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A Strategy to Improve Patient Stagnation in the Emergency Department of Dr. Wahidin Sudirohusodo General Hospital Using Lean Hospital

Una estrategia para mejorar el estancamiento de pacientes en el Servicio de Urgencias del Hospital General Dr. Wahidin Sudirohusodo mediante el uso de Lean Hospital

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SUMMARY

Background: *Patient stagnation in the Emergency Department (ED) of Surgery is one of the serious issues in hospital service management. This condition reflects a blockage in the flow of patients from the ED to inpatient wards, which risks lowering service quality and increasing patient safety risks. According to The Joint Commission standards, patient boarding time, which is the duration a patient stays in the ED after being declared in need of hospitalization, must not exceed 4 hours. A length of stay exceeding this standard has been proven to increase the risk of nosocomial infections, staff fatigue, and worsen patient satisfaction. At Dr. Wahidin Sudirohusodo General Hospital, Makassar, this stagnation problem still frequently occurs and requires systematic improvement.* **Objective***: This study aims to develop improvement strategies for patient stagnation from the Surgical Emergency Department (ED) to the Inpatient Unit using the Lean Hospital approach.* **Methods:** *This study was analyzed using the Lean approach to identify non-value-added activities (waste) in the patient care flow. The approach is supported by several Lean tools, namely Value Stream Mapping (VSM) to map process flows, Fishbone Diagram to trace root causes of problems, and Kaizen as a continuous improvement approach. Data were collected through qualitative methods such as direct observation, in-depth interviews with relevant staff, and a review of hospital documents.*

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Results: *The flow mapping (VSM) results showed that the Observation and Documentation stages represented the longest waiting points, at 3 hours 3 minutes 15 seconds. The main delay was caused by waiting for instructions from the attending physician (DPJP) with an average of 2 hours 7 minutes 17 seconds. The most frequently occurring category of waste was waiting.* **Conclusion:** *Kaizen-based improvement strategies are recommended to reduce time wastage and increase the efficiency of patient flow from the Surgical ED to inpatient wards.*

Keywords: *Stagnation, emergency department installation, waste identification, Lean.*

RESUMEN

Antecedentes*: El estancamiento de pacientes en el Departamento de Emergencias (DE) de Cirugía es uno de los problemas graves en la gestión de los servicios hospitalarios. Esta condición refleja un bloqueo en el flujo de pacientes del DE a las salas de hospitalización, lo que corre el riesgo de reducir la calidad del servicio y aumentar los riesgos de seguridad del paciente. Según los estándares internacionales de calidad hospitalaria establecidos por la Joint Commission International (JCI), el tiempo de embarque —es decir, el período entre la decisión de hospitalizar a un paciente en el Departamento de Emergencias y su traslado efectivo a una cama hospitalaria— no debe exceder las 4 horas. Se ha demostrado que una estancia que supere este estándar aumenta el riesgo de infecciones nosocomiales, la fatiga del personal y empeora la satisfacción del paciente. En el Hospital General Dr. Wahidin Sudirohusodo de Makassar, este problema de estancamiento sigue siendo frecuente y requiere una mejora sistemática.* **Objetivo:** *Este estudio tiene como objetivo desarrollar estrategias para la mejora del estancamiento de pacientes del Departamento de Emergencias Quirúrgicas (DE) en la Unidad de Hospitalización utilizando el enfoque Lean Hospital.* **Métodos:** *Este estudio analizó e identificó mediante el enfoque Lean las actividades sin valor añadido (desperdicio) en el flujo de atención al paciente. El enfoque está respaldado por varias herramientas Lean, a saber, Value Stream Mapping (VSM) para mapear flujos de procesos, Fishbone Diagram para rastrear las causas raíz de los problemas y Kaizen como un enfoque de mejora continua. Los datos se recopilaron a través de métodos cualitativos como la observación directa, entrevistas en profundidad con el personal relevante y una revisión de los documentos del hospital.* **Resultados:** *Los resultados del mapeo de flujo (VSM) mostraron que las etapas de Observación y Documentación representaron los puntos de espera más largos, con 3 horas 3 minutos 15 segundos. El retraso principal fue causado por la espera de instrucciones del médico tratante (DPJP) con un promedio de 2 horas 7 minutos 17 segundos. La categoría de desperdicio que ocurrió con mayor frecuencia fue la espera.* **Conclusión:** *Se recomiendan estrategias de mejora basadas en Kaizen para reducir el desperdicio de tiempo y aumentar la eficiencia del flujo de pacientes desde la sala de emergencias quirúrgicas a las salas de pacientes hospitalizados.*

Palabras clave*: Estancamiento. instalación de servicios de urgencias, identificación de residuos, Lean.*

INTRODUCTION

Based on Law No. 44 of 2009 concerning hospitals, a hospital is a health service institution that provides comprehensive individual health services, offering inpatient care, outpatient care, and emergency services. The Emergency Department (ED) is a hospital facility that provides the first 24-hour service to patients at risk of death and disability in an integrated manner. In line with this definition, emergency services are provided to patients who arrive at the hospital in a critical condition or are expected to deteriorate. An emergency is a threat to the patient's life if help is not provided immediately. The speed of patient handling in the Emergency Department (ED) is crucial, especially for patients in critical condition. Delays in the service process can increase the risk of serious complications and even death. Therefore, efficiency in the ED service flow plays a significant role in improving patient safety and the quality of care (1,2).

The service flow in the Emergency Department (ED), particularly for Surgery, begins when the patient first arrives at the emergency unit. In the initial stage, the patient will undergo registration to record their personal data and the medical complaints they have experienced. After registration, the patient will undergo a triage process, where medical staff conduct an initial assessment of the patient's condition to determine the severity and urgency of treatment. The medical team will immediately attend to patients in critical condition to receive the necessary initial care. If needed, the patient will then undergo a series of further examinations, such as physical

examination, laboratory tests, or medical imaging, to ensure an accurate diagnosis.

Overcrowding or congestion in the Emergency Department (ED) is a trigger for prolonged stagnation in the ED. Overcrowding can be defined as a condition in which the performance of the Emergency Department is disrupted, primarily due to the large number of patients waiting for consultation, diagnosis, treatment, transfer, or discharge (3). An imbalance between supply and demand characterizes overcrowding. Although many factors contribute to Overcrowding (patient congestion), it essentially depends on three key factors: the number of incoming patients (input), the time required to process and treat patients (throughput), and the number of patients leaving the ED (output) (4). Among the various factors, patient Boarding turns out to be one of the most influential. Boarding refers to the practice of keeping patients in the ED for extended periods due to limited inpatient bed capacity in the hospital. Boarding, along with Overcrowding in general, negatively impacts the quality of care, mortality rates, morbidity rates, patient satisfaction, and the quality of services provided. This condition also leads to longer patient stays in the ED, an increase in the number of patients leaving the ED without being examined (also known as "left without being seen"), and a rise in the number of medical errors (5,6).

Based on recommendations from The Joint Commission Accreditation, the practice of boarding patients in the Emergency Department (ED) should not exceed 4 hours to ensure patient safety and optimal quality of care, as stated in Standard LD.04.03.11, Element of Performance (EP) 6. Boarding refers to the situation when a patient is held in the ED or a temporary location after a decision to admit or transfer them has been made. Hospitals are expected to set this goal while considering the patient's severity level and best practices, in order to reduce stagnation, ensure efficient care flow, and minimize excessive waiting times.

One example of a hospital in Indonesia is Dr. Wahidin Sudirohusodo Central General Hospital, a Type A hospital owned by the Ministry of Health, located on a 35-hectare site. Central General Hsopital Dr. Wahidin Sudirohusodo Makassar has set a patient waiting time in the ED of 4 hours. However, many patients have complained about the long service times provided by healthcare workers; even after receiving treatment, they are still required to wait more than 10 hours before being transferred to another care unit.

Data from Dr. Wahidin Sudirohusodo Makassar Hospital shows that nearly half of the patients in the ED experience stagnation, which is a waiting time of more than 4 hours before entering the inpatient ward. The average percentage of stagnation from January to November 2024 reached 47.5 %, with the highest rate in September (61 %) and the lowest in April (27 %). This situation indicates the phenomenon of patient stagnation in the ED, which can potentially cause overcrowding, delayed treatment, and a decline in the quality of service.

Therefore, it is important to analyze the factors that influence the length of patient stagnation in the ED, especially in the surgery department, to support effective triage, ensure smooth patient flow, and prevent overcrowding. Optimal management of length of stay is an important indicator of emergency service quality. One approach that can be used is Lean Hospital (or Lean Healthcare). This transformative management approach adapts industrial Lean principles to the healthcare setting, with the patient at the center of every decision. It is a management method focused on reducing waste, optimizing workflows, and enhancing patient value by improving care quality, safety, and satisfaction, and increasing efficiency and value of services for patients. Various studies have shown that prolonged stagnation can be caused by a number of interconnected factors, including both internal hospital factors and external factors that affect ED performance (7). Therefore, to address this issue, an approach is needed that can systematically identify and reduce waste in the care pathway. One such approach that has proven effective in improving efficiency and reducing length of stay is the application of Lean Healthcare principles, which focus on eliminating waste, improving workflow, and optimizing the use of both medical and non-medical resources in the ED. By adopting Lean, hospitals can reduce waiting times, speed up medical decision-making, and ultimately shorten the duration of patient stays in the ED, thereby improving service quality and the overall operational efficiency of the hospital. This is in line with research conducted by Souza

et al. (8), which found that implementing Lean principles in the ED provided significant benefits, including a 50 % reduction in waiting times, $2 million in annual savings through the elimination of inefficiencies, and a 30 % reduction in patient length of stay.

Therefore, the researcher hopes that the implementation of Lean Hospital in the ED will not only reduce overcrowding, optimize ED Length of Stay (EDLOS) management, and improve efficiency and quality of service at Dr. Wahidin Sudirohusodo General Hospital Makassar, Indonesia, but will also become the first study to specifically examine the application of Lean principles to surgical patient stagnation cases in the ED of a referral hospital in Indonesia, thus providing a new scientific and practical contribution in the context of emergency service management in developing countries.

MATERIALS AND METHODS

This research is qualitative research, meaning that it is conducted because the issues are related to humans and rely on observation. The data obtained in qualitative research consists of factual information and is analyzed in depth. Qualitative research places greater emphasis on obtaining more in-depth data, particularly through the direct involvement of the researcher in the field.

Study Design

The research approach is phenomenological, which is the study of knowledge aimed at clarifying situations experienced in a person's daily life and describing phenomena, both those that can be directly observed by the senses (external phenomena) and those that can almost be experienced, felt, imagined, or thought of by the observer without the need for empirical reference. This research comprehensively examines the overall background of the research subjects in the hope of obtaining data regarding issues in the Emergency Department at Dr. Wahidin Sudirohusodo General Hospital, Makassar. Data was obtained through structured interviews, observation, and documentation from informants.

Study Population

An informant is someone who is utilized to provide information about the situation and conditions of the research. The selection of the first informant is generally based on demographic characteristics or specific variables already known by the researcher from previous studies. Informants serve as sources for obtaining information regarding policies, planning, implementation, evaluation, and management reviews of the Emergency Installation at Dr. Wahidin Sudirohusodo General Hospital in Makassar. Informant selection employs purposive sampling, specifically the critical case sampling type, which involves selecting locations, events, or individuals that possess specific or important characteristics for a particular reason. The selection of information-rich samples takes into consideration the informants' positions, length of service, and relevant fields of work.

Sampling

The respondents in this study consisted of two groups: key informants and main informants, totaling nine people. The key informants numbered 3 people: the Head of the Emergency Room Department, the Head of the Medical Records Department, and a patient. The key informants were selected because they possess in-depth knowledge and essential information relevant to the focus of the study. The Head of the Emergency Room Department was chosen as the person in charge of ER services. At the same time, the Head of the Medical Records Department was selected due to their responsibility for the registration system and management of medical records. The selection of key informants was based on their position, length of service, and their role in the management of the ER, registration, and medical records. Meanwhile, the main informants consisted of 6 people: 2 registration officers, 2 medical records officers, and 2 ER staff. They were chosen due to their direct involvement in service delivery in the field and their firsthand experience with the service process in the ER. The characteristics of the main informants include their position, length of service, and areas of work closely related to ER operations, patient

registration, and emergency medical records management.

Study Instrument

The instruments in this research include the researchers themselves, respondents, interview guidelines, Field Notes, Recording Devices, Documents, and observation.

Data Collection

The data collection techniques in this study include observation, interviews, and documentation. Observations were conducted directly in the Emergency Room (ER) at Dr. Wahidin Sudirohusodo Central General Hospital, Makassar, to assess service quality, focusing on the registration section, ER services, and medical records, including queue flow, service delivery, communication, as well as prescription and medication retrieval at the pharmacy depot. Structured interviews were carried out with registration staff, doctors, ER staff, pharmacy staff, and patients to gather information about the eight wastes in the ER. The interview process followed systematic steps, starting with the preparation of questions, the use of recording devices, and the documentation of the results. Documentation was used to review policy documents, service flow, as well as data related to waiting times, registration, medical examinations, and medication provision, to support the validity of the research data.

Ethical Considerations

This research has been passed ethical review by the research department of the Faculty of Public Health, Hasanuddin University, Makassar, with the number: 99/UN4.14.I/TP.01.02/2025

RESULTS

Patient Service Flow in the Emergency Department of Dr. Wahidin Sudirohusodo Hospital

The flow of patient services in the Emergency Department begins as soon as the patient arrives through various entry points, whether by standard emergency ambulance, referral ambulance, or arriving independently or escorted by family. Patients who are referred undergo an initial triage process (pre-hospital). At the same time, those who are not admitted are directed to the Emergency Department area for repeat triage by hospital triage staff. Following this re-triage process, patients are classified into several categories of emergency severity: emergency (critical), urgent (minor emergency), non-urgent, or false emergency. This classification determines the subsequent course of action: emergency and urgent patients are directed to the treatment/ observation room or the resuscitation area. In contrast, non-urgent or false emergency patients may be referred to the outpatient clinic, especially if their condition is not life-threatening (Figures 1 and 2).

Patient administrative processes such as registration and data entry are usually carried out after triage, especially for stable patients. In emergency cases, administration is done in parallel with or after initial medical treatment to prioritize patient safety. After treatment, patients may be discharged, admitted for inpatient care, referred to in the operating room, Intensive Care Unit (ICU), or directed to the mortuary if deceased. Non-emergency patients who arrive outside of office hours may be redirected to the polyclinic. However, researchers' observations have shown discrepancies between real-life practice and the official procedures established by Dr. Wahidin Sudirohusodo Central General Hospital.

A. Patient Arrival

When patients arrive at the Emergency Department of Dr. Wahidin Sudirohusodo Central General Hospital, they undergo an initial triage by the Triage Team to determine the level of emergency. Patients requiring resuscitation are taken directly through the resuscitation entrance, while others are directed to the emergency room for medical triage and vital sign checks. While the triage process is ongoing, the patient's family is usually directed to the administrative section for registration. If the emergency department is full, patients may have to wait their turn or be referred to other services. Staff will provide education regarding this situation. However,

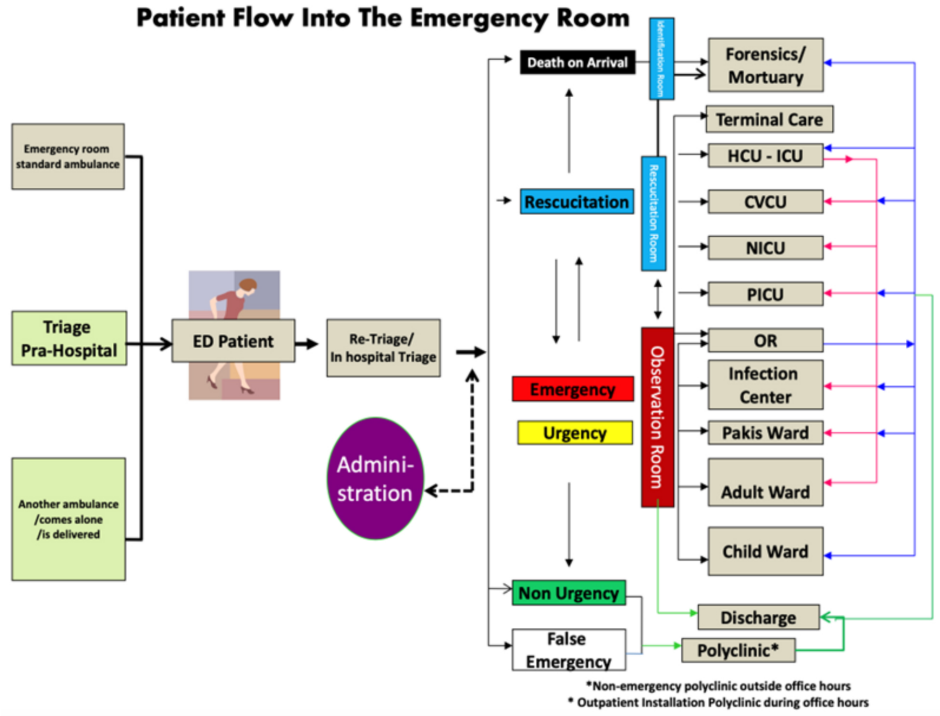

Figure 1. Patient Service Flow in the Emergency Department of Dr. Wahidin Sudirohusodo Central General Hospital

this education is not always well received by patients or their families, often leading to refusals and delays in the triage process. The primary obstacle encountered in the field is the limited number of triage nurses during busy periods in the emergency department, resulting in queues and longer waiting times. Non-value-added activities in this process account for 16.2 %, with the primary types of waste being waste due to waiting and waste due to motion (Table 1).

B. Emergency Department Patient Registration

The patient registration process at the Emergency Department (ED) of Central General Hospital, Dr. Wahidin Sudirohusodo, begins when the patient's family is directed to the admission section located in the Medical Records Installation. Registration includes verification of documents such as a national ID card (KTP), Family Card (KK), and social security insurance Card, as well as the completion of patient data, followed by delivery of identification bracelets and educational forms to the triage nurse station. Although medical services can be provided before registration is completed, queues often build up due to the large number of patients arriving at the same time and the limited number of staff. Admissions officers are also responsible for both ED and inpatients from the outpatient clinic, which slows down the process further. Additionally, technical issues such as instability of the electronic medical records (e-RM) system and printer malfunctions also hamper the speed of registration. Another challenge in the registration process is ineffective communication between staff and the patient's family. The lack of visual information media in the admission area leaves families without a clear understanding of the registration flow, forcing staff to explain procedures repeatedly. This increases the workload, especially during periods of high patient volume. This inefficiency leads to various non-value-added activities, dominated by waste of waiting, overprocessing, defects, motion, and non-utilized talent. Eight types of waste have been identified, including long queues,

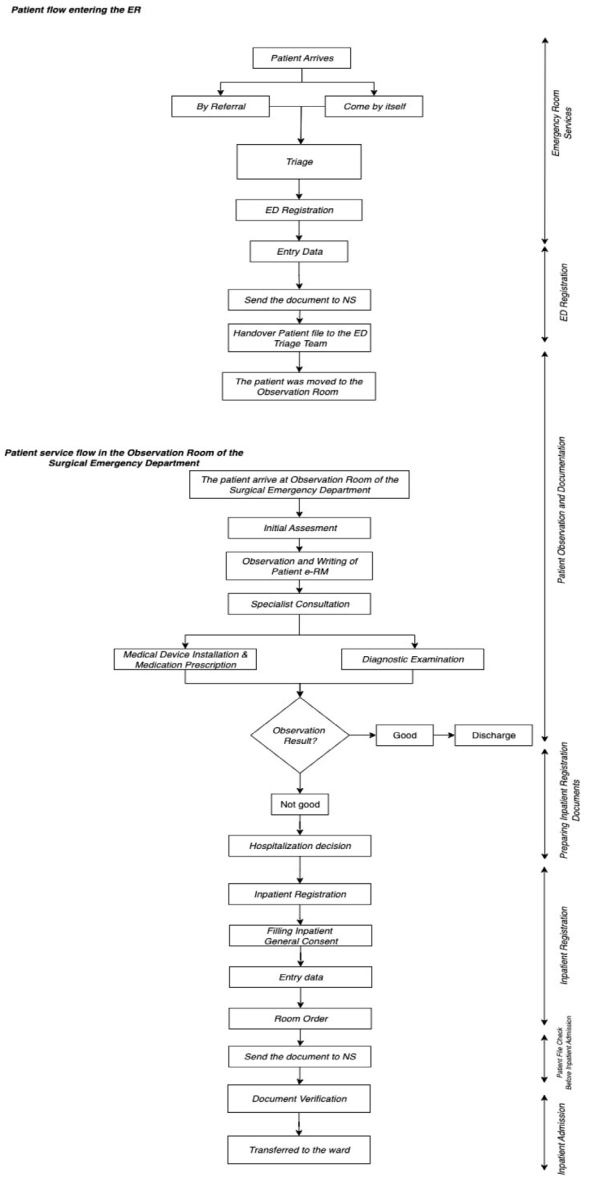

Figure 2. ER Service Flow Based on Researchers' Observation.

input errors, and inefficient communication, all of which negatively impact the efficiency of the ED registration flow (Table 2).

The lengthy registration process causes delays in transferring patient status to the ER staff. Activities that do not add value (Non-Value Added) in this process account for 35.2 %. Waste in this service is dominated by waste of waiting, waste of transportation, and waste of motion

C. Patient Observation

After medical triage, the doctor fills out a triage form that still requires printing, despite the implementation of the electronic medical record (e-MR) system. This process causes delays because staff must wait for the data to be auto-filled before the document can be printed and completed manually. Examinations by the attending doctor are also often delayed due to the doctor's involvement in emergency procedures or absence from the location. After registration is complete, the nurse attaches an identification bracelet, provides education, and requests a signature from the patient's family. The patient is then referred to the Surgical or Non-surgical division and waits for an initial assessment by the on-duty resident. As a teaching hospital, a tiered consultation system (from junior resident to attending physician) is part of the learning process. Still, it can cause delays in medical decision-making, especially when the attending physician is not yet available. The process of filling out medical records and inputting procedures by the on-duty resident is also hampered when the e-MR system encounters issues, requiring records to be completed manually and re-entered later.

This leads to duplication of work and additional administrative burdens, reducing efficiency.

Picking up medication at the ER Pharmacy Depot can often create confusion because patients are unfamiliar with the location. Since there is no internal delivery system, families must collect the medication themselves, resulting in unnecessary transportation costs. Additionally, the limited number of staff requires individuals to handle multiple duties, which decreases efficiency. For laboratory tests, nurses collect samples, and the patient's family must deliver them to the laboratory. Many families face difficulties because they are unfamiliar with the lab's location. This can be addressed by providing an internal courier between the ER and the laboratory. Finally, ER nurses often perform duties outside the scope of nursing, such as patient evacuation and handling paperwork. This double workload reduces their focus on nursing care and increases the risk of fatigue. Non-value-added activities are recorded at 69.8 %, with waste dominated by waste of waiting, transportation, motion, and overprocessing (Table 3).

Table 1. Activities in the Patient Arrival Process at the Surgical Emergency Room

No.	Activity	Average Time (seconds)	VA / NVA	Type of Waste (if NVA)
Patient arrives at the ED entrance area				
1	Staff look for an available stretcher/bed	49	**NVA**	*Waiting*
2	The stretcher is cleaned and prepared	18	**NVA**	*Waiting*
3	Waiting for assistance to move the patient (if needed)	15	**NVA**	*Waiting*
4	Patient is transferred onto the stretcher	41	**VA**	–
5	Initial triage by ED Triage Team (rapid assessment and classification)	172	**VA**	–
6	Patient is wheeled into the ED	14	**VA**	–
7	Medical triage by ED Triage Team (vital signs check, initial assessment)	361	**VA**	–
8	Companion directed to the registration counter	21	**NVA**	*Motion*
9	Patient waits for a doctor's examination (if ED is full)	34	**NVA**	*Waiting*
10	Initial education by staff to the patient/family regarding the ED condition	103	**VA**	–
Total Time		828 (13'48") Standard <5 minute	**VA**: 83.8 % **NVA**: 16.2%	

Note: VA = Value Added; NVA = Non-Value Added

Table 2. Activities in the Patient Registration Process at the Surgical Emergency Department

No.	Activity	Average Time (seconds)	VA / NVA	Type of Waste (if NVA)
1	The patient's family waits in line at the registration counter	38	**NVA**	*Waiting*
2	Family is served by registration staff	16	**VA**	-
3	Staff explain the registration procedure	44	**VA**	-
4	Family looks for and submits identity documents (ID, Family Card, BPJS)	58	**NVA**	*Motion*
5	Staff check the completeness and accuracy of patient documents	22	**VA**	–
6	Staff enter patient data into the e-RM system	171	**VA**	–
7	Staff print patient ID bracelet and education form	25	**VA**	–
8	The family receives patient documents and an ID bracelet	5	**VA**	-
9	The family delivers documents and a bracelet to the ED nurse station	50	**NVA**	*Motion, Transportation*
10	Documents are collected and submitted to the nurse station	10	**NVA**	*Transportation*
Total Time		439 (7'19")	**VA: 64,8% NVA:35.2%**	

Note: VA = Value Added; NVA = Non-Value Added

Table 3. Observation Process Activities in the Surgical Emergency Room

No.	Activity	Average Time (seconds)	VA / NVA	Type of Waste (if NVA)
Observation				
1	Doctor fills out triage form (E-RM)	133	VA	–
2	Waiting for the triage form to be printed from the e-RM system	17	NVA	*Waiting, Overprocessing*
3	The triage form is manually filled out after printing	23	NVA	*Overprocessing*
4	The nurse provides education to the patient's family	89	VA	–
5	Patient's family signs the education form	18	VA	–
6	The nurse attaches the patient ID bracelet	75	VA	
7	On-call doctor reports the patient to the respective division	30	VA	–
8	Patient is transferred to observation room	17	VA	–
9	Patient waits for assessment by on-call doctor/resident	281	NVA	*Waiting*
10	First examination by on-call doctor/resident	817	VA	–
11	Second examination by on-call doctor/resident	824	NVA	*Waiting, Overprocessing,*
12	Waiting for instructions from the primary doctor in charge (DPJP)	7637	NVA	*Waiting*
13	On-call doctor fills in the medical record after assessment	341	VA	-
14	On-call doctors enter procedures and prescriptions into the system	241	VA	-
15	Nurse executes instructions from DPJP	854	VA	-
Subtotal Observation		11397 (3j 9' 57")	VA: 22.9% NVA: 77.1%	
Prescription Process				
1	Medical staff informs the patient's family to collect the prescription	83	NVA	*Motion*
2	The family goes to collect the prescription	127	NVA	*Motion, Transportation*
3	Family waits in line at the pharmacy	33	NVA	*Waiting*
4	Pharmacy staff confirms patient identity	33	VA	-
5	Family returns the prescription to the surgical nurse station	125	NVA	*Motion, Transportation*
Subtotal Prescription		401 (6' 41")	VA: 6.6 % NVA: 93.4%	
Supporting Investigation				
1	Medical staff informs the family to deliver a blood sample to the laboratory	35	**NVA**	*Motion*
2	The family delivers the sample to the laboratory	400	NVA	*Motion, Transportation*
3	The sample is an investigation	1498	VA	
Subtotal Supporting investigation		1933 (32' 13")	VA: 77.5% NVA: 22.5%	
TOTAL Observation Process		13731 (3j48'51")	VA: 30.2% NVA: 69.8%	

Note: VA = Value Added; NVA = Non-Value Added

D. Inpatient Registration

After the doctor determines that the patient needs to be hospitalized, the room registration process begins as a transition from the ER to inpatient care. The ER Triage Team creates a referral letter through the system and directs the patient's family to the admissions department for the room registration process. At admissions, the family is asked to consent to the hospitalization and receive education, especially if they must wait due to full occupancy. After that, the family returns to the ER to submit documents and wait for room confirmation from the nurse.

This process often takes a long time, especially during peak hours or when rooms are full, because the information system is not yet integrated in real time. ER staff must wait for manual confirmation from admissions or ward nurses, which can be delayed due to busyness or technical issues.

Non-value added (NVA) activities reach 38.6 %, with the main waste being waste of transportation, motion, and waiting (Table 4).

Table 4. Activities in the Registration Process for Inpatient Admission of Surgical ER Patients

No.	Activity	Average Time (seconds)	VA / NVA	Type of Waste (if NVA)
Attending physician (DPJP) declares patient requires inpatient care				

No.	Activity	Average Time (seconds)	VA / NVA	Type of Waste (if NVA)
1	The ED triage team creates an inpatient referral letter via the system	35	VA	–
2	ED staff instructs the family to photograph the patient's ID bracelet and provide the name & medical record number.	41	NVA	*Motion*
3	Family proceeds to admissions for inpatient registration	277	NVA	*Motion, Transportation*
4	The family waits in queue at the admissions counter	213	NVA	*Waiting*
5	Admissions staff request inpatient consent and explain the general consent form	486	VA	–
6	Family signs the general consent and inpatient agreement	19	VA	–
7	Staff educate the family if the room is unavailable and the patient must temporarily remain in the ED	69	VA	–
8	Admissions staff input inpatient room availability data	290	VA	–
9	Family returns to the ED carrying patient records from admissions	33	NVA	*Motion, Transportation*
Subtotal Inpatient Registration		1463 (24'23")	VA: 61.4% NVA: 38.6%	

Note: VA = Value Added; NVA = Non-Value Added

E. Transferring Patients to the Inpatient Ward

After a patient is designated for inpatient care and a room is available, the next step is to check the completeness of inpatient documents, coordinated by the ER staff, admissions, and medical records. The purpose is to ensure all documents are complete before the patient is transferred. However, this process often causes stagnation because documents such as the medical summary are frequently not finished, or technical issues occur with the hospital information system (SIMRS). As a result, patients who are clinically ready to be transferred still have to wait because their documents are not complete. From a Lean Hospital perspective, this process is considered a non-value-added (NVA) activity because it prolongs the length of stay without providing any additional medical benefit. This situation also leads to delayed bed turnover and slows down the admission of new patients. The NVA activity rate in this process reaches 96.4 %, with the dominant forms of waste being waste of waiting, transportation, motion, and overprocessing (Table 5).

Table 5. Activities in the Document Verification Process for Surgical ER Patients

No.	Activity	Average Time (seconds)	VA / NVA	Type of Waste (if NVA)
1	ED nurse reconfirms with the inpatient unit via telephone for coordination	45	NVA	*Waiting, Overprocessing*
2	Waiting for inpatient room availability (due to full or unprepared room)	921	NVA	*Waiting, Inventory*
3	Room information received after the update from the admission/ward nurse	21	VA	-
4	ED staff verifies inpatient documents	55	VA	-
5	Waiting for the doctor/resident to complete the ED Initial Assessment summary	732	NVA	*Waiting*
6	Ward staff re-checks documents before patient admission	44	NVA	*Overprocessing, Waiting*
7	Patient documents are complete	11	VA	-
Subtotal Document Verification Time		1829 (30'29")	VA: 4.8 % NVA: 95.2 %	

Note: VA = Value Added; NVA = Non-Value Added

F. Transferring Patients to the Inpatient Ward

After the administrative process is completed and a room is available, the patient is transferred from the ER to the inpatient ward. Although this may seem simple, this process often becomes the final obstacle that prolongs the patient's stay in the ER. The transfer requires coordination among the ER team, transport staff, and ward nurses. Still, it frequently faces challenges such as a shortage of transport staff, ward nurses not being ready, and poor inter-unit communication.

As a result, patients must wait even though all procedures have been completed. This situation causes stretchers to be held up, delays the admission of new patients, and adds to the ER team's workload. In the Lean Hospital approach, this situation falls into the category of non-value-added (NVA) activities that result in waste, such as waiting, transportation, and motion. Therefore, improved coordination among units, additional staff, and a technology-based transfer system are needed to speed up the process and reduce waste (Table 6).

Table 6. Process of Patient Transfer Activities from the Surgical ER

No.	Activity	Average Time (seconds)	VA / NVA	Type of Waste (if NVA)
Patient Transfer Process				
1	Confirmation by the inpatient room nurse that the patient will be delivered	27	NVA	*Overprocessing*
2	Initial coordination between ED staff and transfer team	32	VA	-
3	Waiting for the transfer team (evacuator)	370	NVA	*Waiting*
4	Patient is moved to the transfer team stretcher	34	VA	–
5	Patients are transferred to the inpatient ward	617	VA	–
Subtotal Inpatient Transfer Time		1080 (18')	VA: 63.7 % NVA: 36.8 %	

Note: VA = Value Added; NVA = Non-Value Added

Figure 3 shows the Value Stream Mapping (VSM) of the service process in the Emergency Department (ED) of Dr. Wahidin Sudirohusodo Central General Hospital. This flow map details the stages of service from the arrival of patients to the transfer process to the inpatient ward. VSM is used to identify activities that add value (Value Added/VA) and those that do not add value (Non-Value Added/NVA), as well as various types of waste that occur in the service flow. Through this mapping, the hospital can clearly see the points that cause delays, bottlenecks, and inefficiencies in the ED service process. This information serves as an important foundation for continuous improvement in enhancing the quality of service and accelerating response times to the needs of emergency patients.

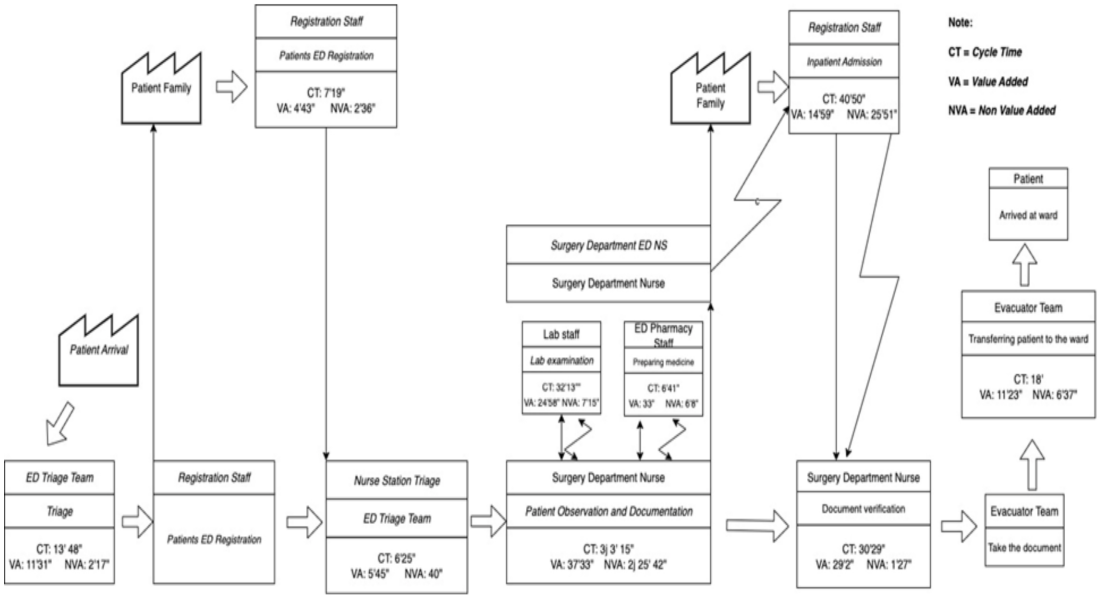

Figure 3. Value Stream Mapping (VSM) of Emergency Department Service Process.

DISCUSSION

Services in the Emergency Department (ED) are characterized by fast response times and a high level of interprofessional coordination. However, the findings of this study indicate that service efficiency in the ED still faces significant challenges, especially regarding waiting times and non-value-added (NVA) activities. Based on the mapping of the service flow using Value Stream Mapping (VSM), it was found that the patient service process goes through ten main stages, starting from arrival and visual triage to administrative processes and transfer to the inpatient ward. Although structurally the service stages have proceeded according to procedure, further analysis shows that most of the service time is spent on activities that do not provide direct value to the patient.

The average length of stay for patients in the ED at Dr. Wahidin Sudirohusodo Central General Hospital was recorded at 3 hours, 59 minutes, and 21 seconds, with the fastest handling time at 2 hours, 15 minutes and 17 seconds, and the longest time reaching nearly 8 hours (7 hours, 54 minutes and 44 seconds). The stage that consumes most of the time is the observation phase, especially when patients must wait for instructions from the attending physician (DPJP). During this period, there are no medical interventions, education,

or active communication with the patient and their family, which makes this time categorized as a non-value-added activity (NVA) under the Lean Thinking approach. Calculations show that about 66.5 % of the total service time falls into the NVA category, meaning that only one-third of the patient's time in the ED is actually used for value-added activities such as examinations, medical procedures, administering medication, or transfer to the inpatient ward.

These findings are consistent with research conducted by Improta et al. (12) in Italy, which showed that most of the patients' length of stay in the ED is spent as passive waiting time due to unintegrated service processes, including in clinical decision-making. Rahman et al. (9) also found that the observation phase and waiting for decisions from the attending physician are critical points contributing to the most extended length of stay, especially in teaching hospitals that apply a tiered consultation system. In addition, Naidoo and Mahomed (10) reported that inefficiencies in inter-unit coordination and delays in administrative processes can cause over 60 % of the patient's time to be spent in non-productive activities, similar to the conditions in this study. Therefore, these data confirm that waiting time during the observation phase is a dominant source of waste in ED services and needs to be prioritized in improvement strategies.

These findings are in line with a study by Mailani et al. (11), which found that waiting is indeed a prominent form of waste in the Arifin Achmad Regional Hospital's Emergency Department, Riau, particularly during the observation and inpatient phases. This waiting can manifest as patients waiting for assessment, treatment, or transfer to other units. Lean methodologies, which focus on eliminating waste, can be applied to improve patient flow and reduce these delays (11). Additionally, Improta et al. (12), in research conducted at AORN Cardarelli Hospital, also reported that waste of motion and transportation often occurs due to a lack of internal logistics systems and insufficient delivery staff, resulting in patients' families being actively involved in non-medical processes. Naidoo and Mahomed (10) add that repetitive activities and manual processes prolong service times, reduce healthcare worker productivity, and increase the risk of burnout.

Another fundamental issue identified in this study is the suboptimal implementation of the electronic medical records (e-MR) system. The system used in the Emergency Department of Dr. Wahidin Sudirohusodo Hospital is still hybrid, combining both digital and manual processes, leading to document redundancy and data input duplication. Some forms still must be filled out manually and then re-uploaded into the digital system, or vice versa. This situation not only results in waste in the form of overprocessing and defects but also opens opportunities for recording errors, loss of information, and longer administrative processing times. In addition, communication between units, such as with inpatient wards, pharmacy, and laboratory, has yet to operate optimally. Coordination that should be able to take place in parallel instead occurs serially due to limitations of the integrated information system. This leads to delays in decision-making and in processing follow-up services.

These findings align with Naidoo and Mahomed (10), who indicate that non-integrated information systems result in wasted time, duplicated work, and reduced quality of service coordination. Similarly, Mailani et al. (11), in their study at Arifin Achmad General Hospital, found that an E-MR system not fully supporting the needs of the Emergency Department is one of the main causes of delays in the service process. In this context, non-value-added processes have become part of the fragmented systemic structure rather than merely a technical or incidental issue (10).

Lack of information integration, limited human resources, a dual-document system, and a reactive pattern of inter-unit communication are interrelated factors that exacerbate patient stagnation in the Emergency Department. This supports the principle of Lean Thinking, which emphasizes the importance of identifying and eliminating activities that do not provide added value to patients. Graban (13) asserts that such systemic waste can have a broad impact on the efficiency, quality, and workload of healthcare institutions. The fact that 66.5 % of service time falls under non-value-added activities shows there is significant room for improvement through a Lean approach focused on streamlining processes and strengthening workflow (flow). Therefore, optimizing the information system and enhancing

inter-unit coordination should be among the strategic priorities in improving the quality of Emergency Department services.

In the context of Lean Thinking, these findings highlight the need to reorient emergency department service systems based on the actual needs of patients, as well as the implementation of systematic, ongoing improvements. Improvement strategies should not be limited to workflow redesign alone but should also involve the active participation of healthcare workers in identifying and addressing problems in the field. One opportunity that can be maximized is through morning report activities, which are held routinely every morning. This forum can serve as a participatory discussion platform, where medical and nursing staff can express service obstacles and propose solutions that are both applicable and realistic. This approach aligns with the Kaizen principle in Lean, which emphasizes continuous improvement driven by direct participation from frontline staff (13).

A study by Usman and Ardiyana (14) also emphasized the importance of fostering a collaborative work culture in the emergency department by involving medical personnel in the problem identification and quality improvement decision-making processes. A similar point was raised by Sánchez et al. (15), who stated that the success of Lean in improving the flow of patients in the emergency department is highly influenced by the active involvement of staff in change initiatives and the streamlining of work processes.

In addition to issues related to medical and administrative processes, this study also found significant barriers in the provision of medications at the Emergency Department Pharmacy Depot. Based on observations, during each shift, there are only two pharmacy staff members available, who are responsible not only for prescriptions from emergency patients, but also for those from outpatients. During busy hours, especially on the morning shift, the high workload can cause delays in medication delivery, and in certain situations, requests from the emergency department may be unintentionally overlooked. This is not due to negligence by the staff, but rather because the work system is not yet fully digitalized and the workload exceeds the available human resources.

This situation is consistent with findings by Febrina (16), who stated that a limited number of pharmacy staff and a manual distribution system are the main causes of medication retrieval delays in the emergency department. In addition, Shah et al. (17) concluded in their study that delays in the pharmacy process are one of the systemic factors prolonging patient stays in the emergency department, especially when processes run in parallel without the support of an integrated system. Therefore, strategies are needed to improve pharmacy service efficiency, whether by increasing labor, separating emergency and outpatient service lines, or implementing a pharmacy information system that is directly connected to the emergency department in real time. In this way, patient waiting times can be minimized and the potential for waste can be significantly reduced.

CONCLUSION

Patient services at the Emergency Department of Dr. Wahidin Sudirohusodo General Hospital, Makassar, consist of eight main stages: Triage, Emergency Department Admission Registration, Observation and Documentation, Prescription Processing, Medical Support Examinations, Inpatient Registration, Document Verification, and Patient Transfer to the Inpatient Unit. Analysis shows that value-added activities include registration, examinations, family education, completing the triage form, as well as coordination and patient transfer, all of which support the smooth operation of service processes. Conversely, non-value-added activities include waiting for documents, manual document printing, waiting for doctor instructions, pharmacy queues, and repetitive administrative processes, which do not directly add value for patients and lead to inefficiency.

Value Stream Mapping shows that the highest proportion of value-added activity occurs when the patient arrives (83.8 %) and during the patient transfer to inpatient care (63.7 %). In contrast, the observation and prescription processes show very low levels of value-added activity, at only 22.9 % and 6.6 % respectively. Conversely, activities such as medical support

examinations and inpatient document verification are dominated by non-value-added activities, reaching 94.8 % and 93.4 %, indicating significant waste in the service flow. The most commonly found types of waste include waiting, inventory, motion, overprocessing, and transportation, all of which significantly extend service times and reduce operational efficiency in the Emergency Department.

The proposed recommendations emphasize that for the board of directors and management of Dr. Wahidin Sudirohusodo General Hospital, Makassar, suggested improvements represent ideal solutions that must be supported by the hospital's resource capabilities and commitment, to maintain and enhance service quality as expected, by continuously applying the principles of Kaizen based on monitoring and evaluation results. For educational institutions, it is recommended to conduct training, such as seminars or workshops, on lean hospital management. This should involve all board members and hospital management at the district/city, or provincial level, so that the importance of implementing the lean method can be widely disseminated and collectively implemented. In addition, it is hoped that future researchers can broaden the scope of research by further studying instances of waste in other facilities, such as inpatient and outpatient services, as well as the relationship between emergency services and these aspects, to identify more comprehensive waste points across all aspects of hospital services.

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Authors' Contributions

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