



## **ANALYSIS OF FACTORS CAUSING PATIENT WAITING TIME IN THE EMERGENCY DEPARTMENT**

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### **ABSTRACT**

Quality of service in the Emergency Department (ER) of a hospital is required to be fast, effective, and efficient. Overcrowding in the ER must be resolved as quickly as possible to ensure the workload is distributed effectively and the room is not overcrowded with healthcare workers, patients, and their families. Several methods used to alleviate overcrowding in the ER include speeding up/simplifying patient registration, triaging/sorting patients, and shortening patient waiting times by transferring patients to other rooms such as the ward, intensive care unit (ICU), inpatient wards, or other rooms. The purpose of this study was to analyze the factors contributing to patient waiting times in the ER of a hospital in the Bali Province. The factors influencing patient waiting times in the ER include registration time, triage time, consultation time for the attending physician, waiting time for laboratory results, waiting time for radiology results, and waiting time for transfer to the next room. This research method was comparative analytic with a cross-sectional design. The multivariate analysis used was logistic regression. Data collection involved observing factors affecting ER waiting times, with findings recorded on observation sheets. This study employed a purposive sampling technique, involving a total of 98 patients as respondents. Multivariate analysis revealed that the time of patient transfer to the next room was the most dominant factor associated with patient waiting times in the Emergency Department (ER), with an OR of 17.16 at a 95% confidence level. The conclusion of this study is that patient transfer time is a dominant factor affecting waiting times.

Keywords: emergency department; service quality; waiting time

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## **INTRODUCTION**

Emergency services in hospitals are crucial. Emergency services address critical conditions that pose a threat of death or disability. Emergency services in hospitals are provided by the Emergency Department (ER). The ER is the frontline service area in hospitals, specifically addressing emergency situations. It can be concluded that the ER is the face of a hospital's services. Emergency health services in the ER reflect and play a significant role in assessing the quality of hospital care.

Emergency Department (ER) services are defined as providing immediate medical care to prevent death or further disability in patients in critical or emergency conditions. Based on health standards, these services operate 24 hours a day, with a primary focus on stabilizing the patient's vital signs. ER services are "open-door," meaning every individual has the right to receive medical treatment without administrative barriers at the outset, in accordance with the mandate of integrated national health insurance (Riu, S.D.M., at al., 2024).

The core of ER operations is the implementation of a triage system, which is the process of sorting patients based on their level of medical urgency, rather than based on the order of arrival. Patients are grouped into color zones, such as red for life-threatening conditions, yellow for critical but stable conditions, and green or blue for non-emergency cases. This process allows medical

personnel to prioritize resources for patients requiring emergency interventions such as basic life support, severe trauma treatment, or acute cardiac arrest, to reduce mortality.

Functionally, emergency room services encompass a range of medical procedures, from a rapid physical examination and diagnostic tests such as laboratory and radiology, to emergency surgery if necessary. After the stabilization phase is complete, the patient will be determined as an inpatient, referred to a more specialized healthcare facility, or discharged with outpatient follow-up. In Bali, information on bed availability and emergency room services can be monitored in real time through the hospital information system to ensure referral efficiency (Lu, C., at al., 2020).

The quality of emergency room services is required to be fast, effective, and efficient. High-quality emergency room services will play a significant role in increasing patient satisfaction with emergency care. Besides the polyclinic, the emergency room is the first point of entry for patients into the hospital. Patients consistently highlight the quality of care provided in the emergency room. Patient arrivals to the emergency room are unpredictable, and may be conducive to or crowded due to mass outbreaks or large-scale accidents. Emergency room congestion must be resolved quickly to ensure the workload is distributed effectively and the room is not overcrowded with healthcare workers, patients, and their families.

Some methods used to reduce congestion in the emergency room include speeding up/simplifying patient registration, triaging/sorting patients, and shortening waiting times in the emergency room by transferring patients to other rooms such as the ward, intensive care unit (ICU), inpatient wards, or other rooms. The patient registration process should be expedited because the timing of first aid measures determines the patient's chances of survival. The faster the response time, the higher the patient's chances of survival from death and disability. This registration process typically involves identifying the patient's identity, the person responsible for the patient, and the coverage/insurance used by the patient (Firdaus, M. N., at al., 2018).

The next method is to use the triage method. Triage is the process of sorting patients based on their condition, such as emergency, non-emergency but critical, critical but not critical, and non-emergency but critical. The purpose of this triage method is to prioritize patients who require immediate care and/or patients whose emergency care can be delayed. However, sometimes patients are unaware of this triage method and want help as soon as possible due to panic and anxiety. This often leads to complaints from patients and their families. This condition must be communicated by a health worker, especially an emergency room nurse. This triage process also requires time for triage officers, therefore triage officers must be trained and standardized through triage training.

The next step is to shorten patient waiting times in the emergency department by expediting first aid measures. Emergency room staff must understand the principles of emergency procedures, which emphasize the role of healthcare workers in the emergency department, focusing on patient stabilization, including airway patency, respiratory effort, circulation patency, patient consciousness, and a rapid head-to-toe assessment of any underlying health issues. This stabilization is summarized in the concept of Airway, Breathing, Circulation, Disability, and Exposure (ABCDE). This ABCDE stabilization concept must be quickly implemented by healthcare workers for patients in the emergency department. Further care, such as recovery or promotion to a higher level of health, can be delegated to other departments such as the emergency room, intensive care unit (ICU), inpatient ward, or other rooms (Barwise, A., at al., 2020).

Patient waiting time in the Emergency Room occurs in the form of assistance measures such as waiting for the results of supporting examinations such as laboratory, venous or arterial blood tests, EKG, echocardiography, ultrasound, CT scan, X-ray, or other radiology. Waiting time can also occur due to waiting for pharmaceutical services, consultations with the doctor in charge of the

Emergency Room and the process of waiting for the next room preparation. Room capacity/availability of the next room is also a very important thing that can reduce patient queues in the Emergency Room. According to the Ministry of Health 2018, the standard waiting time includes: a triage process of less than 5 minutes, waiting time for laboratory results of less than 2 hours, waiting time for radiology results of less than 3 hours, waiting time for pharmaceutical services of less than 1 hour, and consultation time from the doctor in charge between 15-30 minutes. The Ministry of Health 2018 also concluded/recommended that the patient's time in the Emergency Room is less than or equal to 6 hours. Therefore, the longer a patient stays in the emergency room (more than 6 hours), the lower the quality of care provided, even if the care provided is generally professional. Patient waiting times in the emergency room are generally determined by registration time, triage time, consultation time with the attending physician, waiting time for laboratory results, waiting time for radiology results, and waiting time for transfer to the next room.

As of January 2025, the number of patient visits to Emergency Departments (ERs) in Bali showed a high volume, with the workload concentrated in the main referral hospitals. Prof. Dr. I.G.N.G. Ngoerah General Hospital in Denpasar remains the busiest facility, with an average of 100 to 150 patients per day, or approximately 40,000 patients per year.

The characteristics of ER visits in Bali are strongly influenced by tourism dynamics and environmental conditions, with trauma cases from traffic accidents and cardiovascular emergencies still dominating. Based on the latest data, regional hospitals such as Bali Mandara Regional Hospital and regional hospitals in various regencies have increased their emergency service capacity to handle the surge in patients, particularly during natural disasters.

To manage the high patient volume, the Bali Provincial Government has strengthened its integrated service system through the single emergency number, Bali Emergency 112. This system accelerates emergency response and ensures patients are directed to hospitals with adequate capacity through a digital triage system. All patient arrival data is now mandatory to minimize patient congestion and improve treatment efficiency across all hospitals in Bali.

Bali Province has several hospitals offering superior emergency room (ER) services, including Prof. Ngoerah General Hospital, Bali Mandara Hospital, city/regency-level hospitals (Wangaya Hospital, Mangusada Hospital, Tabanan BRSU, Gianyar Regional Hospital, Buleleng Regional Hospital, Negara Regional Hospital, etc.), and private hospitals. Patient visits to the ER for emergency services continue to increase year after year. Data from the Bali Province Central Statistics Agency (BPS) in 2022 indicates that an estimated 500,000 Balinese residents seek healthcare services at the ER. This figure is also reported to be increasing year after year. Based on the above explanation and analysis, the author is interested in conducting a study titled "Analysis of Factors Contributing to Patient Waiting Times in Emergency Rooms (ERs) at Bali Provincial Hospitals."

The approach and problem-solving strategy used in this study are to identify factors contributing to patient waiting times in emergency rooms (ERs) at hospitals in Bali Provincial. These factors will be assessed so that they can be clearly seen/described/illustrated. After these factors are systematically described one by one, the relationship with patient waiting time in the emergency department (ER) will be sought and the dominant factor will be sought. The factors affecting patient waiting time in the ER include registration time, triage time, consultation time for the doctor in charge, waiting time for laboratory results, waiting time for radiology results, and waiting time for the transfer process to the next room.

So it can be concluded that in general the purpose of this study is to analyze the factors that cause patient waiting time in the emergency rooms (ERs) of hospitals in the Bali Province region. And

specifically aims to describe each influencing factor, relate each factor to patient waiting time in the emergency rooms (ERs), and analyze the dominant factors. Benefits of the study: with the results of the study in the form of knowing the dominant factors causing the length of patient waiting time in the ER, it will be an effort by the hospital to accelerate these factors. The results of this study also provide input to the hospital to improve parts of the system, and provide an ideal picture of ER services to improve the quality and quality of service and lead to increased patient satisfaction.

## METHOD

A research method is a systematic, structured, and logical step used by researchers to collect and process data to find answers to a problem or phenomenon. This research is quantitative. The research method is comparative analytic with a cross-sectional design. Bivariate analysis will link the relationships that influence patient waiting times in the emergency department (ER), and multivariate analysis will identify the dominant factors contributing to patient waiting times in the ER. The multivariate analysis used is logistic regression. The null hypothesis in this study is rejected, namely that there is a relationship that influences patient waiting times in the ER.

The population in this study is all patients seeking healthcare services at the ER of hospitals in the Bali region. The sample size is a portion of a population. The sample size is related to the precision (accuracy) of estimates of the influence of the variables being studied. This study used a probability sampling technique. Respondents were selected using purposive sampling. Respondents were selected from ERs in hospitals in the Bali region. Respondents were selected based on inclusion and exclusion criteria. The sample size in this study was determined using the Lameshow formula, namely 98 respondents.

A research instrument is a tool used by researchers to systematically collect data to facilitate the work and produce better results (accuracy, completeness, and systematic). The instrument in this study was a digital stopwatch. A digital stopwatch is a tool used to measure duration or determine patient waiting times in the emergency department (ED). The digital stopwatch has been calibrated to ensure scientifically valid and reliable data.

Data analysis was performed using univariate, bivariate, and multivariate analysis. Bivariate analysis linked the factors that contribute to patient waiting times in the emergency department (ED). Multivariate analysis identified the dominant factors contributing to patient waiting times in the emergency department (ED). The multivariate analysis used was logistic regression. This research has obtained research permits from the Nursing Study Program, Faculty of Medicine, Udayana University, under reference number: B/3027/UN14.2.2.V.4/PT.01.04/2025. All participants were provided with a detailed explanation of the research objectives and provided informed consent prior to data collection. The confidentiality of patient data was strictly maintained in accordance with research ethics principles.

## RESULT

The research data collection process was completed between August 1 and 31, 2025. The results of this study identified the dominant or longest factors contributing to patient wait times in emergency departments (ERs) at hospitals in Bali Province. The results of this study are qualitative data presented in tabular form. The table below describes the analysis of factors contributing to patient wait times in emergency departments (ERs) at hospitals in Bali Province.

Table 1.  
Overview of Respondent Characteristics

| Characteristics | f  | %     |
|-----------------|----|-------|
| Gender          |    |       |
| Male            | 31 | 31,63 |
| Female          | 67 | 68,37 |
| Total           | 98 | 100   |

From table 1, it can be concluded that more female patients come to the ER with a percentage of 68.37%.

Table 2.  
Overview of waiting time variables and factors that influence it

| Variable                  | n  | Min        | Max         | Mean          |
|---------------------------|----|------------|-------------|---------------|
| Waiting Time              | 98 | 160 minute | 1465 minute | 445,82 minute |
| Registration Time         | 98 | 5 minute   | 15 minute   | 10,41 minute  |
| Triage Time               | 98 | 5 minute   | 10 minute   | 7,04 minute   |
| Doctor's Examination Time | 98 | 5 minute   | 30 minute   | 14,08 minute  |
| Lab Results Time          | 98 | 60 minute  | 120 minute  | 69,80 minute  |
| Radiology Results Time    | 98 | 30 minute  | 120 minute  | 54,29 minute  |
| Room Transfer Time        | 98 | 45 minute  | 1200 minute | 290,20 minute |

From table 2 it can be concluded that the time for the patient to be transferred to another room was the longest, namely 290.20 minutes (4.87 hours).

Table 3.  
Analysis of the relationship between waiting time and the factors that influence it

| Independen Variable       | <i>p-value</i> |
|---------------------------|----------------|
| Registration Time         | 1,042          |
| Triage Time               | 1,013          |
| Doctor's Examination Time | 1,004          |
| Lab Results Time          | 0,042          |
| Radiology Results Time    | 0,031          |
| Room Transfer Time        | 0,000          |

Before conducting the bivariate test, the data were tested for normality. The Kolmogorov-Smirnov test was used for normality because the sample size was more than 50. The results of the normality test showed that the data were not normally distributed, so the Spearman Rank test was used. The significance level used was  $\alpha = 0.05$  with a 95% confidence level. From Table 3, it can be concluded that the results of the bivariate analysis show that there are three variables with a *p-value*  $<0.05$ , namely the time of lab results, the time of radiology results, and the time of room transfer. These three variables are related to patient waiting time in the ER. The longer the time for these three variables, the longer the patient waiting time in the ER.

Table 4.  
Multivariate analysis of dominant factors influencing waiting time

| Independen Variable    | Koefisien | OR    |
|------------------------|-----------|-------|
| Lab Results Time       | 1,66      | 6,12  |
| Radiology Results Time | 1,54      | 5,78  |
| Room Transfer Time     | 2,56      | 17,16 |
| Constant               | 1,87      | 0,03  |

From table 4, it can be concluded that the results of the multivariate analysis show that the time of transferring patients to the next room is the most dominant factor related to the length of patient waiting time in the ER with a value of or: 17.16 with a confidence level of 95%.

## DISCUSSION

The primary characteristic of the emergency room (ED) is its highly dynamic nature, with a high degree of uncertainty, where patients arrive without appointments and with varying medical conditions. Unlike outpatient settings, the ED operates 24/7, handling cases requiring immediate intervention to prevent death or permanent disability. The atmosphere is often characterized by a fast and busy work rhythm, demanding the mental and physical readiness of medical personnel to deal with critical situations that can change in a matter of seconds (Blanchard, I. E., at al., 2022).

The quality of emergency care in the ED is greatly influenced by the accuracy and speed of the triage system and the availability of competent human resources. The ability of medical personnel to sort patients based on their level of urgency is not the key to preventing death and disability. The competency standards of ED doctors and nurses have been improved through ongoing certification

in trauma management and advanced cardiopulmonary life support, which has directly impacted the reduction in patient fatalities in the critical phase.

Infrastructure and the availability of state-of-the-art medical equipment also play a crucial role in determining the success of emergency response. An ideal emergency room (ER) facility must be supported by rapid access to laboratories and radiology, and a 24-hour availability of adequate emergency medications. Furthermore, managing patient crowding is a significant challenge. A balanced ratio of bed capacity to patient arrivals significantly impacts waiting times and length of stay in the ER.

Conditions in the ER also rely heavily on a strict triage system to classify patients based on their severity. This creates an environment that prioritizes medical urgency over order of arrival, so work areas are typically divided into specific zones, such as a resuscitation zone for critical patients and a green zone for mild cases. Advanced vital sign monitoring technology and emergency life support equipment are standard features at every patient bedside to ensure continuous and accurate monitoring (Zampas, G., & Taylor, C., 2021).

Beyond the medical aspects, the characteristics of the ER involve intense and stressful interactions between healthcare workers, patients, and their families. Emotional tension often arises from family anxiety about the patient's acute condition, making crisis communication skills crucial for medical staff. Overall, the ER serves as the primary gateway to hospital services, combining speed of action, accurate diagnosis under pressure, and integrated inter-unit coordination to provide optimal life-saving care.

Nurse communication in the ER must focus on rapid, accurate, and reassuring therapeutic communication techniques to address critical situations. Nurses must convey information clearly and concisely to patients and families to reduce anxiety and build trust amidst panic. In this fast-paced environment, using easily understood language without compromising empathy is key to ensuring that medical instructions are well-received by patients experiencing significant psychological distress (Schmutz, T., et al., 2022).

Interprofessionally, emergency room nurses must apply structured and standardized communication, such as the SBAR (Situation, Background, Assessment, Recommendation) method, when handing over patients or reporting critical conditions to physicians. This principle is crucial for preventing medical errors and ensuring the continuity of safe nursing care. The accuracy of data conveyed by nurses, from vital sign observations to patient responses to interventions, forms the basis for rapid and appropriate medical decision-making in the triage zone and resuscitation room.

Nurse communication principles also encompass proficiency in operating integrated health information systems. Nurses act as information bridges between electronic medical record technology and patient understanding, ensuring that all input data reflects the patient's actual condition. This effective communication not only improves patient safety in the hospital but also expedites the referral process and coordination with advanced care units (Mostafa, R., & El-Atawi, K., 2024).

Patient waiting time is the time it takes for a patient to arrive or register at a healthcare facility until they receive their first medical treatment (Ministry of Health, 2018). In the Emergency Department (ER), waiting time is crucial because it is related to patient safety, the effectiveness of medical procedures, and the quality of hospital services (WHO, 2018). The ER is the main gateway to hospital emergency services and often faces a surge in patients with various medical conditions, ranging from mild to life-threatening. Long wait times can increase the risk of complications, decrease patient satisfaction, and even mortality. Based on Minister of Health Regulation No. 47 of

2018, services in the ER are required to use a triage system that prioritizes treatment based on the patient's level of medical urgency. The Red category represents life-threatening conditions requiring immediate treatment (zero minutes), the Orange category requires a maximum of 10 minutes, the Yellow category requires a stable emergency condition within a maximum of 30 minutes, the Green category requires a non-emergency wait of up to 60 minutes, and the Black category requires patients who arrive deceased. The most significant factors influencing waiting times in the emergency department are patient volume and the triage system in place. When there is a simultaneous surge in patient numbers or overcrowding, waiting times for green and yellow patients tend to increase because medical personnel must prioritize red patients who require immediate life-saving intervention. Accurate staffing when triaging patients upon arrival is key to ensuring that patients at highest risk of death do not experience delays in treatment.

The next factor relates to the capacity of human resources and the completeness of the medical infrastructure available in the unit. The ratio of doctors and nurses to the number of patients, as well as the availability of supporting medical equipment such as EKG machines, ventilators, and the speed of laboratory and radiology services, significantly determine the duration of the diagnostic process. Limitations in any of these aspects will create bottlenecks that prolong patient waiting times before receiving a final medical decision.

The final factor is the efficiency of administrative processes and the availability of advanced care or inpatient rooms. Often, patients are held up in the emergency department not because of delays in medical treatment, but because of complicated insurance data verification processes or the lack of available beds in inpatient rooms (full wards). Smooth coordination between units and integrated hospital information system management are essential to expedite the flow of patients in and out of the emergency department (Su, H. Y., et al., 2021).

Waiting times exceeding the standard in the emergency department (ER) have implications for patient safety, as delays in medical treatment can lead to worsening clinical conditions, increased risk of disability, and even death in emergency cases. Based on the 2026 service standards, these delays also trigger dissatisfaction among patients and families, often leading to interpersonal conflicts with healthcare workers in the field.

Beyond the direct impact on patients, long wait times reflect low hospital management efficiency, which can ultimately impact the institution's reputation and hospital accreditation. Excessive workloads among medical personnel due to patient congestion also pose a high risk of burnout and decreased accuracy in diagnosis and medical treatment.

Administratively, uncontrolled waiting times lead to increased operational costs and potential financial losses due to ineffective resource utilization. The inability of the emergency department (ER) to quickly transfer patients to inpatient rooms also hinders the flow of new patients, creating a cycle of service bottlenecks that is detrimental to the health system as a whole.

Widely studied strategies for improving patient waiting times include optimizing patient flow management through the implementation of a technology-based triage system that can predict surges in visits and classify patient conditions more accurately and quickly. The use of this integrated digital system allows medical personnel to directly monitor bed availability and laboratory test status in real time, eliminating delays in the medical decision-making process due to manual communication constraints.

In addition to utilizing technology, strengthening human resource management through flexible shift scheduling in accordance with peak hours is a crucial step to ensure an ideal medical staff-to-patient ratio. This strategy is often accompanied by ongoing training for staff on efficient

emergency management and interprofessional collaboration, ensuring that every stage of care, from registration to treatment, can run more synchronously and minimize disruptions.

Another strategy focuses on improving downstream systems, namely accelerating patient discharge planning from the emergency department to the inpatient ward or discharge home. By implementing more streamlined standard operating procedures in administration and increasing the availability of supporting facilities in inpatient units, hospitals can prevent patient congestion in the emergency department (boarding). Operational management approaches such as Lean Healthcare are also widely implemented to identify and eliminate non-value-added activities, significantly reducing overall waiting times.

Patient waiting time in a hospital's emergency department is an indicator of service quality, influenced by both internal factors (healthcare personnel, facilities, workflow) and external factors (number of patients, referral system). Improvement efforts need to be implemented comprehensively through the implementation of appropriate triage, resource optimization, and innovation in hospital management (Plevová, I., et al., 2021)

This research is considered urgent because emergency services in the emergency department (ED) are vital for the wider community. Morbidity rates and the need for emergency services are increasing daily along with the increasing population. Poor management of ED services will increase overcrowding in the ED, resulting in untreated patients, prolonged suffering, or even increased mortality and disability. Research conducted in sources and journals revealed that this type of research is rare, and the author has not found any similar research in Bali Province. Therefore, it can be concluded that this research title is novel.

The primary solution to shortening waiting times in the emergency department (ER) is strengthening the digital triage system and optimizing patient flow through bed occupancy management. Using digital triage, staff can sort patients more quickly and objectively based on automatically inputted vital signs. Furthermore, implementing a Fast Track zone for patients with a low level of urgency (green category) can separate mild cases from critical ones, allowing medical personnel to treat more patients in a shorter time without compromising safety.

Operational efficiency is also improved through the integration of supporting services such as laboratory and radiology, which prioritize emergency department (ED) patients (point-of-care testing). By shortening the wait time for diagnostic results, doctors can quickly determine a diagnosis and plan follow-up, whether the patient requires hospitalization, referral, or discharge. Hospital management also needs to implement a full capacity protocol, requiring inpatient wards to immediately prepare beds for emergency department patients within 30 minutes of the decision to hospitalize, to prevent patient congestion in the emergency department corridors.

In a high-mobility region like Bali, external solutions involve robust pre-hospital coordination through integrated ambulance services and a one-stop referral information system. Through the use of command centers like Bali Emergency 112, patients can be directed to hospitals with available beds in real time, preventing overloading of any one hospital. Public education on the use of primary healthcare facilities (community health centers or clinics) for non-emergency cases is also crucial to ensure the emergency department (ED) remains functional, specifically for patients requiring urgent care.

A key solution to expedite patient transfers from the ED to inpatient wards is the implementation of a centralized, real-time Bed Management Unit (BMU) system. This system automatically monitors bed availability across all wards through an integrated digital dashboard. When a doctor makes a decision to admit, the system automatically allocates available beds, minimizing manual

administrative processes and time-consuming telephone coordination between ED nurses and ward nurses.

Furthermore, optimizing patient flow can be achieved through the implementation of strict Standard Operating Procedures (SOPs) for patient transfers with a maximum target time (e.g., less than 60 minutes). Hospitals should adopt a "discharge before noon" protocol for stable inpatients to expedite bed turnover for new patients from the emergency department. The use of dedicated transport teams also significantly helps emergency department nurses focus on the medical care of other patients without having to leave the unit to transport patients to the ward or operating room.

In large hospitals, digitally integrating inter-unit communication using the SBAR (Situation, Background, Assessment, Recommendation) method is key to efficiency. Complete and accurate electronic medical record information allows nurses in the next room to assess the patient's condition before arrival, streamlining the handover process. With smooth coordination between the emergency department, administration, and ward cleaning services, boarding issues and patient congestion in the emergency department can be significantly reduced, improving patient safety and comfort.

## **CONCLUSION**

The research results conclude that there are dominant factors, or the factors that contribute to the longest patient wait times in the emergency department (ER) at hospitals in Bali Province. The time it takes to transfer patients to the next room is the most dominant factor associated with long patient wait times in the ER. The research findings suggest that hospitals should shorten patient wait times in the ER to improve patient care.

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