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Research Article

Implementation of Lean Hospital and Continuous Improvement in Reducing Outpatient Pharmacy Waiting Time

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Abstract: Prescription waiting time is a key indicator of pharmacy service quality that directly influences patient satisfaction and hospital efficiency. Data from the Outpatient Pharmacy Installation of Pelabuhan Jakarta Hospital show average waiting times of 30.49 minutes for non-compounded medications and 35.93 minutes for compounded medications. Although these figures are still within national standards, they have not met the hospital's internal targets, indicating inefficiencies that require systematic improvement.This study aimed to analyze prescription waiting times and identify waste in outpatient pharmacy services using Lean Hospital and Continuous Improvement approaches. A qualitative analytical method with a case study design was applied. Data collection involved participatory observation, in-depth interviews with key informants (head of pharmacy, pharmacists, and technicians), and document review. Analysis utilized Lean tools such as Value Stream Mapping (VSM), identification of Value Added (VA) and Non-Value Added (NVA) activities, bottleneck analysis, fishbone diagram, and Failure Mode and Effects Analysis (FMEA).The findings revealed that service processes were dominated by non-value-added activities, especially during prescription receipt, verification, packaging, and dispensing. Major wastes included waiting, motion, and overprocessing. Contributing factors were uneven staff distribution, suboptimal e-prescribing systems, incomplete prescriptions, and lack of standardized procedures. The proposed future state VSM demonstrated potential improvements in reducing waiting time and enhancing service efficiency.

Keywords: Continuous Improvement; Hospital; Lean Hospital; Pharmacy Services; Waiting Time

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1. Introduction

Pharmacy services are a strategic component of hospital healthcare systems, playing a direct role in patient safety and therapeutic outcomes. National regulations, as stipulated in the Indonesian Ministry of Health Regulation No. 72 of 2016, emphasize that pharmaceutical services must be integrated into the healthcare delivery system and oriented toward patient-centered care. According to Donabedian's quality framework, healthcare quality is assessed through the interrelationship between structure, process, and outcomes. In outpatient pharmacy services, the adequacy of human resources, workflow effectiveness, and information technology support are critical determinants of process quality, which ultimately affect patient satisfaction and safety.

One of the most tangible indicators of outpatient pharmacy service quality perceived by patients is medication waiting time. Waiting time reflects operational efficiency and the hospital's capacity to deliver timely and accurate services. Within the SERVQUAL framework, waiting time is closely associated with the dimensions of responsiveness and reliability, both of which strongly influence patient satisfaction. Previous studies have consistently reported that prolonged waiting times are associated with decreased patient satisfaction, increased complaints, and potentially reduced adherence to medication therapy.

To improve efficiency while maintaining patient safety, healthcare organizations have increasingly adopted the Lean Hospital approach and Continuous Improvement (Kaizen). Lean Hospital focuses on eliminating waste within service processes, including waiting time, redundant activities, and non–value-added tasks. This approach has been shown to effectively reduce pharmacy waiting times through workflow redesign and resource optimization. Furthermore, Kaizen promotes continuous, incremental improvements by actively engaging healthcare professionals in quality enhancement initiatives.

However, evidence suggests that the implementation of Lean principles and supporting technologies is not always optimal. Imbalances between pharmacy staffing levels and patient volume, incomplete prescriptions, and suboptimal utilization of electronic prescribing systems remain major challenges in outpatient pharmacy services. Incomplete prescription information often leads to rework, such as repeated clarification with prescribers, which prolongs waiting times and increases the workload of pharmacy staff.

2. Preliminaries or Related Work or Literature Review

Concept of Systems Theory

System Theory was first introduced by Bertalanffy (1950; 1968) through the concept of General System Theory, which explains that an organization is an open system consisting of interrelated and interdependent components working together to achieve specific goals. In the healthcare context, a hospital is viewed as a system composed of subsystems such as medical services, nursing, laboratory, and pharmacy (Bertalanffy, 1968). Each system includes elements of input, process, output, and feedback that must function synergistically. In outpatient pharmacy services, inputs include patients, prescriptions, pharmacists, medications, and facilities; processes involve prescription reception, preparation, verification, and dispensing; while outputs are fast, accurate, and safe medication services. Feedback is obtained from patient satisfaction and waiting time evaluations. According to Checkland (1981), organizations should be viewed holistically, as inefficiencies in one component (e.g., delays in prescription verification or drug stock shortages) will affect the overall system performance.

Furthermore, Avedis Donabedian (1988) developed a system-based approach in healthcare through the input–process–output–outcome model, which is relevant for evaluating the effectiveness of outpatient pharmacy services. This approach is strengthened by Lean Thinking, proposed by Womack & Jones (1997), which focuses on creating value for patients by eliminating waste such as waiting time, unnecessary motion, and overprocessing. The integration of System Theory and Lean Thinking provides a comprehensive conceptual framework: System Theory explains the interrelationships among components at a macro level, while Lean Thinking offers operational tools to improve process efficiency at a micro level. Therefore, improving waiting time in outpatient pharmacy services requires a comprehensive and continuous approach that considers the interconnections among all system components.

Lean Hospital in Pharmacy Services

Lean is one of the key quality improvement methodologies used in organizations, alongside Six Sigma and Theory of Constraints (George, 2003). These approaches are widely adopted due to their effectiveness in improving organizational performance (Coleman, 2012). According to Lawal et al. (2014), Lean is a systematic and continuous approach to identifying and eliminating non-value-added activities (waste) through continuous improvement and value stream mapping. In healthcare settings, Lean aims to maximize patient value by reducing inefficiencies such as waiting time, unnecessary processes, and workflow delays.

The core principles of Lean consist of five key concepts: value, value stream, flow, pull, and perfection (Womack & Jones, 1997). Value is defined from the patient's perspective, while value stream focuses on mapping all processes to distinguish value-added from non-value-added activities. Flow emphasizes smooth and uninterrupted processes, pull systems ensure services are based on actual patient demand, and perfection reflects continuous improvement (Kaizen). In pharmacy services, these principles help reduce waiting times, improve service accuracy, and optimize resource utilization by eliminating waste such as waiting, motion, overprocessing, and excess inventory.

Lean evolves into the concept of Lean Hospital, which according to Graban (2018) is both a management system and a philosophy aimed at improving service quality, patient safety, and operational efficiency through the elimination of waste and errors. Lean Hospital emphasizes two main dimensions: continuous improvement and respect for people, involving

all healthcare staff in ongoing improvement efforts. This approach not only enhances technical processes but also fosters a patient-centered organizational culture. By comprehensively applying Lean principles, hospitals can reduce waiting times, improve service quality, and create more effective, efficient, and sustainable healthcare systems.

Continuous Improvement (Kaizen) in Healthcare Services

Outpatient pharmacy services are an essential part of the hospital healthcare system, focusing on medication therapy management for non-hospitalized patients. These services encompass not only drug dispensing but also consultation, patient education, adherence monitoring, and coordination with other healthcare professionals (George, 2003). This concept aligns with the theory of pharmaceutical care proposed by Hepler & Strand (1990), which emphasizes that pharmaceutical services aim to ensure safe and effective medication use while improving patients' quality of life. In practice, outpatient pharmacy services are continuous and patient-centered, positioning pharmacists in clinical, educational, and collaborative roles to achieve optimal therapeutic outcomes.

Human resources, workload analysis, and facilities and equipment are key factors in the success of outpatient pharmacy services. Pharmacists serve not only as dispensers but also as counselors, educators, and medication therapy managers, requiring strong professional, communication, and managerial competencies. Workload analysis, as recommended by the World Health Organization (2010), is essential to determine appropriate staffing levels based on service volume, case complexity, and working time, thereby improving efficiency and reducing the risk of errors. In addition, the availability of facilities such as dispensing areas, counseling rooms, pharmacy information systems, and technical equipment plays a crucial role in ensuring smooth service flow, enhancing accuracy, and reducing patient waiting times.

The workflow of outpatient pharmacy services includes prescription reception, administrative and clinical verification, medication dispensing, patient education, and therapy monitoring and follow-up. Service quality is commonly assessed using the SERVQUAL dimensions developed by Parasuraman et al. (1988), which consist of tangibles, reliability, responsiveness, assurance, and empathy. The primary objective of outpatient pharmacy services is to ensure rational drug use, enhance patient safety and satisfaction, and support successful therapeutic outcomes. Overall, the scope of these services includes both managerial aspects (medication management) and clinical aspects (direct patient care), which are integrated to deliver effective, efficient, and high-quality healthcare services.

Concept of Drug Waiting Time

Drug waiting time is a key indicator in assessing the efficiency and quality of outpatient pharmacy services in hospitals. Based on the healthcare quality framework proposed by Avedis Donabedian (1980), waiting time is categorized as a process indicator, reflecting how well pharmacy services deliver timely, accurate, and patient-centered care. The shorter the time interval between prescription submission and medication dispensing, the better the quality of the service process. The World Health Organization (2000) also identifies waiting time as part of health system responsiveness, indicating accessibility and the ability of healthcare facilities to respond promptly to patient needs. Furthermore, according to queueing theory developed by Gross (2008), waiting time is influenced by service capacity, patient volume, and workflow efficiency. From a Lean Healthcare perspective, Graban (2015) considers waiting time as a form of waste (waste of waiting) that does not add value to patients and should be minimized through continuous improvement. Additionally, the American Society of Health-System Pharmacists (2013) defines drug waiting time as a performance indicator evaluating the speed and accuracy of prescription verification, preparation, dispensing, and patient counseling. Therefore, effective management of waiting time contributes directly to improved patient satisfaction and overall pharmacy service quality.

Waiting is often the first interaction between patients and healthcare services, and prolonged waiting can lead to discomfort, stress, and negative perceptions of service quality **(Ryan & Valverde, 2003)**. Several factors influence drug service waiting time, including delays caused by workflow interruptions, the complexity of compounded prescriptions compared to non-compounded medications, and limitations in information systems that require manual processes (Wijaya, 2012). Additional factors include the availability, competency, and workload of pharmacy staff; adequacy of facilities and infrastructure; and adherence to policies such as formularies, where non-compliant prescriptions may require additional confirmation with physicians, thereby increasing service time. Other contributing factors identified by Suryana (2018) include insufficient service counters, limited or slow computer systems, inconsistent drug availability, administrative complexities (e.g., insurance/BPJS procedures), and lack of staff familiarity with administrative processes. Overall, these factors can be

grouped into four main categories: human factors (staff quantity, competence, patient type, and discipline), process and procedural factors (service flow, delays, SOP compliance), material factors (drug availability and prescription type), and machine/technology factors (hospital information systems, SOPs, and formularies), all of which collectively determine the efficiency of outpatient pharmacy services.

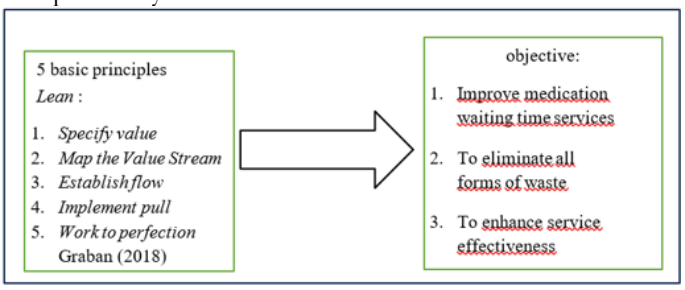

Figure 1. Framework of Thinking.

3. Propose Methode

This study employed a qualitative approach with a case study design to obtain an in-depth understanding of outpatient pharmacy waiting time and the factors influencing it within a real healthcare service context. The research was conducted at the Outpatient Pharmacy Unit of Pelabuhan Jakarta Hospital, allowing for a comprehensive and contextual exploration of pharmacy service processes. The study participants consisted of pharmacy personnel directly involved in service delivery, including pharmacists and pharmacy technicians. Data sources included primary data obtained through direct observations of service processes and in-depth interviews with pharmacy staff, as well as secondary data derived from hospital operational documents such as standard operating procedures (SOPs), waiting time reports, prescription incompleteness data, and patient complaint reports.

Data collection was carried out using multiple techniques to ensure the depth and credibility of the findings, including direct observation of the service flow from prescription receipt to medication dispensing, semi-structured in-depth interviews to explore staff experiences and perceptions, and document review to support and validate the findings. Data were analyzed thematically following the qualitative analysis procedures proposed by Matthew Miles et al. (2014), which include data reduction, data display, and conclusion drawing and verification through triangulation. Within the Lean Hospital framework, the analysis results were used to identify value-added and non–value-added activities (waste) and to formulate improvement strategies based on continuous improvement (Kaizen) principles.

4. Results and Discussion

Overview of Outpatient Pharmacy Services

Outpatient pharmacy services constitute a critical component of the hospital service system, aiming to ensure patient safety and therapeutic success through the provision of accurate, safe, and high-quality medications. These services encompass the processes of prescription receipt and verification, preparation of both ready-to-use and compounded medications, and the dispensing of medications accompanied by patient counseling. At Pelabuhan Jakarta Hospital, the outpatient pharmacy handles a high patient volume with diverse prescription types, necessitating adequate human resources, streamlined workflow, and efficient information systems. However, in practice, several challenges persist, including limited pharmacy staff, incomplete prescriptions, and suboptimal service workflows, which contribute to increased medication waiting times and impact patients' perceptions of service quality and satisfaction.

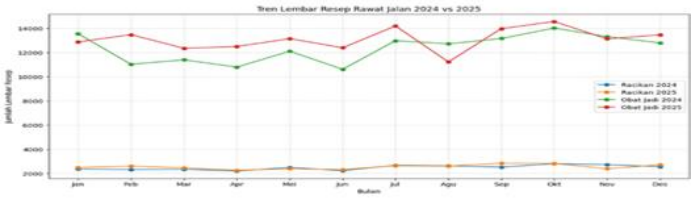

Figure 2. Grafik Trend of Outpatient Prescription Sheets in 2024 and 2025.

The chart shows that the number of outpatient prescription sheets in 2024–2025 was dominated by finished drug prescriptions compared to compounded prescriptions. In 2025, the number of finished drug prescriptions tended to be higher and more fluctuating than in 2024, with notable increases in July, September, and October. Meanwhile, the number of compounded prescriptions remained relatively stable in both years, with smaller fluctuations, although a slight increase was observed in some months of 2025. This pattern indicates an increased workload in outpatient pharmacy services in 2025, particularly for finished drug prescriptions, which could potentially affect waiting times and necessitate improvements in service process efficiency.

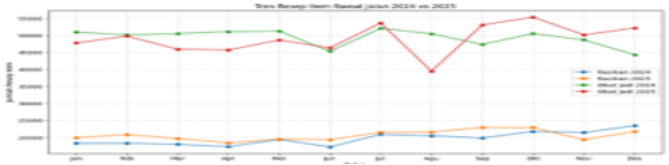

Figure 3. Grafik Outpatient Prescription Item Trends, 2024–2025.

The chart shows that outpatient prescription items in 2024–2025 were dominated by finished drugs compared to compounded prescriptions. In 2025, finished drug items exhibited sharper fluctuations, with a decrease in August followed by an increase in September–October, while compounded items remained relatively stable, showing a tendency to rise in the second half of the year. This pattern indicates an increased workload and complexity in outpatient pharmacy services in 2025, requiring more efficient process management.

Drug Waiting Times for 2024-2025

The average waiting time for outpatient pharmacy services in 2025 tended to be higher than in 2024 for finished drugs, but lower for compounded drugs. The average waiting time for finished drugs increased from 25.00 minutes in 2024 to 28.00 minutes in 2025, which still exceeded the standard waiting time of ≤20 minutes in almost all observation months. Conversely, the average waiting time for compounded drugs decreased from 45.17 minutes in 2024 to 36.87 minutes in 2025, although it still did not consistently meet the standard of ≤45 minutes in several months, particularly January, March, and September. On a monthly basis, the waiting time for finished drugs in both years showed significant fluctuations, with the highest peaks occurring in August and September, indicating an increase in service burden and a potential imbalance between prescription volume and resource capacity. Meanwhile, the reduction in waiting times for compounded medications in 2025 indicates improvements in the compounding and packaging processes, although these stages still have the potential to become bottlenecks during periods with increased service volume.

Identification of Activities in the VSM of Ready-to-Use Prescription Drug Service Process (BPJS) at the Outpatient Pharmacy

Value Stream Mapping (VSM) of the insured compounded drug service at Pelabuhan Hospital Jakarta shows variations in cycle time and waiting time at each process stage. The prescription receiving and verification stage has a relatively short cycle time but is accompanied by a significant waiting time. The drug preparation and labeling processes exhibit lower waiting times, whereas the packaging stage emerges as the main bottleneck, with the highest cycle and waiting times, indicating potential waiting waste that should be prioritized for process improvement.

Identification of Activities in the VSM of Compounded Prescription Service Process under Insurance at the Outpatient Pharmacy

The ratio of value-added to non-value-added activities in the overall drug service process exceeds 30%. According to Vincent (2007), to be considered a lean enterprise, the allowable value-to-waste ratio is 30%. This indicates that the entire existing process has not yet reached the lean enterprise standard.

Identification of the Root Causes of Drug Service Waiting Time at the Outpatient Pharmacy

Figure 4. Identification of the Root Causes of Drug Service Waiting Time.

The output shown in the figure above can be interpreted as the words that frequently appeared in interviews with all informants in this study.

Research Interview Results Using NVivo Software

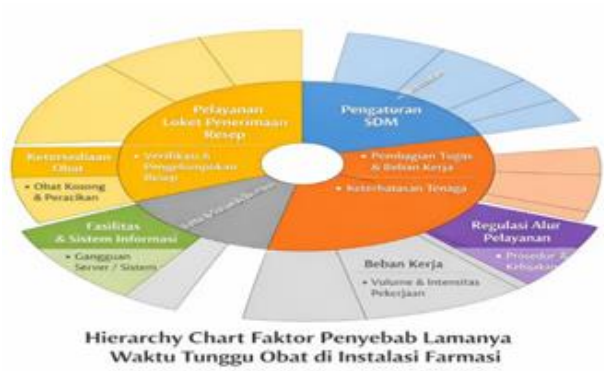

Figure 5. Hierarchy Chart of Factors Affecting Drug Waiting Time.

Based on the analysis using the hierarchy chart, it was found that the duration of drug waiting time in the outpatient pharmacy is influenced by various factors arranged hierarchically according to their level of contribution. The most dominant factors are the service process at the prescription reception counter and human resource (HR) management, particularly related to prescription verification and administration, task allocation, and staff workload. Other factors, such as facilities and information systems, service workflow, and drug availability, also contribute but to a lesser extent. These findings indicate that the issue of drug waiting time is multifactorial, suggesting that improvement priorities should focus on optimizing the prescription reception process and HR management as key steps in reducing service waiting times

Figure 6. Hierarchy Chart of Themes Related to Drug Waiting Time Factors.

Based on the hierarchy chart, the most dominant factors affecting drug waiting time are the service workflow, particularly the prescription verification process, as well as HR management and staff workload. Other factors, such as facilities and information systems, service flow regulations, drug availability, and operational aspects, also contribute but to a lesser extent. These findings indicate that efforts to reduce drug waiting time should prioritize improvements in the prescription verification process and HR management.

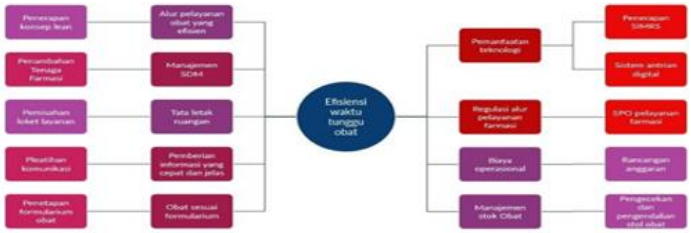

Figure 7. Mind Map of Drug Waiting Time.

The figure illustrates that the efficiency of drug waiting time in pharmacy services is influenced by various interrelated factors, including service processes, human resources, layout, technology, policies, and inventory management. Improving efficiency cannot be achieved through a single intervention but requires an integrated system-based approach grounded in lean principles to reduce non-value-added activities. These findings are consistent with the results of the Value Stream Mapping and qualitative analysis, which identified dominant wastes in waiting, motion, and overprocessing. Therefore, improvement efforts should focus on optimizing service workflow, strengthening human resources, leveraging technology, ensuring formulary compliance, and controlling drug inventory.

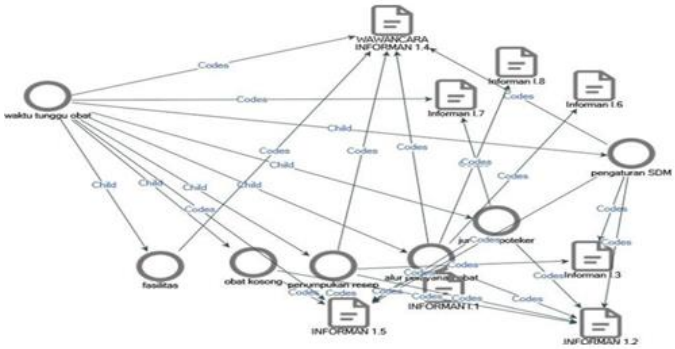

Figure 8. Project Map of Drug Waiting Time.

The NVivo Project Map illustrates that drug waiting time is the main theme influenced by various interrelated causal factors. Prescription backlog and the drug service workflow show the strongest association with waiting time, as they appeared in nearly all informants' responses, making them the dominant causes of service delays. Additionally, human resource management, facilities, and occurrences of drug stockouts contribute to prolonged waiting times through wastes such as waiting, motion, and overprocessing. These findings confirm that the issue of drug waiting time is multidimensional and form the basis for formulating lean healthcare-based recommendations for improving pharmacy services.

Figure 9. Fishbone Analysis of Root Causes of Drug Service in the Outpatient Pharmacy.

The Man (Human Resource) factor indicates that the shortage of pharmacists, discrepancies between the prescribing physician's prescriptions and the formulary, and the absence of structured training directly increase workload, repetitive clarifications, and drug service waiting time. The limited number of pharmacists leads to task overlap, while formulary mismatches trigger repeated verification and prescription adjustments.

Regarding the Machine aspect, suboptimal utilization of the Hospital Information System (SIMRS) means that much of the pharmacy service process is still performed manually and is not integrated, resulting in duplicated checks and delayed communication between units. This contributes to longer waiting times in outpatient pharmacy services.

The Environment factor shows that the layout of the outpatient pharmacy does not support an efficient service flow. Excessive distances between work areas cause back-and-forth movement of staff (motion waste), prolonging the drug service process.

From the Method perspective, the absence of Standard Operating Procedures (SOPs) and service flowcharts leads to process variation, duplicated work, and difficulty identifying non-value-added activities, thereby reducing service efficiency.

Meanwhile, the Material factor relates to limited drug availability due to delayed claim disbursements and a stock control system that is not real-time. This results in drug shortages and service delays, ultimately increasing patient waiting time at the Outpatient Pharmacy of Pelabuhan Hospital – Jakarta.

Discussion

Overview of Outpatient Pharmacy Service Process at the Pharmacy Installation of Pelabuhan Jakarta Hospital

Outpatient pharmacy services at Pelabuhan Jakarta Hospital involve coordination between the polyclinics, pharmacy installation, and cashier, supported by the Hospital Information Management System (SIMRS) and the implementation of electronic prescriptions (e-prescriptions). Although information technology has been applied to support prescription recording and processing, the system is still a combination of electronic and manual processes, particularly for patients covered by the National Health Insurance (JKN). This condition leads to double verification between e-prescriptions and physical prescriptions, which may prolong service time.

Observations indicate that the outpatient pharmacy workflow is not fully streamlined due to limited SIMRS integration between units and occasional system disruptions. Real-time coordination between the polyclinic, pharmacy, and cashier is not yet optimal, requiring pharmacy staff to manually reconfirm information before dispensing medication to patients. This situation results in increased waiting times, especially during peak service hours.

In general, the service workflow begins with prescription reception, verification through SIMRS, preparation, packaging, and ends with medication dispensing to patients. Differences in the workflow mainly occur in the initial stage depending on the payment method (cash or insurance), while the stages from preparation to dispensing are relatively similar. Although the implementation of SIMRS and e-prescriptions provides benefits in speeding up services, technical constraints and system desynchronization remain major factors affecting outpatient pharmacy service waiting times.

Non-Value Added Activities Using Value Stream Mapping at the Outpatient Pharmacy, Pharmacy Installation, Pelabuhan Jakarta Hospital

Value Stream Mapping (VSM) is used as a lean approach to visualize the pharmacy service workflow and identify waiting times as well as non-value added activities. Based on observations at the Outpatient Pharmacy of Pelabuhan Jakarta Hospital, medication services are categorized into ready-to-use (finished) medicines and compounded medicines under the BPJS insurance system, which were analyzed using a current state VSM.

The VSM mapping for BPJS-covered finished medicines shows that the prescription verification stage has the longest cycle time and waiting time. This is caused by repeated clarifications with the attending physician (DPJP) due to formulary discrepancies, drug availability, and insurance administrative verification, making the verification stage the main bottleneck in the service process.

Meanwhile, in the VSM of BPJS-covered compounded medicines, the drug packaging stage is identified as the most dominant process contributing to waiting time and non-value added activities. The duration of this process is influenced by the complexity of compounding, limited staff availability, and task overlapping among pharmacy personnel. These findings indicate that prescription verification and drug packaging stages are the primary priorities for improvement efforts aimed at reducing waiting time and enhancing outpatient pharmacy service efficiency based on Lean Hospital principles.

Identification of Waste Types in Non-Value Added Activities at the Outpatient Pharmacy, Pharmacy Installation, Pelabuhan Jakarta Hospital

From a Lean Hospital perspective, waste refers to non-value added activities that do not provide benefits to patients or the organization. According to Graban (2015), waste can be categorized into Type 1 waste (necessary non-value added), which is difficult to avoid due to safety and regulatory requirements, and Type 2 waste, which can be eliminated through process improvements. The eight common types of waste include waiting, overprocessing, defects, motion, transportation, inventory, overproduction, and underutilized human potential.

Current state VSM mapping at the Outpatient Pharmacy of Pelabuhan Jakarta Hospital shows that both Type 1 and Type 2 waste occur across nearly all stages of medication service, from prescription reception to medication dispensing. Type 1 waste generally involves clinical and administrative clarifications required for patient safety and regulatory compliance, while

Type 2 waste is dominated by waiting, duplicated processes, unnecessary motion and transportation, and underutilized human resources.

At the prescription reception counter, Type 2 waste is primarily waiting due to queues and combined service functions, while Type 1 waste appears as motion associated with administrative verification and prescription clarification. At the verification counter, Type 1 waste manifests as defects and motion resulting from prescription-formulary discrepancies and limited system integration, whereas Type 2 waste occurs as overprocessing and waiting due to double verification and delayed prescription flow.

In the medication preparation section, Type 2 waste in the form of waiting is the main contributor due to workload imbalance and stock availability constraints. The labeling and packaging stages demonstrate a combination of Type 1 waste (extra processing and defects) and Type 2 waste, including waiting, transportation, and underutilized personnel, resulting from fragmented processes and duplicated checks. Meanwhile, at the compounding and dispensing counters, Type 2 waste—such as waiting, motion, and transportation—emerges due to facility layouts that do not support continuous workflow.

Overall, these findings emphasize that Lean Hospital implementation at Pelabuhan Jakarta Hospital should focus on standardizing workflow, integrating information systems, balancing workloads, and redesigning service layouts. Such efforts are expected to reduce Type 2 waste without compromising patient safety inherent in Type 1 waste, thereby improving waiting time efficiency and the quality of outpatient pharmacy services.

Identification of Root Causes of Medication Service Waiting Time through Fishbone Analysis at the Outpatient Pharmacy, Pharmacy Installation, Pelabuhan Jakarta Hospital

Based on root cause analysis using a fishbone diagram, the main factors contributing to prolonged waiting times in the Outpatient Pharmacy at Pelabuhan Jakarta Hospital are grouped into five key aspects: human resources (man), work methods (method), facilities and technology (machine), materials, and work environment (environment). These factors interact and collectively contribute to waste in the pharmacy service workflow. From a Lean Hospital perspective, fishbone analysis plays a crucial role in identifying the underlying causes of process inefficiency, enabling targeted improvement interventions.

In the human resources aspect, the main issues include a limited number of active pharmacists, high workload during peak hours, low compliance of attending physicians (DPJP) with formularies, and the absence of structured Lean Hospital-based training. These conditions trigger waiting, rework, and overburden, directly affecting service waiting time. The method aspect is characterized by the lack of standardized operating procedures (SOPs) and standardized service flowcharts, resulting in work variations, duplicated processes, and inconsistent service flow.

In the machine aspect, limited supporting facilities such as automated queue systems, computers, and unstable internet networks hinder smooth data input and verification, leading to waiting and overprocessing. The material aspect relates to suboptimal medication availability due to delayed insurance claims and underutilization of the pharmacy information system (SIMRS), resulting in waste in the form of waiting and excess inventory. Meanwhile, the environment aspect includes the pharmacy layout and the absence of visual service displays, which do not support continuous workflow, thereby increasing motion and waiting waste.

Overall, the fishbone analysis indicates that the prolonged medication service waiting time at Pelabuhan Jakarta Hospital is multidimensional and requires integrated interventions. These findings form the basis for Lean Hospital-based improvement proposals focusing on strengthening human resources, standardizing processes, optimizing technology and information systems, improving inventory management, and redesigning the work environment to reduce non-value added activities and enhance the quality of outpatient pharmacy services.

Uji T (Paired Sample T-Test)

Tabel 1. Paired Samples Test.

Variabel	Mean (Menit)	N	N	Std. Deviation
Waiting Time for Pre-Lean Drugs (2024)	**25,00**		**12**	**3,56**
Post Lean Drug Waiting Time (2025)	**28,20**		**12**	**4,29**

The results of the paired sample t-test indicate a statistically significant difference in waiting times for finished medicines before and after the implementation of Lean Hospital (mean difference = –3.20 minutes; t = –2.78; df = 11; p = 0.018). The negative mean difference indicates that the average waiting time during the post-intervention period was higher

than during the pre-intervention period. Although the difference is statistically significant, the direction of change reflects an increase in waiting time, suggesting that Lean Hospital and Continuous Improvement have not yet been effective in reducing outpatient pharmacy waiting times. These findings indicate the persistence of non-value added activities and process bottlenecks, emphasizing the need to strengthen Lean implementation through workflow redesign, process standardization, and control of service variation.

Tabel 2. Std Deviation .

Variabel	Mean (menit)	N	Std.Deviation
Waiting Time for Pre-Lean Drugs (2024)	**25,00**	**12**	**3,56**
Post Lean Drug Waiting Time (2025)	**28,20**	**12**	**4,29**

Descriptive statistics indicate that the mean waiting time for compounded medicines decreased from 45.17 minutes (SD = 6.11) in the pre-Lean period (2024) to 36.87 minutes (SD = 4.88) in the post-Lean and Continuous Improvement period (2025). The reduction in mean waiting time by 8.30 minutes, accompanied by decreased variability, suggests that the compounded medication service process became more efficient and stable. These findings indicate that Lean Hospital implementation has begun to effectively reduce non-value added activities and improve workflow and coordination in the compounding and dispensing processes

Tabel 3. Paired Samples Correlations.

Variabel	N	Correlation	Sig.
Pre Lean & Post Lean Medicine So	12	0,742	0,006

Correlation analysis of 12 paired observations yielded a correlation coefficient of 0.801 with a significance value of 0.002 ($p < 0.05$), indicating a very strong and statistically significant positive relationship between compounded medicine waiting times before and after Lean Hospital implementation. This finding suggests that waiting time patterns remained relatively consistent across periods, implying that structural issues such as process bottlenecks and limited compounding capacity continue to influence service performance despite Lean interventions. Therefore, stronger and more targeted Lean Hospital and Continuous Improvement efforts are required to eliminate non-value added activities and reduce process barriers to achieve optimal and sustainable waiting time improvements.

Tabel 4. Paired Samples Test.

Paired Differences	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre – Post Finished Drugs	-3,20	3,98	1,15	-2,78	11	0,018

The paired sample t-test results demonstrate a statistically significant reduction incompounded medicine waiting times following the implementation of Lean Hospital and Continuous Improvement. The mean reduction of 8.30 minutes ($t = 5.32$; $df = 11$; $p < 0.001$) indicates that waiting times during the post-Lean period were significantly lower than during the pre-Lean period. These findings suggest that the Lean interventions implemented such as workflow simplification, elimination of non-value added activities, and bottleneck control were effective in improving the efficiency of outpatient pharmacy services.

Tabel 5. Summary of Paired Sample T-Test Results.

Type of Service	Mean Pre	Mean Post	Sig. (2-tailed)	Decision
Prescription Drugs	25,00	28,20	0,018	Ineffective
Prescription Drugs	45,17	36,87	0,000	Effective

The comparison of the effectiveness of Lean Hospital and Continuous Improvement implementation shows contrasting results between finished medicine and compounded medicine services. For finished medicines, the average waiting time increased from 25.00 minutes in the Pre-Lean period to 28.20 minutes in the Post-Lean period, with a statistically significant difference ($p = 0.018$), indicating that Lean interventions were not yet effective. In contrast,

for compounded medicines, the average waiting time decreased significantly from 45.17 minutes to 36.87 minutes ($p < 0.001$), demonstrating the effectiveness of Lean implementation in improving service efficiency. These differences suggest that the impact of Lean Hospital depends on process characteristics, where services with higher complexity and a greater proportion of non-value added activities—such as compounded medicines—are more responsive to Lean interventions than finished medicine services.

This study demonstrates that the implementation of Lean Hospital and Continuous Improvement has differing impacts on outpatient pharmacy service waiting times depending on the type of service provided. For compounded medication services, Lean Hospital implementation was proven effective in significantly reducing waiting times, reflecting successful elimination of non-value added activities and improvement of complex process workflows. In contrast, for finished medication services, Lean Hospital implementation did not show performance improvement and was associated with an increase in waiting time, although the difference was statistically significant.

These findings indicate that the effectiveness of Lean Hospital is strongly influenced by the characteristics of the service process. Therefore, Lean strategies should be designed in a specific and contextual manner according to service complexity and supported by sustained continuous improvement efforts to achieve optimal efficiency in outpatient pharmacy services.

5. Comparison

The findings of this study demonstrate that the implementation of Lean Hospital principles combined with Continuous Improvement strategies is highly effective in improving outpatient pharmacy service performance, particularly in reducing waiting time. Compared to conventional service approaches, which often involve complex workflows and unstructured processes, the lean approach provides a more systematic method for identifying inefficiencies such as waiting time, unnecessary motion, and process delays. By streamlining workflows, optimizing human resources, and eliminating non–value-added activities, pharmacy services become more efficient, responsive, and patient-centered.

In comparison, before the application of Lean principles, pharmacy services tended to rely on fragmented processes, manual systems, and limited coordination, which contributed to longer waiting times and lower patient satisfaction. However, after implementing improvements such as better task distribution, enhanced communication, and the adoption of e-prescribing systems, service delivery became faster, more accurate, and more integrated. These results indicate that Lean Hospital and Continuous Improvement not only improve operational efficiency but also foster a culture of quality and ongoing service enhancement within healthcare organizations.

6. Conclusions

Based on the study findings, the implementation of Lean Hospital principles and Continuous Improvement strategies plays a significant role in improving the efficiency of outpatient pharmacy waiting times at Pelabuhan Jakarta Hospital. Improvements in workflow, optimization of human resources, utilization of technology, and elimination of non–value-added activities (waste) contribute to better service performance and increased patient satisfaction. The identification of waste revealed the presence of waiting time, unnecessary motion, and process inefficiencies, particularly during prescription verification and medication preparation. In addition, the adequacy and distribution of pharmacy staff, the completeness and accuracy of prescriptions, and the implementation of an e-prescribing system were found to significantly enhance service speed and operational effectiveness.

Overall, the application of Lean Hospital supported by Continuous Improvement has a positive impact on reducing medication waiting times and improving service quality. Continuous improvement efforts foster a more efficient, responsive, and patient-centered work culture. Therefore, this approach can serve as an effective management model for enhancing outpatient pharmacy services, with consistent and sustainable implementation recommended as part of hospital quality improvement strategies.

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