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Implementation of an Emergency Department Boarding Time Monitoring Dashboard to Reduce Patient Retention

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Abstract
Background: rolonged waiting times in hospital emergency departments (EDs) are widely recognized as a major barrier to timely inpatient care and patient satisfaction. Efficient transition processes from the ED to inpatient units can reduce crowding and improve care outcomes.
Methods: This study employed a descriptive survey design in Hospital X, Riau Islands, with a sample of 200 participants including ED nurses, administrative staff, and inpatient unit personnel. Data were collected using structured questionnaires and analyzed descriptively to assess the perceived impact of implementing a boarding time monitoring dashboard in the ED.
Results: Prior to dashboard implementation, the proportion of patients transferred to inpatient wards within the target time (<120 minutes) was 53%. Post-implementation, compliance rose to 83.39%. Participants reported improved interdisciplinary communication, decision-making, and workflow efficiency. Dashboard color indicators were also found helpful in enabling real-time responses.
Conclusion: The implementation of a boarding time monitoring dashboard significantly enhanced the ED's ability to reduce patient retention times. Results support the broader adoption of digital monitoring systems to improve patient flow and satisfaction.
Keywords: Boarding Time, Emergency Department, Patient Retention, Dashboard, Nursing Informatics

INTRODUCTION

Emergency Departments (EDs) are the entry point for critical care and play a pivotal role in stabilizing patients requiring urgent interventions. The efficiency of transitions from the ED to inpatient units reflects the overall functionality of hospital services. In many hospitals, including those in Indonesia, prolonged waiting time in the ED has emerged as a common quality-of-care concern, especially for patients awaiting inpatient admission. ED boarding, which refers to the time a patient waits in the ED after the admission decision has been made, directly affects patient safety, satisfaction, and outcomes (1,2).

A 2023 review by Maninchedda et al. reported that overcrowding in EDs, due to delays in inpatient room availability, not only increases healthcare provider burden but also correlates with adverse patient outcomes such as infection, mortality, and delayed treatment (3). Studies from both developed and developing countries highlight the boarding time issue as a structural barrier in emergency care delivery systems. The Indonesian Ministry of Health has called for innovations in digital-based service efficiency in response to this systemic challenge.

Despite standardized operational procedures, delays often occur due to the lack of real-time monitoring systems that track patient progress across different service points. These delays are exacerbated by staffing shortages, administrative bottlenecks, and limited inpatient bed availability (4). Traditional retrospective reporting systems also prevent timely managerial intervention.

Numerous strategies have been suggested to address the boarding time problem, such as increasing bed capacity, staffing improvements, and streamlining hospital workflows. However, these approaches require large-scale investment and are difficult to implement immediately (5). Alternatively, health informatics offers a cost-effective solution to monitor, analyze, and enhance clinical and administrative performance in real-time.

A growing number of hospitals worldwide have begun using dashboards to visualize clinical performance indicators, including boarding time. According to Su et al., real-time dashboards allow ED teams to identify bottlenecks early, thus enabling faster triage and transfer decisions (6). Huang et al. found that digital alerts significantly reduced the boarding duration for critical patients in Taiwan's urban hospitals (7).

However, these international solutions may not directly apply to Indonesia due to contextual differences in human resources, information systems, and policy enforcement. Existing literature on dashboard interventions in Indonesian EDs remains sparse, particularly in private hospital settings.

Given this research gap, our study evaluates the perceived effectiveness of implementing a boarding time monitoring dashboard in a private hospital in the Riau Islands, Indonesia. We aim to explore how such a system affects boarding time performance and to what extent it supports patient flow, nursing roles, and service quality. The novelty of this study lies in its application of real-time digital monitoring within the Indonesian healthcare context.

METHODS

This study adopted a descriptive survey design to explore the perceived impact of implementing a boarding time monitoring dashboard in the Emergency Department (ED) of Hospital X, a private Type B hospital located in the Riau Islands, Indonesia. The methodology was designed to capture both quantitative and qualitative perspectives from frontline healthcare professionals involved in the patient admission process.

Study Setting

Hospital X is a referral hospital serving a broad geographic population in the Riau Islands. The hospital's ED functions as a primary entry point for patients requiring urgent care and subsequent inpatient admission. The boarding time dashboard was developed and implemented by the hospital's Information Technology (IT) team in response to recurring issues with prolonged patient retention in the ED.

Study Population and Sample

The study population consisted of hospital personnel directly involved in the ED-to-inpatient admission process. These included ED nurses, triage officers, inpatient nurses, administrative staff handling inpatient registration, and physicians on duty. A total of 200 participants were selected using purposive sampling, based on their roles and experience in using the dashboard system.Inclusion criteria were: (1) being actively employed at Hospital X, (2) having worked in the ED or inpatient department for at least six months, and (3) having used or observed the use of the boarding time monitoring dashboard. Exclusion criteria included newly hired staff with less than three months of work experience and personnel not directly involved in the ED admission workflow.

Instrumentation and Data Collection

Data were collected using a structured self-administered questionnaire developed by the research team in collaboration with hospital quality assurance personnel. The questionnaire was validated through expert review and pilot testing. It consisted of three sections: (1) demographic and professional background, (2) perceptions regarding the effectiveness of the dashboard, and (3) observed changes in workflow, communication, and patient retention.Most items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Open-ended questions were included to allow respondents to elaborate on perceived strengths, limitations, and suggestions for improvement of the dashboard system.

Data collection was conducted over a four-week period in February 2024. Participants received printed or digital copies of the questionnaire and were instructed to complete it anonymously. Completed questionnaires were returned to the research team via secure drop-boxes or encrypted email.

Data Analysis

Quantitative data were analyzed descriptively using means, percentages, and standard deviations. Demographic data were summarized to present the distribution of respondents by profession, years of service, and unit of assignment. Perception scores were aggregated to assess general trends in the acceptance and perceived effectiveness of the dashboard.Qualitative responses from open-ended questions were subjected to content analysis. Responses were coded manually to identify recurring themes related to dashboard utility, communication, decision-making support, and patient flow.

Ethical Considerations

Ethical clearance was obtained from the hospital's institutional review board. All participants provided informed consent prior to participation. Confidentiality and anonymity were strictly maintained throughout the research process, with all data stored securely and accessible only to the core research team.

Dashboard Features Observed

The boarding time monitoring dashboard displays patient admission status in real-time using color-coded indicators: green indicates that the boarding time is within target (<120 minutes), while red signals delay (>120 minutes). The dashboard tracks multiple timestamps including: patient registration, triage time, medical assessment, laboratory and radiology orders, inpatient admission decision, room assignment, and patient transfer to inpatient wards.Users can access the dashboard through PCs located in the ED, inpatient units, and administration offices. The dashboard updates automatically through integration with the hospital's electronic medical record (EMR) system.

This methodology was designed to yield a comprehensive understanding of how the boarding time monitoring dashboard influences workflow dynamics, interdisciplinary communication, and patient care outcomes in the ED setting of Hospital X.

RESULT AND DISCUSSION

Result

Table 1. Characteristics Respondent

Variable	Frequency (n)	Percentage (%)
Total Respondents	200	100.0
ED Nurses	90	45.0
Inpatient Nurses	30	15.0
Triage Personnel	40	20.0
Administrative Staff	20	10.0
Physicians	20	10.0
Experience ≥ 3 years	124	62.0
Prior Digital System Experience	150	75.0

Source : Primery data 2024

Table 1 A total of 200 healthcare professionals participated in the study, all of whom were actively involved in the emergency-to-inpatient transition process at Hospital X in the Riau Islands. As shown in Table 1**,** the majority of respondents were Emergency Department (ED) nurses (n=90; 45%), followed by triage personnel (n=40; 20%), inpatient nurses (n=30; 15%), administrative staff responsible for inpatient registration (n=20; 10%), and attending physicians (n=20; 10%).

The demographic profile indicates that 62% (n=124) of participants had more than three years of work experience, suggesting a mature workforce with sufficient institutional familiarity to evaluate operational changes. Furthermore, 75% (n=150) of respondents reported having previous exposure to digital systems in clinical practice prior to the implementation of the dashboard. This existing digital literacy may have contributed to the smooth integration and adoption of the boarding time monitoring system.

The composition of respondents reflects a multidisciplinary engagement with the dashboard, encompassing clinical, administrative, and decision-making roles. Such diversity ensures a holistic assessment of the system's impact from multiple vantage points within the hospital setting. The high level of representation from frontline nursing staff emphasizes the practical implications of boarding time management on patient care delivery and nursing workload.

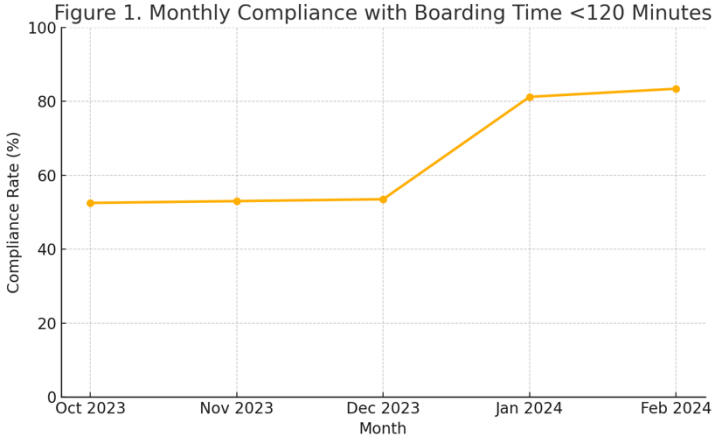
Changes in Perceived Patient Flow Efficiency

After the implementation of the dashboard, 87% of respondents agreed or strongly agreed that patient flow from the ED to inpatient wards improved. The percentage of staff who felt that boarding time targets were clearly communicated increased from 48% to 92% after dashboard integration. Furthermore, 85% stated that they were more confident in identifying delays through the dashboard interface.

Boarding Time Compliance Rates

According to hospital records and EMR data, the proportion of patients transferred from the ED to inpatient rooms within 120 minutes increased from 53% in 2023 (pre-dashboard) to 83.39% in the first two months of 2024 (post-dashboard). Figure 1 illustrates monthly compliance trends, highlighting a sharp improvement after dashboard deployment.

Figure 1. Monthly Compliance with Boarding Time <120 Minutes



Interdisciplinary Communication and Workflow

Respondents reported enhanced communication between ED and inpatient units. Nearly 79% of nurses and physicians noted quicker coordination of bed assignments, while 82% of administrative staff agreed that digital alerts improved readiness for patient registration and transfer. One nurse stated: "When the dashboard turns red, we know we need to act immediately. It shortens decision-making time."

Dashboard Usability and Interface

The dashboard's color-coded visual system green for compliant cases and red for delays—was rated as easy to interpret by 91% of respondents. Most staff accessed the dashboard via nursing station monitors or administrative terminals. While 86% of participants rated the interface as user-friendly, 14% reported occasional delays in data syncing.

Staff Satisfaction and Perceived Impact

A majority of respondents (88%) expressed satisfaction with the new system. Among them, 76% believed it had a positive impact on their daily workflow. Qualitative responses emphasized the sense of control and situational awareness the system provided, allowing staff to proactively manage potential bottlenecks.

Patient Feedback (Indirect Observation)

Although patient perspectives were not directly surveyed, staff reported noticeable reductions in patient complaints related to waiting time. Based on daily customer service summaries, the incidence of complaints regarding ED boarding dropped by 47% within the first month post-dashboard.

Discussion

The findings of this study demonstrate a significant improvement in boarding time compliance and staff perceptions of efficiency following the implementation of a real-time monitoring dashboard in the emergency department (ED). Prior to the dashboard, only 53% of patients were transferred to inpatient units within the targeted 120 minutes. After the system's introduction, this increased to 83.39%, reflecting a substantial operational gain. This aligns with research by Su (6), which showed that real-time dashboards in EDs improve bottleneck identification and accelerate decision-making.

Our findings are consistent with prior studies conducted in other countries, including those by Huang et al. (7), who reported a decrease in critical patient mortality following reductions in ED boarding time. In our study, while direct clinical outcomes were not measured, staff reported a 47% reduction in patient complaints, suggesting improved service experience and potential downstream effects on clinical quality.Sun further emphasize that longer boarding times in the ED are associated with poorer patient outcomes, underscoring the significance of such interventions.(13)

The results further support Maninchedda et al.'s systematic review (3), which emphasized that structural and technological interventions are key to alleviating ED overcrowding. By introducing a simple, visual dashboard, Hospital X was able to overcome existing barriers to timely patient transfers, such as poor communication and delayed triage decisions. This also aligns with the conceptual framework presented by Asplin et al. (15), who highlighted input, throughput, and output factors in ED congestion.

This study also expands upon local research. A study by Fitrio and Setyoadi (2) found that administrative inefficiencies contributed to delayed inpatient admissions in Indonesian EDs. Our data reinforce that perspective, but also highlight how digital innovation can directly address those inefficiencies. The dashboard's color-coded indicators enabled staff to act quickly, reducing reliance on retrospective reporting and manual coordination. Similar digital interventions have shown effectiveness in other settings, such as those reported by Dimitrov et al. (17) and Ghanes et al. (18) using simulation and predictive models.

Respondents also expressed strong satisfaction with the dashboard interface, and over 85% reported improved interdisciplinary communication. These perceptions mirror the findings of Romiko [4], who noted that nurse and physician collaboration is essential to decreasing boarding times in emergency settings. The use of a shared digital platform in our study likely fostered this collaboration. Furthermore, Trzeciak and Rivers [22] emphasized that overcrowding threatens patient safety and public health, reinforcing the value of this system.

Interestingly, our results also support Bashkin (1), who emphasized the role of organizational factors such as staffing levels, task coordination, and monitoring tools in affecting ED throughput. Although this study did not directly intervene in staffing, the dashboard's introduction seemed to mitigate workflow inefficiencies by improving real-time visibility of each patient's status.

In addition, Morley et al. (12) and Kristiansen et al. (21) underline that multi-dimensional strategies—including electronic systems are the most effective in reducing ED congestion. As shown in our study, the visibility provided by the dashboard led to more proactive management and reduced delay in patient transition.

Nonetheless, some limitations must be acknowledged. First, the study did not measure patient-level clinical outcomes, such as mortality or length of stay, which limits conclusions on health impact. Second, the assessment was confined to staff perceptions and internal metrics at a single hospital, restricting generalizability.

Future studies should aim to evaluate the dashboard's impact on broader indicators, including clinical safety, nurse workload, and long-term patient satisfaction. Multi-site studies would also strengthen the evidence base for scaling dashboard-based interventions across other hospital settings in Indonesia.

In conclusion, this study affirms that a real-time boarding time monitoring dashboard can significantly enhance ED operations and nursing workflow, reduce patient retention, and improve interprofessional communication. It presents a scalable, low-cost intervention that aligns with both national health digitalization goals and global best practices

CONCLUSION

This study demonstrated that the implementation of a boarding time monitoring dashboard in the Emergency Department (ED) of Hospital X in the Riau Islands significantly enhanced patient flow efficiency, increased boarding time compliance, and improved interprofessional coordination. The system's ability to visualize workflow bottlenecks and trigger real-time alerts was perceived by healthcare staff as a critical factor in reducing patient retention in the ED.

The improvement from a 53% to an 83.39% compliance rate for boarding time <120 minutes reflects the intervention's direct contribution to operational effectiveness. These findings support existing international evidence on the benefits of health informatics tools in managing emergency department congestion. They also offer a new perspective in the Indonesian context, particularly in private hospitals where such digital systems are not yet widespread.

By integrating this system into daily routines, staff reported increased satisfaction, clearer accountability, and more streamlined communication between ED, inpatient, and administrative units. While the study did not measure clinical outcomes directly, the reduction in patient complaints and the increased responsiveness observed post-implementation highlight potential downstream benefits to patient safety and experience.

In light of these findings, the dashboard presents itself as a scalable, cost-effective solution for hospitals aiming to meet service quality standards and respond to national health digitalization mandates. Further research should expand the scope to include clinical outcomes and test the system's adaptability across various hospital settings.

The study underscores the role of nurses and administrative teams as critical actors in implementing health technology to improve system responsiveness. As such, hospital leadership and policymakers should prioritize capacity-building initiatives and infrastructure investment to replicate similar outcomes nationwide.

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REFERENCES

1. Bashkin O, Caspi S, Haligoa R, Mizrahi S, Stalnikowicz R. Organizational factors affecting length of stay in the emergency department: initial observational study. Isr J Health Policy Res. 2015;4(1):38.
2. Fitrio D, Setyoadi A. Analisis Faktor yang Berhubungan dengan Waktu Tunggu Pasien Setelah Keputusan Rawat Inap di Zona Kuning IGD RSUD dr. Iskak Tulung Agung. NurseLine J. 2017;2.
3. Maninchedda M, Proia AS, Bianco L, Aromatario M, Orsi GB, Napoli C. Main Features and Control Strategies to Reduce Overcrowding in Emergency Departments: A Systematic Review. J Emerg Med. 2023;255–266.
4. Romiko. Faktor-faktor yang berhubungan dengan lama waktu tunggu pasien di IGD RS Muhammadiyah Palembang. J 'Aisyiyah Medika. 2018;2.
5. Butun A, Kafdag EE, Gunduz H, et al. Emergency department overcrowding: causes and solutions. Emerg Crit Care Med. 2023;3(4):171–176.
6. Su H, Meng L, Sangal R, Pinker EJ. Emergency Department Boarding: Quantifying the Impact of ED Boarding on Patient Outcomes and Downstream Hospital Operation. Yale University; 2024.

7. Huang KW, Yin CH, Chang R, et al. Price for waiting: adverse outcomes of boarding critically ill elderly medical patients. Postgrad Med J. 2024;Published online: 02 Feb 2024.
8. Derlet RW, Richards JR. Overcrowding in the nation's emergency departments: complex causes and disturbing effects. Ann Emerg Med. 2000;35(1):63–68.
9. Hoot NR, Aronsky D. Systematic review of emergency department crowding: causes, effects, and solutions. Ann Emerg Med. 2008;52(2):126–136.
10. Moskop JC, Sklar DP, Geiderman JM, Schears RM, Bookman KJ. Emergency department crowding, part 1—concept, causes, and moral consequences. Ann Emerg Med. 2009;53(5):605–611.
11. Forero R, McCarthy S, Hillman K. Access block and emergency department overcrowding. Crit Care. 2011;15(2):216.
12. Morley C, Unwin M, Peterson GM, Stankovich J, Kinsman L. Emergency department crowding: a systematic review of causes, consequences and solutions. PLoS One. 2018;13(8):e0203316.
13. Sun BC, Hsia RY, Weiss RE, et al. Effect of emergency department crowding on outcomes of admitted patients. Ann Emerg Med. 2013;61(6):605–611.
14. Barish RA, McGauly PL, Arnold TC. Emergency room crowding: a marker of hospital health. Trans Am Clin Climatol Assoc. 2012;123:304–311.
15. Asplin BR, Magid DJ, Rhodes KV, et al. A conceptual model of emergency department crowding. Ann Emerg Med. 2003;42(2):173–180.
16. Bertolini G, Ricci L, Anghileri A, et al. A multicenter study on emergency department crowding and hospital bed shortage in Italy. Eur J Emerg Med. 2017;24(6):400–406.
17. Dimitrov D, Jordanov I, Zaharieva E. Emergency department efficiency assessment using simulation modeling. J Med Syst. 2016;40(3):77.
18. Ghanes K, Bouzidi A, Bouzidi L, et al. Predictive modeling of patient flow in emergency department. Health Inf Sci Syst. 2020;8(1):18.
19. Kelen GD, Wolfe R, D'Onofrio G, et al. Emergency department crowding: the canary in the health care system. NEJM Catalyst. 2021;2(4).
20. Al-Qahtani MH, Alamri SH, Almazroa MA, et al. Strategies to reduce emergency department overcrowding: a scoping review. Int J Environ Res Public Health. 2022;19(3):1542.
21. Kristiansen T, Lassen AT, Rehn M, et al. Evaluating the effectiveness of emergency department interventions on patient flow: a scoping review. BMC Health Serv Res. 2021;21(1):1–17.
22. Trzeciak S, Rivers EP. Emergency department overcrowding in the United States: an emerging threat to patient safety and public health. Emerg Med J. 2003;20(5):402–405.
23. Khalifa M. Barriers to health information systems and electronic medical records implementation. Perspect Health Inf Manag. 2013;10:1c.
24. Anggraini DR, Hardianti A. Efektivitas dashboard monitoring terhadap pengurangan waiting time pasien IGD: studi di RSUD kota besar. J Manaj Inform Kesehat Indones. 2021;9(1):33–41.
25. Sari N, Hartini S. Penerapan sistem informasi manajemen rumah sakit untuk meningkatkan efisiensi pelayanan IGD. J Kebijakan Kesehatan Indonesia. 2020;9(3):170–178.