit coordination variables and the Length of Stay (LOS) of patients in the Emergency Department (ED) (Wang & Cheng, 2020).

The study was conducted at Hospital X, South Tangerang. The research period took place during the data collection phase in accordance with the timeline of the thesis research. The population in this study consisted of all patients who received treatment at the Emergency Department of Hospital X, South Tangerang during the study period.

The sampling technique used in this study was purposive sampling, which refers to the selection of samples based on specific criteria determined by the researcher. The inclusion criteria included patients who received treatment in the Emergency Department and had complete medical record data related to the research variables. Meanwhile, the exclusion criteria included patients with incomplete medical record data or patients who were referred before the ED treatment process was completed.

The independent variables in this study consisted of patient clinical complexity, hospital capacity, and inter-unit coordination, while the dependent variable was the Length of Stay (LOS) of patients in the Emergency Department. Clinical complexity was measured based on the severity of the patient's condition and the need for supporting medical examinations. Hospital capacity was measured based on the availability of healthcare service facilities, such as inpatient beds and healthcare service resources. Inter-unit coordination was measured based on the communication processes and collaboration among service units involved in patient management in the Emergency Department. Meanwhile, LOS was measured based on the duration of time patients remained in the ED from arrival until they were transferred to another unit, discharged, or referred.

Data analysis was performed using univariate, bivariate, and multivariate statistical analyses. Univariate analysis was used to describe respondent characteristics and the distribution of each research variable. Bivariate analysis was conducted to determine

the relationship between independent variables and the dependent variable using appropriate statistical tests. Furthermore, multivariate analysis was conducted using logistic regression or linear regression to identify the variables that had the most significant influence on the Length of Stay (LOS) of ED patients.

This study adhered to ethical principles in health research No 0369/KEP/UNKAHA/LPPM/X/2025, including maintaining the confidentiality of patient data and ensuring that the data were used solely for research purposes.

RESULTS

Tabel 1. Distribution of Respondents Based on Clinical Complexity, Hospital Capacity, Inter-Unit Coordination, and Length of Stay in the Emergency Department in 2025

Characteristics	Frequency(f)	Percentage (%)
Clinical Complexity		
High	75	25.3
Moderate	221	74.4
Mild	1	0.3
Hospital Capacity		
High (BOR <70%)	172	57.9
Moderate (BOR 70-85%)	125	42.1
Inter-Unit Coordinationt		
Good (Skor 3-4)	175	58.9
Fair (Skor 5-6)	101	34.0
Slow (Skor 7-9)	21	7.1
Length of Stay (LOS)		
< 2 hours	39	13.1
2-4 hours	118	39.7
4-6 hours	79	26.6
> 6 hours	61	20.5
Total	**297**	**100**

Based on the table 1 from 297 respondents, the majority of patients had moderate clinical complexity, accounting for 221 respondents (74.4%). Patients with high clinical complexity totaled 75 respondents (25.3%), while only 1 respondent (0.3%) had low clinical complexity. Regarding hospital capacity, the majority of cases were categorized as high capacity (Bed Occupancy Rate/BOR < 70%), with 172 respondents (57.9%), while moderate capacity (BOR 70–85%) accounted for 125 respondents (42.1%). For inter-unit coordination, the majority of respondents experienced good coordination, totaling 175 respondents (58.9%). Meanwhile, 101 respondents (34.0%) were categorized as adequate coordination, and 21 respondents (7.1%) experienced slow coordination. The distribution of Length of Stay (LOS) in the Emergency Department showed that the majority of patients stayed 2–4 hours, totaling 118 respondents (39.7%). This was followed by 4–6 hours with 79 respondents (26.6%), more than 6 hours with 61 respondents (20.5%), and less than 2 hours with 39 respondents (13.1%).

Tabel 2. Distribution of Respondents Based on Clinical Complexity and Length of Stay (LOS) in the Emergency Department , 2025

Clinical Complexity	< 2 jam	2-4 jam	4-6 jam	> 6 jam	Total	p value
High	5 (6,7%)	25 (33,3%)	22 (29,3%)	23 (30,7%)	75	**0,036***
Moderate	33 (14,9%)	93 (42,1%)	57 (25,8%)	38 (17,2%)	221	
Mild	1 (100%)	0 (0%)	0 (0%)	0 (0%)	1	
Total	**39**	**118**	**79**	**61**	**297**	

**) Uji Chi-Square, signifikan pada α = 0,05*
Pearson Chi-Square = 13,495; df = 6

Based on the table 2, the results of the Chi-Square statistical test showed a p-value of 0.036 (p < 0.05), indicating a statistically significant relationship between clinical complexity and Length of Stay (LOS) in the Emergency Department. Among patients with high clinical complexity, 30.7% experienced LOS > 6 hours, compared to only 17.2% among patients with moderate complexity.

Tabel 3. Distribution of Respondents Based on Hospital Capacity and Length of Stay (LOS) in the Emergency Department , 2025

Hospital Capacity	< 2 jam	2-4 jam	4-6 jam	> 6 jam	Total	p value
High	29 (16,9%)	74 (43,0%)	42 (24,4%)	27 (15,7%)	172	**0,025***
Moderate	10 (8,0%)	44 (35,2%)	37 (29,6%)	34 (27,2%)	125	
Total	**39**	**118**	**79**	**61**	**297**	

**) Uji Chi-Square, signifikan pada α = 0,05*
Pearson Chi-Square = 9,377; df = 3

Based on the table 3, the results of the analysis showed that among 172 respondents with high hospital capacity, only 27 respondents (15.7%) experienced LOS > 6 hours. Meanwhile, among 125 respondents with moderate hospital capacity, 34 respondents (27.2%) had LOS > 6 hours. The results of the Chi-Square statistical test showed a p-value of 0.025 (p < 0.05), indicating a statistically significant relationship between hospital capacity and Length of Stay (LOS) in the Emergency Department.

Tabel 4. Distribution of Respondents Based on Inter-Unit Coordination and Length of Stay (LOS) in the Emergency Department , 2025

Inter-Unit Coordinationt	< 2 jam	2-4 jam	4-6 jam	> 6 jam	Total	p value
Good	30 (17,1%)	78 (44,6%)	43 (24,6%)	24 (13,7%)	175	**0,004***
Fair	8 (7,9%)	35 (34,7%)	30 (29,7%)	28 (27,7%)	101	
Slow	1 (4,8%)	5 (23,8%)	6 (28,6%)	9 (42,9%)	21	
Total	**39**	**118**	**79**	**61**	**297**	

**) Uji Chi-Square, signifikan pada α = 0,05*
Pearson Chi-Square = 19,055; df = 6

Based On the table 4The results of the Chi-Square statistical test showed a p-value of 0.004 (p < 0.05), indicating a statistically significant relationship between inter-unit coordination and Length of Stay (LOS) in the Emergency Department. Among respondents with slow coordination, 42.9% experienced LOS > 6 hours.

Tabel 5. Analysis of the Effects of Clinical Complexity, Hospital Capacity, and Inter-Unit Coordination on Emergency Department Length of Stay (LOS)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	12.547	3	4.182	2.983	0.032*

Jurnal SMART Keperawatan, 2026, 13 (1), 79-85
https://ejournal.unkaha.ac.id/index.php/jskp
Received 13 March; Revised 5 May; Accepted 5 May 2026

Residual	410.876	293	1.402
Total	**423.423**	**296**	

**) Signifikan pada α = 0,05*

Based on the table 5. Analysis, the regression model involving three variables—clinical complexity, hospital capacity, and inter-unit coordination—showed a significant effect on Length of Stay (LOS). The model produced an F-value of 2.983 with a p-value of 0.032 ($p < 0.05$), indicating that these variables collectively contribute significantly to variations in patient Length of Stay in the Emergency Department.

DISCUSSION

The results of this study indicate that patient clinical complexity has a significant influence on Length of Stay (LOS) in the Emergency Department (ED). Patients with more complex clinical conditions generally require more comprehensive diagnostic processes, including laboratory examinations, radiological assessments, and consultations with various medical specialists. These conditions lead to longer patient management time in the Emergency Department. In addition, patients with comorbidities often require more intensive monitoring before decisions can be made regarding transfer to inpatient care units. This finding suggests that the severity of a patient's condition is one of the important factors influencing the efficiency of patient flow in the Emergency Department (Mailani et al., 2024).

These findings are consistent with previous studies indicating that patient clinical complexity is a major determinant of service duration in the Emergency Department. Patients with critical conditions or those requiring immediate medical intervention usually require more intensive coordination of care and greater utilization of medical resources, which can extend service duration, particularly under high patient volume conditions (Veen et al., 2018).Therefore, an effective triage system and well-managed patient flow are necessary to ensure that patients with high acuity conditions receive optimal care without causing overcrowding (Burkholder & Calvello, 2019).

In addition to clinical complexity, this study also found that hospital capacity significantly influences patient Length of Stay in the Emergency Department. Hospital capacity includes the availability of inpatient beds, healthcare workforce resources, and supporting medical facilities. Limited hospital capacity may lead to delays in transferring patients from the Emergency Department to inpatient wards, a condition commonly referred to as boarding (Uswatun H, 2019) This situation increases the workload of healthcare providers and reduces service efficiency. When inpatient wards are full, patients remain in the Emergency Department, reducing space availability for new emergency cases (Mchugh et al., 2012). Therefore, optimal hospital capacity management is crucial to improving Emergency Department effectiveness and reducing LOS (Millin, 2017).

The results of this study also indicate that inter-unit coordination significantly affects patient Length of Stay in the Emergency Department. Patient management in the Emergency Department involves multiple service units, including laboratories, radiology departments, pharmacy services, and inpatient wards. Ineffective coordination among these units may result in delays in examinations, diagnosis establishment, and patient transfer processes, thereby increasing waiting time and prolonging LOS (Prananingrum et al., 2025). Effective coordination, supported by good communication, integrated hospital information systems, and clear standard operating procedures, can accelerate patient care processes (Kadir et al., 2025). With effective coordination, diagnostic, therapeutic, and transfer processes can be carried out more efficiently (Safira, 2025).

In addition, several studies have emphasized the role of digital health systems, discharge planning, and consultation response time in improving patient flow and reducing Length of Stay in Emergency Departments (Oredsson et al., 2011). The implementation of integrated hospital information systems and coordination frameworks has also been shown to significantly enhance service efficiency and reduce delays (Campanella et al., 2015).

Overall, the findings of this study demonstrate that patient clinical complexity, hospital capacity, and inter-unit coordination are interrelated factors influencing Length of Stay in the Emergency Department.

Improving Emergency Department performance requires a comprehensive approach, including strengthening triage systems, optimizing hospital capacity, and enhancing coordination and communication among service units (Jakl et al., 2024).

This study has important implications for hospital management, particularly in improving Emergency Department service efficiency through strengthening triage systems, optimizing bed management, and enhancing inter-unit coordination. However, this study has several limitations, including the use of a cross-sectional design which does not allow causal inference, and the use of secondary data from medical records which may contain incomplete or unrecorded variables. Future research is recommended to use longitudinal designs and include additional variables such as staffing levels, patient acuity scores, and service response time.

CONCLUSION

This study demonstrates that clinical complexity, hospital capacity, and inter-unit coordination significantly influence the Length of Stay (LOS) of patients in the Emergency Department. The multivariate analysis revealed that inter-unit coordination is the most dominant factor affecting LOS, indicating that delays in communication and patient transfer between units contribute substantially to prolonged stays in the Emergency Department.

Therefore, hospitals should prioritize strengthening inter-unit coordination through integrated service systems, effective communication pathways, and clear standard operating procedures. In addition, improving hospital capacity management and optimizing triage processes are essential to enhance patient flow and reduce Length of Stay in the Emergency Department.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to all colleagues in the Emergency Department Unit of Hospital X, South Tangerang, for their support and cooperation during the research process.

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