Jurnal
Manajemen Kesehatan Indonesia

Volume 13 Nomor 3 Desember 2025

OPTIMIZING ACUTE LYMPHOBLASTIC LEUKEMIA PATIENT LENGTH OF STAY (LOS) IN KARIADI HOSPITAL: A QUASI-EXPERIMENTAL STUDY

Ninung Rose Diana Kusumawati[1,4], Laksono Trisnantoro[2], Slamet Basir[3], Liauw Jaya Prabawa[4], Sofie Astri Risanty[4]*

[1]Master of Public Health Program Faculty of Public Health, Diponegoro University
[2]Faculty of Medicine, Public Health and Nursing, Gajahmada University
[3]Indonesia Ministry of Health
[4]Kariadi Hospital Semarang

**Corresponding author: roseadhiani@yahoo.co.id*

Article History:
Received: 18/08/2025
Accepted: 12/11/2025
Available Online: 25/12/2025

ABSTRACT

Prolonged length of stay (LOS) in acute lymphoblastic leukemia (ALL) patients contributes to overcrowding, increased healthcare costs, and reduced bed availability, especially in Indonesian referral hospitals. Although structured discharge planning and clinical pathway integration have shown potential in reducing LOS, their application in Indonesian cancer centers remains limited.
This study aimed to find the strategy needed to reduce LOS among ALL patients at Dr. Kariadi Hospital.
A sequential exploratory mixed-methods design was employed. In the qualitative phase, two rounds of focus group discussions (n = 12 healthcare professionals) identified and prioritized causes of prolonged LOS using a fishbone diagram and Urgency–Seriousness–Growth (USG) scoring. The quantitative phase evaluated all medical records (pre-intervention: January–June 2024; post-intervention: July–December 2024) to measure impact.
The absence of structured discharge planning and clinical pathway integration into the electronic medical record (EMR) were identified as key issues. Based on these findings, a mandatory discharge planning and clinical pathway entry was introduced for all suspected ALL admissions. The intervention reduced average LOS from 10.14 days to 3.13 days, showing a 7.01-day reduction. These results align with international evidence supporting discharge planning and pathway integration to improve care efficiency.
Integrating discharge planning and clinical pathways into the initial inpatient assessment significantly reduced LOS among ALL patients. This low-cost, EMR-based strategy holds promise for wider adoption in resource-constrained hospital settings across Indonesia.

Keywords: Length of stay, leukemia, ALL, discharge planning, clinical pathway, Indonesia, EMR integration

INTRODUCTION

As part of Indonesia's health transformation program, the reform of referral health facilities emerged as a

national priority. However, a significant challenge faced by many hospitals is the imbalance between bed capacity and patient volume. This mismatch disrupts the continuity and timeliness of care, especially in high-demand settings such as emergency departments and tertiary referral hospitals. A central factor in addressing this issue is the effective patient flow management, which directly impacts bed availability Studies have shown that streamlined patient flow reduces overcrowding, enhances care delivery, and improves hospital efficiency[1–3]. Conversely, ineffective patient flow contributes to various systemic problems, including overcrowding, prolonged waiting times, and reduced bed turnover rates[4,5]Optimizing the length of stay (LOS) has been recognized as a critical strategy for alleviating overcrowding, especially in emergency departments (EDs). Efficient LOS management improves patient throughput and enhances the quality of care[6–8]. Furthermore, reducing unnecessary LOS not only prevents overcrowding but also improves patient satisfaction and outcomes, as extended hospital stays are associated with increased mortality.

Cancer treatment has been identified as a national priority in Indonesia's health transformation agenda. As a catastrophic illness, cancer care requires substantial resources and funding. Currently, cancer treatment services are concentrated in major referral hospitals equipped with diagnostic and therapeutic capabilities[9]. According to GLOBOCAN data from 2022, there were more than 408,000 new cancer cases in Indonesia. However, only 517 hospitals were available for cancer treatment, and just 15 of them were capable of providing comprehensive cancer care—including chemotherapy, surgery, and radiotherapy. This disparity has resulted in an overload of cancer patients at referral hospitals. If not properly managed, this burden can lead to overcrowding, ultimately hindering the treatment of other patients [10–12].

To better understand the challenges faced by referral hospitals, we examine a specific case: Dr. Kariadi Hospital in Semarang. Located in Central Java, Kariadi Hospital serves as the main referral center for the region and also receives patients from other provinces. It is one of Indonesia's cancer centers, offering comprehensive cancer treatment. Among its cancer caseload, leukemia—particularly acute lymphoblastic leukemia (ALL)—is the most commonly treated malignancy [13–15]. Kariadi's ED functions as a primary entry point for inpatient care, admitting patients both from within Semarang and from other referring hospitals. However, Kariadi Hospital is currently facing issues

of overcrowding and patient stagnation. Between January and May 2024, the ED received an average of 91 patients per day, despite having only 35 emergency beds available. Additionally, Kariadi Hospital is experiencing prolonged LOS. From January to June 2024, the average LOS for leukemia patients was 10.14 days, exceeding the National Health Insurance (NHI/BPJS Kesehatan) standard of 9 days. This extended LOS may lead to increased operational costs and negatively impact patient outcomes. Therefore, addressing LOS optimization is critical to alleviating the overcrowding challenges currently faced by Kariadi Hospital. This study aims to formulate strategies for LOS management and evaluate their implementation in patients with ALL.

.METHOD

This study employed an exploratory sequential mixed-methods design, integrating qualitative insights to inform a subsequent quantitative evaluation. The research was conducted in Dr. Kariadi Hospital from June 2024 to December 2024.

Phase 1: Qualitative Exploration

An initial round of focus group discussions (FGDs) was conducted in June 2024 to identify factors contributing to prolonged length of stay (LOS) among leukemia inpatients. A total of 12 participants were recruited using purposive sampling based on clinical experience and involvement in patient discharge processes. The participants were director of medical operational, head of inpatient department, 2 physicians, 3 nurses (including 1 head nurse), 2 clinical pharmacist, and 3 case managers. Discussions were audio-recorded, transcribed verbatim, and thematically analyzed. To ensure validity, member checking was employed, and triangulation was conducted by comparing input across different professional groups.

Phase 2: Cause Identification and Prioritization

Qualitative findings were synthesized into a fishbone diagram (Ishikawa analysis) to categorize root causes of extended LOS into major domains: man, method, machine, material, milieu, and measurement. A three-point Likert scale was then used to prioritize the contributing factors based on urgency, severity, and potential for change (USG method). Scoring was conducted independently by the same FGD participants. The factor with the highest cumulative score was selected for targeted intervention.

Phase 3: Intervention Development

A second round of FGDs was held in July 2024, involving the same participants, to co-design a practical and context-appropriate discharge planning intervention. Feedback from this phase was used to refine the workflow, assign roles, and develop discharge readiness criteria.

Phase 4: Implementation and Evaluation

The discharge planning intervention was implemented over a six-month period (July to December 2024) in the hematology ward. To evaluate its effectiveness, retrospective LOS data from the pre-intervention period (January - July 2024) were compared with post-intervention LOS data (July - December 2024).

RESULTS AND DISCUSSION

The fish-bone analysis of ineffective LOS was shown in Figure 1. We managed to identify 10 problems associated with LOS. This problems were then sorted into a table and measured by the FGD participants according to the problems Urgency, Seriousness and Growth potential. Table 1 Provided the results of the USG, and two main issues received the highest scores: (1) the lack of attending physicians' awareness regarding treatment and discharge planning, and (2) the clinical pathway not being integrated into the medical record system

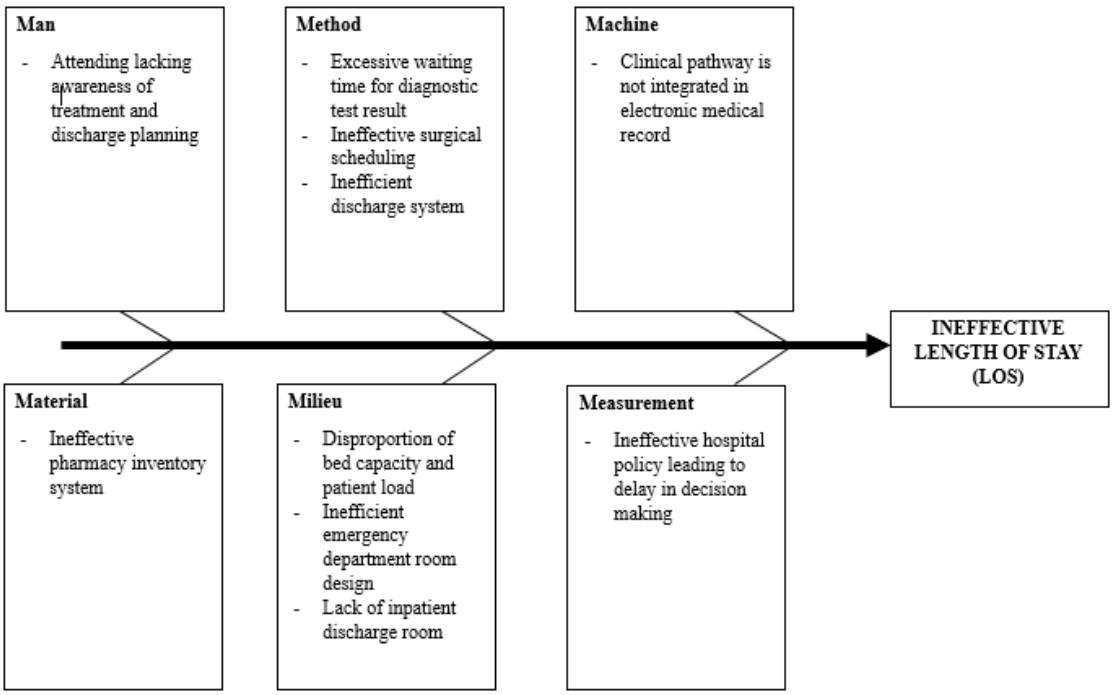

Figure.1 Fish-bone analysis of ineffective LOS

Table 1. USG Analysis of Problems

No	Problems	Urgency	Seriousness	Growth	Score
1	**Attending lacking awareness of treatment and discharge planning**	**3**	**3**	**3**	**9**
2	Excessive waiting time for diagnostic test result	2	2	3	7
3	Ineffective surgical scheduling	2	2	3	7
4	Inefficient discharge system	2	2	3	7
5	**Clinical pathway is not integrated in electronic Medical Record**	**3**	**3**	**3**	**9**
6	Ineffective pharmacy inventory system	1	1	2	4
7	Disproportion of bed capacity and patient load	1	1	1	3
8	Inefficient emergency department room design	1	1	3	5
9	Lack of inpatient discharge transit room	3	3	2	6
10	Ineffective hospital policy leading to delay in decision making	2	**3**	**3**	6

In response to the identified problems, the focus group discussion proposed integrating clinical pathways and discharge planning as mandatory components of the initial inpatient assessment. This strategy requires attending physicians to complete both elements at the beginning of patient care. This approach ensures that discharge planning and clinical pathways are not only systematically integrated into the care process but also incentivizes physicians to engage with these tools by granting access to additional features within the electronic medical record (EMR) system.

We implemented a policy requiring attending physicians to include discharge planning for suspected ALL patients requiring diagnostic procedures. This discharge plan was integrated into the EMR system and made a mandatory component of the initial inpatient assessment. The policy was executed over a six-month period, from January to June 2024. Prior to the intervention, the average LOS for ALL patients was **10.14 days**. Following the intervention, the LOS was significantly reduced to **3.13 days.**

According to the focused group discussion, lack of treatment planning, as well as clinical pathway integration were needed to be solved immediately (urgency). To address these challenges, we proposed the integration of clinical pathways and discharge planning as mandatory components of the initial inpatient assessment. These methods were proven to be effective, as average LOS was significantly reduced by **7.01 days**.

Reflecting on inefficient LOS, delay in integrating clinical pathway and continuous absent of discharge planning only worsen the patient flow (seriousness), increased hospital costs, diminished patient satisfaction, and an elevated risk of delayed or suboptimal treatment [16–18].

Furthermore, these issues have the potential for long-term growth in both operational inefficiencies and negative patient outcomes if not solved [19–21].

Effective discharge planning by attending healthcare professionals plays a critical role in optimizing patient flow. A well-structured discharge plan not only reduces hospital LOS but also improves patient satisfaction. Furthermore, it prepares both patients and caregivers for smooth transitions from inpatient to outpatient care, thereby minimizing the risk of readmission [22]. Despite its benefits, several barriers to effective implementation remain. These include ineffective communication between nurses and physicians, as well as unclear roles and responsibilities. One of the approach to develop effective discharge planning is IDEAL approach, that stands for: [23]

- Include patient and family as full partners in discharge planning process
- Discuss five key areas to prevent problems at home: Life at home will be, review medications, warning signs and problems, explains test results, and make followup appointment
- Educate patient and family in plain language about the condition, discharge process, and next steps **at every opportunity** throughout the hospital stay
- Asses how well doctors and nurses explain the diagnosis, condition, and next steps to patients and family
- Listen and honor the patinet and family's goals, preferences, observations, and concerns.

Clinical pathways play a significant role in reducing hospital LOS by ensuring that patients receive timely and appropriate care while optimizing the use of healthcare resources. A systematic review of both surgical and non-surgical procedures found that the implementation of clinical pathways contributed to shorter LOS, reduced 90-day complication rates, and decreased hospital costs [24].

There were several study limitation in this research. This study only involved a very specific case, (ALL patients) which may not be applicable in other diagnosis setting. The relatively short duration of new policy implementation may also be biased by new other policies in the follow-up periods and may not be able to reflect the long term effect of this intervention.

CONCLUSION

Implementing structured discharge planning and integrating clinical pathways into the initial inpatient assessment

significantly reduced the length of stay for ALL patients at Dr. Kariadi Hospital by 7.01 days. Future studies in different diagnosis setting with longer follow up period were encouraged to fully understands the implication of implementing these strategies for improving LOS.

ACKNOWLEDGEMENT

We would like to express our gratitude to Mr. Ali Muhtas and Mr. Agus Edy Cahyono for the input necessary in our article. We would also like to thank dr. Damianus Galih Panunggal for the help in proof reading and arranging the manuscript.

REFERENCES

1. Benjamin E, Jacelon C. An analysis of the concept of patient flow management. *Nurs Forum* 2022; 57: 429–436.

2. Hybinette K, Praetorius ,Gesa, Ekstedt ,Mirjam, et al. Exploring patient flow management through a lens of cognitive systems engineering. *Ergonomics* 2023; 66: 2106–2120.

3. Ezzat A, Hamoud H, Fadlallah B. Factors affecting patient flow planning in hospitals. *IOSR Journal of Dental and Medical Sciences*; 13. Epub ahead of print 1 December 2014. DOI: 10.9790/0853-131222224.

4. Tremblay T. Patient Flow Management: Improve Hospital Operations and Patient Care. *Kohezion*, https://www.kohezion.com/blog/patient-flow-management (2024, accessed 9 April 2025).

5. Nguyen Q, Wybrow M, Burstein F, et al. Understanding the impacts of health information systems on patient flow management: A systematic review across several decades of research. *PLOS ONE* 2022; 17: e0274493.

6. Mashao K, Heyns T, White Z. Areas of delay related to prolonged length of stay in an emergency department of an academic hospital in South Africa. *African Journal of Emergency Medicine* 2021; 11: 237–241.

7. Negasi KB, Tefera Gonete A, Getachew M, et al. Length of stay in the emergency department and its associated factors among pediatric patients attending Wolaita Sodo University Teaching and Referral Hospital, Southern, Ethiopia. *BMC Emerg Med* 2022; 22: 203.

8. Otto R, Blaschke S, Schirrmeister W, et al. Length of stay as quality indicator in emergency departments: analysis of determinants in the German Emergency Department Data Registry (AKTIN registry). *Intern Emerg Med* 2022; 17: 1199–1209.

9. Brown JS, Amend SR, Austin RH, et al. Updating the Definition of Cancer. *Molecular Cancer Research* 2023; 21: 1142–1147.

10. Lindner G, Woitok BK. Emergency department overcrowding : Analysis and strategies to manage an international phenomenon. *Wien Klin Wochenschr* 2021; 133: 229–233.

11. Marzano L, Darwich AS, Jayanth R, et al. Diagnosing an overcrowded emergency department from its Electronic Health Records. *Sci Rep* 2024; 14: 9955.

12. Sartini M, Carbone A, Demartini A, et al. Overcrowding in Emergency Department: Causes, Consequences, and Solutions—A Narrative Review. *Healthcare* 2022; 10: 1625.

13. Mughal TI, Goldman JM. Leukaemias. In: *Treatment of Cancer*. CRC Press, 2008, pp. 981–1026.

14. Anggraini TL, Rustina Y, Syahreni E. Pengalaman Orang Tua Melakukan Perawatan Lanjutan di Rumah Pada Anak Penderita Leukemia Limfoblastik Akut. *Jurnal Kesehatan Bhakti Husada* 2015; 1: 3–3.

15. Jiwani N, Gupta K, Pau G, et al. Pattern Recognition of Acute Lymphoblastic Leukemia (ALL) Using Computational Deep Learning. *IEEE Access* 2023; 11: 29541–29553.

16. Soto Z. *An Empirical Review of Patient Flow Management for Clinical Practices*. 2023.

17. Hankey G. Patient flow management in a South African academic hospital: the Groote Schuur Hospital (GSH) case, https://www.semanticscholar.org/paper/Patient-flow-management-in-a-South-African-academic-Hankey/a43664e6b1276fd3575e4caa08fd844c65a8ecb4 (2017, accessed 9 April 2025).

18. Amin Y, Haswita H. Emergency Department Overcrowding and Its Potential Impact on Care Processes: A Literature Review. *International Journal of Advanced Health Science and Technology*; 3. Epub ahead of print 21 April 2023. DOI: 10.35882/ijahst.v3i2.221.

19. Savioli G, Ceresa IF, Gri N, et al. Emergency Department Overcrowding: Understanding the Factors to Find Corresponding Solutions. *Journal of Personalized Medicine* 2022; 12: 279.

20. Pearce S, Marchand T, Shannon T, et al. Emergency department crowding: an overview of reviews describing measures causes, and harms. *Intern Emerg Med* 2023; 18: 1137–1158.

21. Cheng I. *Emergency department crowding and hospital patient flow : influential factors and evidence-Informed solutions*. Thesis, Karolinska Institutet, https://openarchive.ki.se/articles/thesis/Emergency_department_crowding_and_hospital_patient_flow_influential_factors_and_evidence-Informed_solutions/26922403/1 (2016, accessed 9 April 2025).

22. Pahlevani M, Taghavi M, Vanberkel P. A systematic literature review of predicting patient discharges using statistical methods and machine learning. *Health Care Manag Sci* 2024; 27: 458–478.

23. Kalaiee ZMR, Ghafouri R, Zandi M, et al. Effect of implementing of the IDEAL discharge model on satisfaction of patient referred to trauma emergency department. *PLOS ONE* 2024; 19: e0304969.

24. Harahap AA, Rayasari F, Besral B, et al. Analisa Faktor yang Berhubungan dengan Length of Stay (LOS) id IGD. *Jurnal Keperawatan* 2022; 14: 821–830.