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Improving Service Process Quality at Hospital Pharmacy Using Lean Management

Grace Faskarina Sembiring, Sahat Saragi, Rafrini Amyulianthy

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Abstract: Efficient pharmaceutical services are vital to hospital care quality. This study addresses process inefficiencies at RSIA Viola Bekasi's pharmacy, including SOP non-compliance, long wait times, and poor stock management. Using a qualitative descriptive approach, observations, interviews, and secondary data, Lean Management was implemented collaboratively with hospital leadership. Pre-intervention, compounded prescriptions averaged 30–45 minutes; non-compounded, 15–20 minutes. Post-intervention, times dropped to 20.17 and 6.5 minutes respectively, improving efficiency by 33%–68%. Lean practices also reduced waste, improved flow, and optimized inventory through JIT and FEFO systems. Results show Lean Management effectively enhances pharmacy operations, service quality, and patient satisfaction, offering practical evidence for its application in Indonesian maternal and child healthcare settings.

Introduction

Pharmaceutical services are an integral part of the hospital healthcare system, playing a strategic role in ensuring the availability, safety, quality, and affordability of medications for patients (1). According to Regulation No. 72 of 2016 of the Indonesian Minister of Health, concerning Pharmaceutical Service Standards in Hospitals, the Pharmacy Department is required to provide professional and accountable services to support the overall quality of healthcare (2, 3). The effectiveness and efficiency of pharmaceutical services not only affect patient satisfaction but also significantly contribute to the operational sustainability of hospitals (4, 5).

To improve the quality of pharmaceutical services, the Lean Management approach presents a promising solution (6, 7). Lean Management is a process improvement methodology that focuses on eliminating waste and increasing value-added activities within a system (8). This approach has been widely implemented in the healthcare sector, including pharmaceutical services, and has proven effective in reducing waiting times, streamlining workflows, and enhancing resource utilization (9-12). Several studies have reported that the application of Lean Management in pharmacy services can reduce waiting times by up to 66% and significantly improve patient satisfaction (13).

One hospital with rapidly developing maternal and child healthcare services and a high volume of daily patient visits is Viola Bekasi Mother and Child Hospital. This condition requires pharmaceutical services that are fast, accurate, and efficient to meet patient needs and support the hospital's clinical workflows. Additionally, RSIA Viola had identified several operational challenges in its pharmaceutical services, including prolonged waiting times, inconsistent adherence to standard operating procedures, and inefficient management of drug inventory. These issues presented a strategic opportunity to apply Lean Management principles and reduce waste, thereby enhancing value-added activities for patients.

Given these characteristics, RSIA Viola Bekasi offers a relevant and practical context for evaluating the effectiveness of Lean Management in enhancing the quality of pharmaceutical service processes within a hospital setting. Internal data indicate that, before any improvements, the average waiting time for compounded prescriptions ranged from 30 to 45 min, while non-compounded prescriptions required 15 to 20 min. This condition indicates non-compliance with pharmaceutical service standards and may lead to decreased patient satisfaction and overall service efficiency (14). Several contributing factors have been identified, including suboptimal queuing systems, limited pharmaceutical staff, and poorly structured medication stock management.

Based on these issues, this study aims to analyze the implementation of Lean Management in improving service quality in the Pharmacy Department of RSIA Viola Bekasi. The primary focus is on optimizing prescription waiting times, reducing waste in work processes, and enhancing outpatient satisfaction. Through a comprehensive evaluation, this study is expected to provide practical insights for developing a more effective and patient-centred pharmaceutical service model.

Methodology

This study employs a qualitative research approach with a descriptive-exploratory design, aiming to explore in depth

the phenomenon of waste in the operational processes of pharmaceutical services at the Pharmacy Department of RSIA Viola Bekasi, located at Pondok Ungu Permai, Sektor V A1 No. 22–26, Bekasi, West Java, from October to December 2024. Before conducting the research, formal permission was obtained from RSIA Viola Bekasi through a letter of approval issued by the hospital's management (Letter No. 021/RSIA-VB/PKM/I/2024). In addition, ethical clearance and institutional approval were obtained from the Farmacy Research Ethics Committee of Pancasila University, as per approval letter number 032/EC/Farmasi Universitas Pancasila X/II/2024. These approvals ensured that the study adhered to the ethical standards and institutional policies for conducting research involving healthcare facilities and personnel. Examples of waste waiting are patients or nurses waiting for a long time because drugs are not available due to manual prescription input queues or delays in prescription verification by pharmacists, or waste transportation, such as pharmacists having to go back and forth from outpatient depots to central pharmacy warehouses to pick up medicines because stocks are incomplete. Furthermore, it aims to assess the implementation of Lean Management in enhancing the effectiveness and efficiency of these services.

The study participants included pharmaceutical personnel and hospital management, such as the Director, Medical Support Manager, Quality Committee, Head of the Pharmacy Department, and Pharmacy Technicians with at least one year of relevant work experience. In addition, the sample included outpatients who received pharmaceutical services during the study period.

A purposive sampling technique was employed to select pharmaceutical staff and hospital management, while random sampling was used for outpatients to obtain more objective perspectives on service quality (15, 6). The inclusion criteria encompassed staff members who had worked for at least one year, were involved in pharmaceutical services, and had an understanding of the Lean Management approach. For patients, inclusion required willingness to participate and provision of informed consent. Exclusion criteria for study participation included staff who were unwilling to participate in Lean-related activities, patients with communication barriers or medical conditions that prevented comprehension of the questionnaire, and medical records that were incomplete or deemed irrelevant to the pharmacy workflow analysis.

Before the implementation of Lean Management, the pharmacy installation at RSIA Viola Bekasi used a conventional service model characterized by sequential, paper-based prescription processing and minimal integration between pharmaceutical and clinical workflows. This approach often resulted in prolonged waiting times, redundant administrative steps, and inefficiencies in inventory handling. Lean Management was introduced in January 2023 and applied continuously for three months before outcome observations and evaluations began. During this preparatory phase, baseline data on service times, inventory flow, and patient satisfaction were collected to enable a before-and-after comparison. Before implementation, comprehensive training sessions were conducted for all pharmacy staff, covering core Lean principles, the use of Value Stream Mapping (VSM), the application of Just-in-Time (JIT) and First Expired First Out (FEFO) inventory strategies, and the identification of non-value-added activities. The training was delivered in both workshop and hands-on formats, aiming to build internal capacity for Lean execution and sustainment.

Data Collection

Data were collected using in-depth interviews, participant observation, and document review. Interviews were conducted with key stakeholders to understand the hospital's strategies for improving pharmaceutical service quality through Lean Management. Observations focused on identifying value-added (VA) and non-value-added (NVA) activities within the pharmacy workflow. Value-Added (VA) activities are activities that directly benefit patients or healthcare customers. This activity alters the form, function, or characteristics of a product or service to ensure it aligns with the patient's needs and expectations. Activities can be categorized as value-added if the customer is willing to pay for the process. If the activity is eliminated, it will affect the quality or outcome of the service that the patient receives. Examples in pharmaceutical services include the process of compounding drugs according to doctors' prescriptions, providing education to patients on how to use their medications, and the timely and accurate delivery of drugs to service units.

On the other hand, Non-Value-Added (NVA) activities are those that do not provide direct benefits to patients and, if eliminated, will not significantly impact the quality of service. These activities generally only add time, cost, or effort to the process without providing the value that the patient feels. Examples include waiting for unverified prescriptions, repetitive data input in different systems, or searching for drugs due to inefficient arrangements. The assessment of whether an activity includes VA or NVA is generally viewed from the perspective of hospital management, which includes doctors, nurses, pharmacists, administrative staff, and information systems. Secondary data included prescription waiting times, patient satisfaction levels, and service quality indicators before and after the implementation of Lean Management (9, 10, 17, 18).

Data Analysis

Data were analyzed using Miles and Huberman’s interactive model, which involves three main steps: data reduction, data display, and conclusion drawing/verification (19). In the data reduction phase, relevant data related to waste and the impact of Lean Management were filtered, selected, and summarized. Redundant or irrelevant data were excluded to focus the analysis.

In the data display phase, reduced data were organized into narratives, tables, and Value Stream Mapping (VSM) diagrams to illustrate the pharmacy service process before and after Lean Management implementation. Finally, conclusions were drawn and verified by identifying patterns, relationships, and the overall effectiveness of Lean practices in enhancing service efficiency and quality. To strengthen data validity, source and method triangulation was applied by comparing findings from interviews, observations, and document reviews (20).

Results and Discussion

This sub-chapter presents the results of research that focuses on the identification and assessment of VA and NVA

Table 1. Value assessment outpatient pharmacy service activities.

No.	Type of Activity	Action Category	Cycle Time (Minute)	Lead Time (Minute)	Free time (Minute)
1	Patient receives prescription from doctor (manual)	VA	1	1	0
2	Patient submits prescription to pharmacy depot (manual)	NVA	2	2	0
3	Prescription received and verified by pharmacist	VA	5	10	5
4	Waiting for prescription verification queue	NVA	3	5	2
5	Prescription are corrected if there are any errors	NVA	3	7	5
6	Input data into the system for recording stock and creating patient bills	NVA	5	8	3
7	Taking drugs from stock or compounding drugs	VA	3	7	3
8	Waiting in line for drug delivery	NVA	5	15	0
9	Patient education regarding drug use	VA	3	7	5
10	Patient receives medication and leaves pharmacy	VA	1	1	0
Total Time (Minutes)			31	63	23
Average (Minutes)			**3.5**	**8.5**	**4.5**
Note: NVA = Non-value added and VA = value added.					

Table 2. Value assessment of outpatient pharmacy service activities.

Action Category	Doctors & Nurses	Pharmacy	Administration & Information Systems	% Activity
Value Added Activities (Minutes)	8	15	-	30%
Non-Value Added Activities (Minutes)	-	47	8	70%
Total Time (Minutes)	**8**	**62**	**8**	**100%**

in the operational process of pharmaceutical services at the Pharmacy Installation of RSIA Viola, Bekasi City. This assessment is conducted to evaluate the extent to which the activities can make a meaningful contribution to improving the quality of pharmaceutical services, as well as identify potential waste that can be reduced or eliminated. Activities that fall under the VA category are those that directly benefit patients and cannot be eliminated without affecting service outcomes. Meanwhile, activities categorized as NVA are activities that do not add value from the patient's point of view and have the potential to increase the burden of time, cost, or effort. The results of this identification are expected to be the basis for continuous improvement and the application of lean principles in the operational management of hospital pharmaceutical installations.

Value Assessment Outpatient Pharmacy Patient Service Activities

Based on **Table 1**, the pharmaceutical service process flow at Viola Hospital has a Lead Time of 63 min, with a total Cycle Time of 31 min and Free Time (NVA) reaching 23 min or 36.5% of the total Lead Time. The high proportion of Free Time indicates inefficiencies in the pharmaceutical service system that can impact patient experience and the operational effectiveness of the hospital. Several main factors contributing to this inefficiency include queues in prescription verification, prescription corrections due to inconsistencies, and long queues in distributing drugs to patients. The prescription verification process takes an average of 10 min in Lead Time, while the verification queue adds 5 min, causing an accumulation of patient waiting time. Additionally, prescription corrections that occur in some cases can increase the waiting time by up to 7 min. Drug distribution is one of the stages with the longest waiting time, which is 15 min, and significantly contributes to the total Lead Time.

The management of RSIA Viola recognizes that optimizing time in pharmaceutical services is a top priority, as patient waiting time has a direct impact on service satisfaction. The Director of RSIA Viola emphasized that efficiency in the pharmaceutical process can be improved through the implementation of information technology and workflow optimization. In addition, the Medical Support Manager also emphasized the importance of synergy between units to overcome obstacles to delays in drug verification and distribution. Improved coordination and integration of the pharmaceutical information system are expected to significantly reduce patient waiting times.

According to **Table 2**, the total time used in the pharmaceutical service process at Viola Hospital was 78 min, comprising 8 min for doctors and nurses, 62 min for the pharmacy, and 8 min for administration and information systems. Of the total time, only 30% or around 23 min were value-added activities, while 70% or 55 min were non-value-added activities. The majority of time that did not provide added value occurred in the pharmacy section, which was 47 min, indicating potential inefficiencies in drug distribution, prescription verification, or service queues. Additionally, 8 min of non-value-added time were also identified in the administration and information systems process, which was likely caused by delays in data recording or validation.

The Director of RSIA Viola is aware of the high proportion of non-value-added time in the pharmaceutical service process. He has emphasized that management is seeking solutions to optimize efficiency. In his statement, he emphasized that long pharmaceutical service times can have

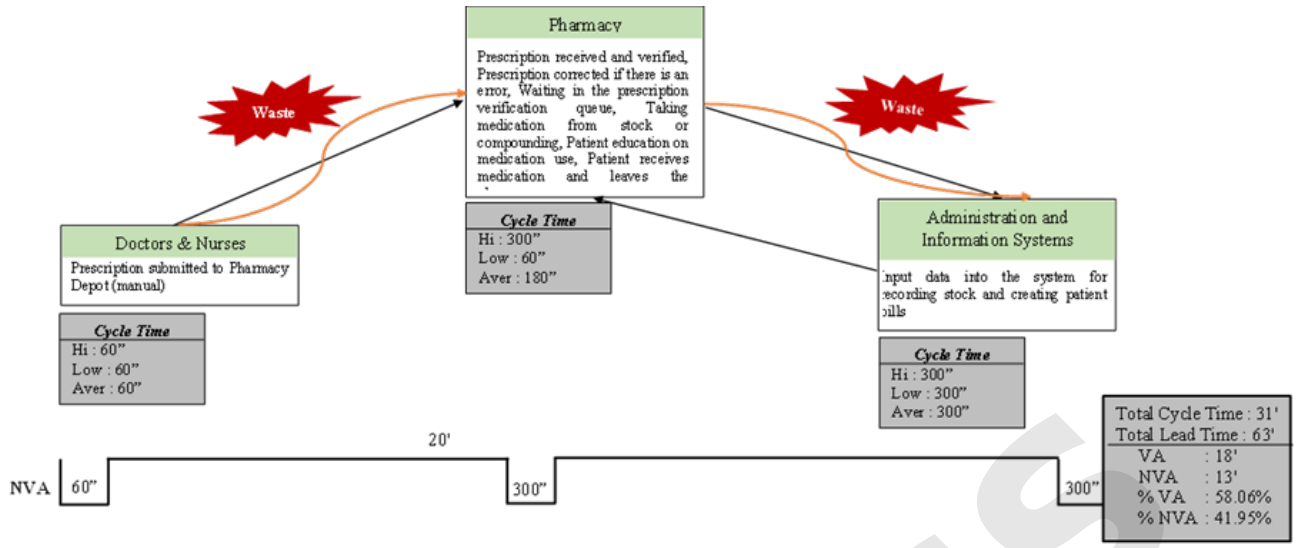

Figure 1. Current value stream mapping (VSM) outpatient prescription service activities.

Table 3. Waste in outpatient pharmacy service activities.

No	Type of Waste (what)	Source of Waste (where)	Reason for occurrence (why)
WAITING			
1	Waiting for the prescription verification queue	Pharmacy and Doctor Depot	Limited number of pharmacists, long patient queues, and manual verification processes
2	Waiting in line for drug delivery	Pharmacy Depot	The drug distribution flow is not optimal; there are many patients at one time
TRANSPORTATION			
3	Patient submits prescription to pharmacy depot (manual)	Doctors and Nurses	Patients have to move locations to submit prescriptions manually
4	Taking drugs from stock or compounding drugs	Pharmacy Warehouse	The drug storage location is not optimal or requires additional steps.
DEFECT			
5	Prescription received and verified by pharmacist	Pharmacy Depot	Errors in prescription writing by doctors or non-compliance with SOP
6	Patient education regarding drug use	Pharmacy Depot	Unclear education causes patients to ask questions again or take the wrong medication.
OVERPROCESSING			
7	Prescriptions are corrected if there are any errors	Pharmacy and Doctor Depot	Prescriptions do not always comply with the formulary or there are errors in the doctor's input.
8	Input data into the system	Hospital Information System	The stock recording and billing system still requires manual input

a direct impact on patient satisfaction. Therefore, the Lean Management strategy is implemented to reduce non-value-added time by accelerating the verification process, optimizing the pharmaceutical information system, and improving coordination between units. These steps are expected to expedite the delivery of drugs to patients without compromising safety and accuracy in pharmaceutical services.

Based on **Figure 1** presented, the pharmaceutical service process at Viola Hospital still faces inefficiencies that cause waste. The process begins when doctors and nurses manually submit prescriptions to the pharmacy depot, with an average Cycle Time of 60 s. Furthermore, the pharmacist verifies the prescription, corrects any errors, validates the queue, dispenses the medicine, educates the patient, and ensures the medicine is delivered, with an average Cycle Time of 180 s. After that, the administration and information system input the prescription data into the system for recording stock and making patient bills with an average Cycle Time of 300 s. The diagram also highlights the waste of time at the pharmacy and administration stages, which causes non-value-added time (NVA) to account for 41.95% of the total process time, equivalent to approximately 13 min of the total Lead Time of 63 min.

One of the leading causes of waste is the queue in the prescription verification process at the pharmacy and the delay in data input in the administration system. From this analysis, it can be concluded that the efficiency of the pharmacy service process can still be improved, considering that the total Lead Time reached 63 min, with a total Cycle Time of 31 min, where only 58.06% of the activities provided added value. To reduce patient waiting time and increase

efficiency, several improvement steps can be taken, such as accelerating prescription verification through digitalization or a more efficient queue system, optimizing data input in the administration system so that it does not become an obstacle in pharmacy services, and reducing wasted time in queues and prescription corrections through more accurate and automatic validation. By implementing the principles of Lean Management, RSIA Viola can reduce non-value-added activities and accelerate the pharmacy service process to increase patient satisfaction.

Root Cause Analysis in Outpatient Pharmacy Service Activities

The analysis of service flow at the pharmacy revealed multiple categories of waste that contribute to inefficiency and delays (see **Table 3**). A key issue is excessive waiting, particularly during prescription verification and drug delivery, which is linked to staffing limitations, manual procedures, and high patient volume. Transportation-related waste also emerged, with patients and staff required to move between locations due to manual prescription handoffs and suboptimal drug storage layouts. Defects in the process, such as prescription errors and unclear patient education, further disrupt workflow and risk compromising medication safety. Overprocessing was evident in repetitive corrections and manual data entry, caused by mismatches with formularies and outdated systems. Together, these forms of waste highlight systemic issues in workflow design, staffing, and digital infrastructure that undermine the efficiency and quality of pharmaceutical services.

Standart Time

Table 4 illustrates that the Standard Time, the stages of the pharmaceutical service process at Viola Hospital, include three main categories: doctors & nurses, pharmacy, and administration & information systems. The average time for the doctor & nurse stage is 5 min, with an additional 2 min categorized as Necessary Non-Value Added (NNVA), so that the total standard time reaches 7 min. At the pharmacy stage, the average time for a compounded prescription is 15 min, while for a non-compounded prescription, it is 5 min. All the time at this stage is included in the NNVA category. Meanwhile, the administration & information system stage has an average time of 3 min with an additional 2 min of NNVA, so that the total standard time is 5 min.

Overall, the total standard time for compounding prescription services is set at a maximum of 30 min, with 23 min being the average time and 14 min being categorized as NNVA. Meanwhile, the total standard time for non-compounding prescriptions is set at a maximum of 10 min, with an average time of 8 min and 4 min as NNVA. These data indicate that compounding prescription services take longer than non-compounding services, which may be due to the complexity of compounding and stricter verification requirements.

In an interview with the Director of RSIA Viola, he emphasized the importance of setting standard time standards in the pharmaceutical service process as an effort to improve efficiency and patient satisfaction. This standard serves as a guideline for pharmacists, enabling services to be more structured and measurable, and allowing for performance monitoring and periodic evaluation to minimize time that does not provide added value. In addition, RSIA Viola's management continues to encourage the use of a more integrated information system to accelerate the prescription verification and drug distribution process, enabling pharmaceutical services to run more effectively and improve patient satisfaction.

Outpatient Prescription Service Activity Improvement Flow

Based on the results of the Current Value Stream Mapping analysis, researchers removed several activities that did not provide added value. Therefore, the improvement flow in the patient discharge process was arranged as seen in **Figure 2**.

Time Study

After determining the standard time based on the calculation results, the researcher then socialized the standard time to the staff. This standard is applied in every process of outpatient pharmacy services. To evaluate the implementation of standard time, the researcher conducted two stages of observation (Action Research) on the outpatient prescription service process. The following are the results of the activity time after the implementation of standard time.

As presented in **Table 5**, the Phase 1 data reveal that six patients underwent the service process with varying durations. The fastest processing time occurred in Patients 3 and 6, each taking 10 min. Meanwhile, the longest processing time occurred in Patient 1, which took 21 min.

Overall, the average time required to complete the process at this stage was 15.7 min. Variations in the process length can be attributed to several factors, including the complexity of the patient's case, the readiness of the medical staff, and the efficiency of the administrative system. With further monitoring, efforts can be made to improve efficiency and ensure more consistent service standards.

Table 4. Standart time as a reference for determining the time standards for the pharmaceutical service process at RSIA Viola Bekasi.

Process Stage	Average Time (minutes)	NNVA Average Time (minutes)	Standard Time (minutes)
Doctors & Nurses	5	2	7
Pharmacy (Compounded Prescription)	15	0	15
Pharmacy (Non-Compounded)	5	0	5
Administration & Information System	3	2	5
Total (Compounded Prescription)	23	14	30
Total (Non-Compounded)	8	4	10

Note: NNVA = Necessary non-value added

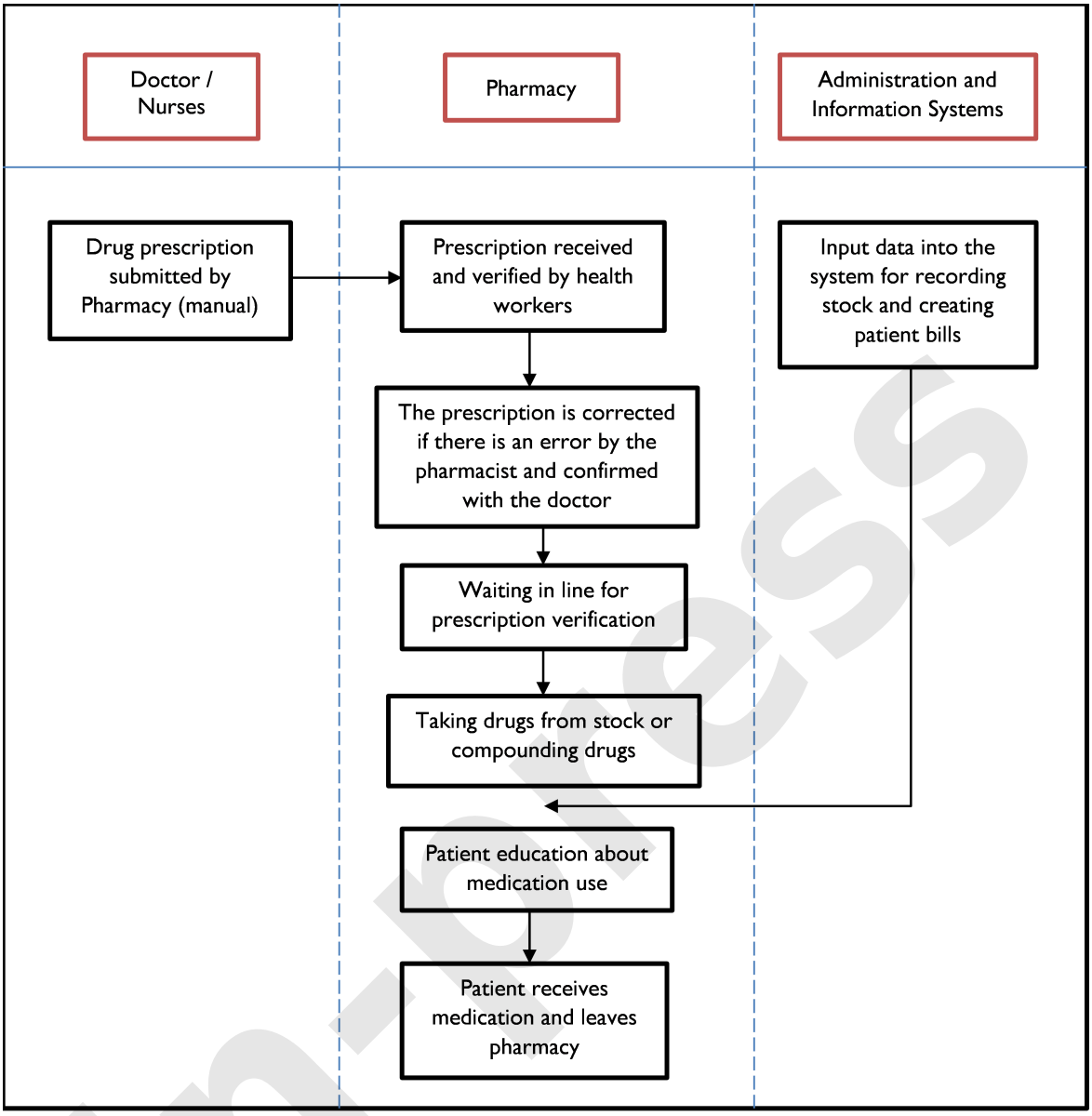

Figure 2. Flowchart for improving outpatient pharmacy services.

Table 5. Time of non-compound prescription service activities for outpatients after lean approach phase 1.

No	Date	Patient	Start Time	Finish Time	Processing Time (minutes)
1	12/01/2025	Patient 1	07:32	07:53	21
2	12/01/2025	Patient 2	09:12	09:27	15
3	12/01/2025	Patient 3	15:45	15:55	10
4	01/13/2025	Patient 4	17:15	17:35	20
5	01/13/2025	Patient 5	08:40	08:55	15
6	01/15/2025	Patient 6	10:20	10:30	10
Average time					15.7

Based on **Table 6**, in Phase 1, the patient service process has a varying duration, with an average completion time of 20.17 min. The longest process time occurred in Patient 4, which took 26 min, while the shortest time occurred in Patients 3 and 6, each with 15 min.

In general, service times show differences between patients, which can be attributed to factors such as case complexity, service queues, and the efficiency of medical personnel and administrative systems. With an average service time of 20.17 min, further evaluation is necessary to identify potential improvements in speeding up the process without compromising service quality.

Based on **Table 7**. explains that after calculating the waiting time after the repair in Stage 1, the average waiting time for prescription services was 20.17 $\pm$ 3.40 min, a significant decrease from the standard time that has been set, which is <30 min, and the waiting time for non-prescription services 15.7 $\pm$ 2.76 is still an increase from the time that has been determined by 5.7 min. From the flow above, several activities are still included in the waste in

Table 6. Time of activity for outpatient prescription service after lean approach phase 1.

No	Date	Patient	Start Time	Finish Time	Processing Time (minutes)
1	12/01/2025	Patient 1	07:35	11:29	25
2	12/01/2025	Patient 2	09:00	10:22	20
3	12/01/2025	Patient 3	15.31	17:35	15
4	01/13/2025	Patient 4	17:10	19:17	26
5	01/13/2025	Patient 5	08:41	10:50	20
6	01/15/2025	Patient 6	10:23	12:36	15
Average time				20.17	

Table 7. Processing time comparison of mixed prescription and non-mixed prescription after Lean Management adoption with standard time.

Prescription Types	Average time (Minutes)	Standard Time (Minutes)	Excess time
Prescription Mix	20.17 $\pm$ 3.40	$\leq$30	Efficient (Appropriate)
Non-Mixed Prescriptions	15.7 $\pm$ 2.76	$\leq$10	5.7 min excess

prescription and non-prescription services, namely:

Waste in Prescription Service

1. The pharmacy confirms the drug with the DOCTOR if the stock is empty (Overprocessing).
2. Waiting for verification and drug preparation (Waiting).
3. Suboptimal placement of drug stock results in longer times in searching for materials (Motion).
4. Excessive drug stock results in storage waste and potential expiration (Inventory).
5. Ineffective officer duty schedules lead to workload imbalances and service delays (Wasteful).

Waste in Non-Prescription Service

1. Less efficient queuing system (Waiting).
2. Data input is done repeatedly or has not been appropriately digitized (Overprocessing).
3. Needs correction due to recording errors or prescription discrepancies with drug stock (Defect).
4. Excessive drug stock results in storage waste and potential expiration (Inventory).
5. Ineffective staff shift schedules cause workload imbalances and service delays (Unused Talent)

After a re-discussion with management, it was found that waste, overprocessing, and inventory remain the primary challenges in pharmaceutical services at RSIA Viola, Bekasi. These three issues have a significant impact on the efficiency of pharmaceutical services, particularly in the processes of verifying prescriptions, recording pharmaceuticals, and managing drug stocks.

Based on the results of the interview with the Director of RSIA Viola, it was stated that the patient waiting time in the verification queue and drug delivery was still quite high, indicating the existence of waste Waiting. In addition, the repetitive recording process and less-than-optimal stock management were also obstacles that needed to be resolved immediately. The Director stated that increasing the efficiency of pharmaceutical services was one of the hospital's top priorities, particularly with the implementation of a more structured system and the utilization of technology to streamline administrative processes.

In line with this, the Medical Support Manager noted that the high waste waiting was caused by a queue system that was not operating efficiently, which had a direct impact on increasing patient waiting times. Meanwhile, waste overprocessing occurred due to repeated data entry and the need for doctor confirmation when discrepancies arose between the prescription and the availability of the drug. On the other hand, waste Inventory is also a significant challenge, especially with the existence of excess stock of certain medications that are at risk of expiring, while several other drugs are often out of stock.

Evaluation in Phase 1 revealed that waste (Overprocessing), waiting, and inventory management remain the primary challenges in the service of compounded and non-compounded prescriptions at Viola Hospital. Patient waiting time in the verification queue and for drug delivery remains high due to the inefficient queue system. At the same time, repeated recording and suboptimal stock management further compromise service efficiency. To overcome this, Viola Hospital aims to optimize the HIS system by implementing an automatic formulary list, introducing an electronic queue system, and enhancing the efficiency of drug stock layout and management based on the First Expired First Out (FEFO) principle. In addition, full integration of HIS with the pharmacy system is expected to reduce Overprocessing in administration. At the same time, the implementation of the fast track and evaluation of pharmacists will accelerate the service of non-compounded prescriptions. The implementation of this strategy will be monitored through periodic assessments and the PDCA method to ensure continuous improvement. The target service times are 30 min for compounded prescriptions and a maximum of 10 min for non-compounded prescriptions, following quality standards.

Based on **Table 8**, the phase 2 data indicate that the patient service process time varies, with an average time of 6.5 min. The fastest service times occurred in Patients 1, 3, and 5, each requiring only 5 min, while the longest time was recorded in Patient 2, which required 10 min. Overall, the service duration was relatively short and fairly consistent, ranging from 5 to 10 min, indicating efficiency in the process carried out. However, further evaluation is still needed to ensure that service standards are maintained and patient waiting times can continue to be minimized.

Based on **Table 9** in Phase 2, the average prescription service time at the Pharmacy Installation of Viola Bekasi Hospital is 16 min, with a variation of 10 to 20 min. However, there were discrepancies in the recording of several patients, such as Patient 2 and Patient 6, where the end time was recorded earlier than the start time. This error is likely caused by manual recording or a system that has not been fully digitized, thus affecting the validity of the data. In addition, the difference in service time between patients indicates that the pharmacy workflow is not yet fully consistent, which can be influenced by the complexity of the prescription, the efficiency of the pharmacy staff, and the queuing system, which is not yet optimal. Although the

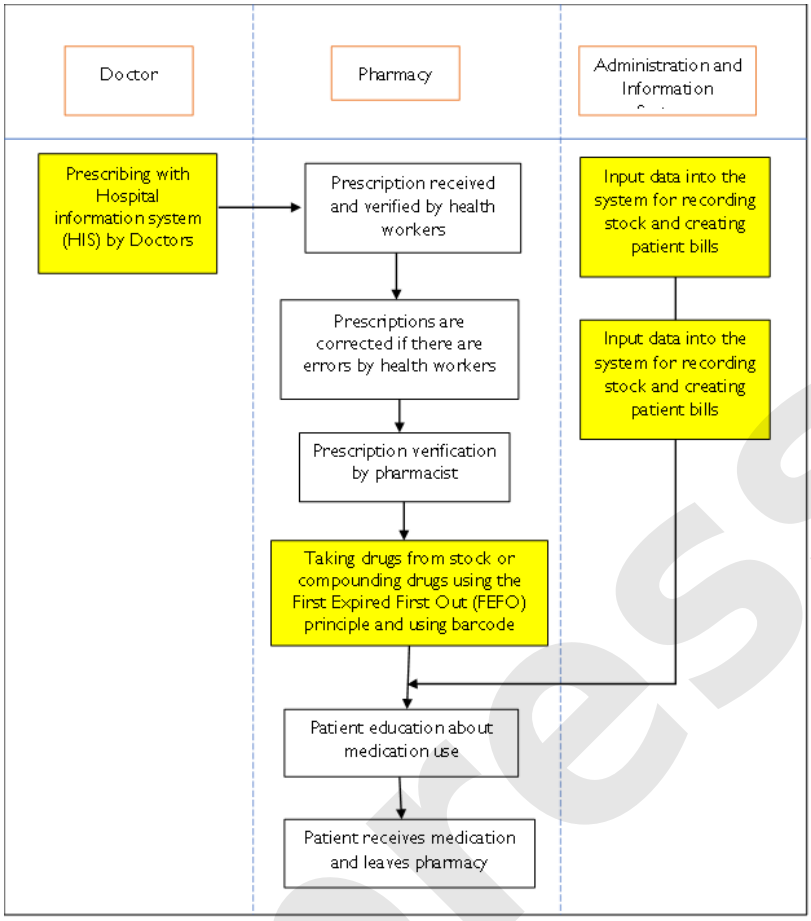

Figure 3. Flowchart for improvement of outpatient pharmacy service activities phase 2.

Table 8. Time outpatient non-compound prescription service activities after lean approach phase 2.

No	Date	Patient	Start Time	Finish Time	Processing Time (minutes)
1	01/16/2025	Patient 1	09:35	09:40	5
2	01/16/2025	Patient 2	11:10	11:20	10
3	01/16/2025	Patient 3	15:10	15:15	5
4	01/17/2025	Patient 4	08:15	08:21	6
5	01/17/2025	Patient 5	10:10	10:15	5
6	01/17/2025	Patient 6	15:00	15:08	8
Average time				6.5	

Table 9. Time outpatient non-prescription drug service activities after lean approach phase 2.

No	Date	Patient	Start Time	Finish Time	Processing Time (minutes)
1	01/16/2025	Patient 1	09:32	11:42	10
2	01/16/2025	Patient 2	11:15	10:35	20
3	01/16/2025	Patient 3	15:05	17:20	15
4	01/17/2025	Patient 4	08:14	19:30	16
5	01/17/2025	Patient 5	10:13	10:33	20
6	01/17/2025	Patient 6	15:01	12:16	15
Average time					16

average service time remains within the standard limits of 10 min for non-compound prescriptions and 30 min for compound prescriptions, further analysis is needed to identify potential bottlenecks. To improve the accuracy of recording and service effectiveness, improvements in recording methods, queue optimization, and better integration of the pharmacy information system are needed (see **Figure 3**). Further evaluation at the next improvement stage will ensure an increase in the quality of Lean Management-based pharmacy services at Viola Bekasi Hospital.

Future State Value Stream Mapping: Viola Bekasi Hospital Pharmacy Services

The results of the service time measurement in Phase 2 showed a significant increase in efficiency, with the average service time decreasing from 16 min to 6.5 min and a more controlled variation between 5 and 10 min. This increase reflects the success in reducing waste, particularly in the areas of waiting and overprocessing. From the perspective of Future State Value Stream Mapping (FSVSM), this achievement is the basis for designing a more optimal pharmacy service flow at RSIA Viola Bekasi. The optimization of the Hospital Information System (HIS) needs to be strengthened by increasing integration between the pharmacy information system and electronic medical records to reduce the need for repeated recording and confirmation requests to doctors. Additionally, improving the queuing system and task division for pharmacists through task

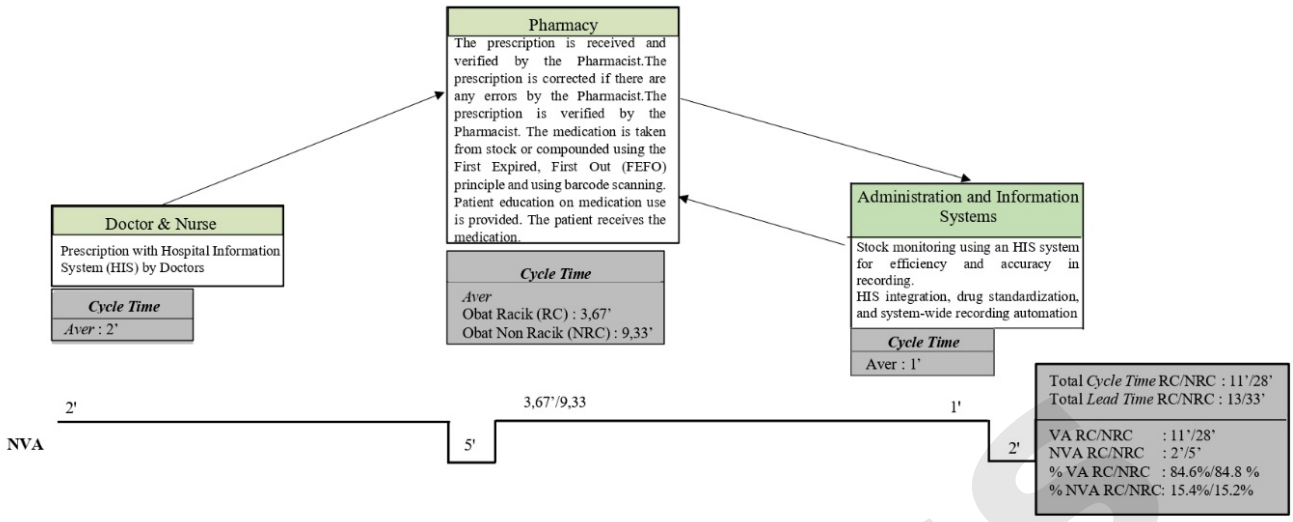

Figure 4. Future value stream mapping outpatient prescription service activities.

balancing can ensure a more balanced workflow and reduce potential bottlenecks. From a stock management perspective, the implementation of the Just-in-Time (JIT) and First Expired First Out (FEFO) methods can accelerate the flow of drugs and prevent both excess and stock shortages. To maintain sustainable efficiency, digitalization is necessary for monitoring and evaluation based on real-time data through an analytical dashboard in the HIS, enabling the detection of obstacles more quickly. In non-compound prescription services, waiting time can be reduced by adjusting the number of pharmacists and implementing a fast-track system for patients with simple prescriptions. Integration of HIS with the pharmacy system, the use of automatic templates, and a technology-based double-check system can also reduce overprocessing and defect waste. With this optimization, pharmacy services at RSIA Viola are expected to be more efficient, faster, and of higher quality, thereby increasing patient satisfaction and the effectiveness of hospital operations.

Lean Management-Based Service Quality at RSIA Viola Bekasi

The implementation of Lean Management at RSIA Viola Bekasi has demonstrated notable improvements in reducing waste, decreasing prescription waiting times, and increasing patient satisfaction. However, rather than simply reiterating these findings, a deeper analysis reveals how these improvements are closely tied to Lean principles, such as waste elimination, continuous flow, and value stream optimization.

For example, the reduction in waiting time for compounded prescriptions from 30–45 min to 20.17 min and for non-compounded prescriptions to 6.5 min reflects a successful application of time standardization and the minimization of *Waiting Waste*. These outcomes are consistent with those of D'Andreamatteo *et al*. (17), who emphasized that Lean interventions in healthcare settings can significantly reduce process inefficiencies and improve patient flow, particularly through enhanced staff coordination and system integration.

Moreover, the identification and removal of *Non-Value-Added (NVA)* activities, such as redundant data input and manual prescription verification, illustrate how Lean tools like Value Stream Mapping (VSM) can expose systemic bottlenecks. The hospital's adoption of a digital prescription system and inventory methods, such as Just-in-Time (JIT) and First Expired, First Out (FEFO),urther aligns with global best practices in Lean healthcare, as also noted by Costa and Godinho Filho (21) in their literature synthesis of Lean healthcare applications. The success of Lean implementation also reflects internal process ownership and leadership engagement. Interviews with hospital management revealed a shared vision for service improvement, consistent with the Lean literature, which highlights leadership commitment as a key enabler of sustained efficiency (22).

Nevertheless, some challenges remain. Although Lean reduced many inefficiencies, issues such as Overprocessing and Inventory Waste persisted in early phases. These challenges align with findings from Kovacevic *et al*. (2016), who discovered that Lean success is often incremental and contingent upon the organizational capacity to adapt over time. Furthermore, the patient perspective highlighted additional areas for improvement. For instance, while service speed improved, some patients still desired more thorough communication between pharmacists and patients. This indicates a tension between Lean's emphasis on efficiency and the need for empathetic, individualized care an issue also raised in critiques of Lean's applicability in people-centered environments (23).

Overall, the discussion of results from RSIA Viola Bekasi aligns well with existing literature and also contributes new contextual evidence from Indonesian healthcare, emphasizing that while Lean Management is a powerful tool for improving service quality, its implementation must be continuously refined to strike a balance between speed, accuracy, and patient engagement.

Conclusion

The implementation of Lean Management at the Pharmacy Installation of RSIA Viola Bekasi markedly enhanced service quality and efficiency. Average waiting times fell to 20.17 ± 3.40 min for compounded prescriptions and 6.5 min for non-compounded prescriptions, while patient satisfaction rose, particularly in service speed, medication accuracy, and

pharmacist interaction. Value Stream Mapping revealed a significant decline in non-value-added activities, and the adoption of Just-in-Time and FEFO inventory systems further streamlined drug distribution, reducing waste. Although these outcomes are compelling, they stem from a qualitative descriptive study in a single hospital; therefore, the findings may not be universally generalizable without local adaptation.

Future Studies and Institutional Plans

To build on these results, future research should employ mixed-method or longitudinal designs and include multiple hospital settings to validate and broaden the evidence base. Within RSIA Viola Bekasi, forthcoming initiatives involve integrating digital prescription systems, improving the interoperability of pharmacy and medical records, and extending Lean principles to outpatient clinics and laboratory services, steps aimed at creating a seamless, patient-centred continuum of care.

Challenges and Sustainability Considerations

Sustaining Lean gains will require overcoming persistent hurdles such as staff turnover, variable adherence to Lean protocols, and technological constraints. Continuous staff development, strategic investment in digital infrastructure, and cultivating a culture that consistently reinforces Lean thinking are vital for long-term success. Ultimately, the durability of Lean Management at RSIA Viola Bekasi will hinge on the hospital's capacity to adapt, scale, and embed these improvements across its operations over time.

Declarations

Author Informations

Grace Faskarina Sembiring
Affiliation: Faculty of Pharmacy, Pancasila University, Jakarta 12630, Indonesia.
Contribution: Conceptualization, Data Curation, Formal analysis, Methodology, Resources, Visualization, Writing - Original Draft.

Sahat Saragi ✉
Corresponding Author
Affiliation: Faculty of Pharmacy, Pancasila University, Jakarta 12630, Indonesia.
Contribution: Conceptualization, Methodology, Supervision, Validation, Writing - Review & Editing.

Rafrini Amyulianthy
Affiliation: Faculty of Pharmacy, Pancasila University, Jakarta 12630, Indonesia.
Contribution: Conceptualization, Methodology, Supervision, Writing - Review & Editing.

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Conflict of Interest

The authors declare no conflicting interest.

Data Availability

The unpublished data is available upon request to the corresponding author.

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Not applicable.

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