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## **Analysis of Pharmacy Service Performance Improvement for BPJS Patients Using the Lean Method at XYZ Hospital**

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### ABSTRACT

Pharmacy services are a critical support unit within the healthcare system of hospitals, particularly for BPJS (Indonesia's National Health Insurance) patients, whose numbers continue to rise. However, pharmacy service processes often face several challenges, including prolonged waiting times, inefficient queues, lengthy initial registration procedures, and drug stock mismatches. This study aims to analyze and propose performance improvements in pharmacy services for BPJS patients at XYZ hospital using a Lean approach. The method employed in this research is Value Stream Mapping (VSM) to map out the service flow and identify waste. Data were collected through direct observation, interviews, and documentation, covering initial process mapping, service time for each process activity, and the number of prescriptions served monthly. The analysis revealed several non-value-adding activities affecting service efficiency, such as high waiting times, inefficient staff movements, drug stockouts, and disorganized drug storage. After implementing improvements based on Lean principles, average patient waiting time decreased, with compounding drug service time reduced from 23 to 20 minutes and non-compounded drug service time reduced from 17 to 14 minutes. The study concludes that applying the Lean method can significantly enhance the performance of pharmacy services. Strategic recommendations are also provided to maintain work efficiency and ensure continuous quality improvement at XYZ Hospital.

## 1. BACKGROUND

### 1.1 Introduction

XYZ Hospital, located in the city of Bandung, is a government-owned healthcare facility that comprises various support units for delivering medical services. One of the most crucial support units at XYZ Hospital is the pharmacy. The hospital pharmacy provides pharmaceutical services including drug compounding, storage, and distribution to the public, both with and without a prescription. In its pharmaceutical services, the pharmacy at XYZ Hospital serves both general patients and BPJS (Indonesia's National Health Insurance) patients.

BPJS patients are those who receive healthcare services through the national health insurance program under prevailing regulations and procedures. Generally, healthcare services provided to BPJS patients must accommodate a high volume of patients with diverse characteristics. Despite these demanding conditions, hospitals and their pharmacy units are expected to maintain excellent service. Speedy service, minimal waiting times, and affordable service costs are among the main expectations of patients from healthcare providers (Rexhepi, 2011).

According to data obtained from the XYZ Hospital pharmacy, the number of prescriptions received in March 2023 was 22,275, including both BPJS and regular patients. The average service time for BPJS pharmacy patients was 83 minutes. Meanwhile, government regulations stipulate that the expected waiting time for prescription services at a pharmacy is between 15 and 30 minutes (Permenkes, 2014). Often, the pharmacy fails to meet this target, creating a significant challenge for the hospital, especially for the pharmacy unit, in delivering fast, high-quality services.

One method adopted by hospitals to improve service performance is the Lean method. Lean is a concept initially applied in manufacturing to enhance organizational performance by eliminating waste within workflows (Protzman, 2015). The Lean concept was first developed by Toyota Motor Corporation (TMC), rooted in the management philosophy and practices of Sakichi Toyoda's textile company. The goal of Lean principles in the service sector is to create more efficient processes, faster services, lower costs, better quality, and improved customer satisfaction (Womack, 2005).

Several studies have successfully applied the Lean method to improve service performance. One such example is a study conducted at Royal Bolton Hospital, which implemented Lean in its pharmacy unit and achieved a 30% reduction in patient waiting times (The Pharmaceutical, 2009). Given the issues faced by the pharmacy at XYZ Hospital, this study aims to analyze and propose improvements in pharmacy service performance for BPJS patients at

XYZ Hospital using the Lean method. The findings of this research are expected to serve as a reference for improvement not only at XYZ Hospital's pharmacy but also at other pharmacies or hospital units with similar characteristics.

### 1.2 Research Purposes

Based on the aforementioned issues, the objectives of this study are as follows:

1. To implement the Lean method in the hospital pharmacy as an effort to improve its performance in serving BPJS patients.
2. To analyze improvement proposals using the Lean method that can serve as a reference for enhancing the pharmacy's performance at XYZ Hospital.

## 2. LITERATURE REVIEW

Lean is a concept initially implemented in manufacturing industries to improve organizational performance and operational efficiency. Over time, the use of lean principles has expanded beyond manufacturing and is now widely adopted in the service sector. In service contexts, *waste* is defined as any action that does not add value to the customer and is considered unnecessary. The objective of lean in services is to create more efficient processes that deliver faster service, reduce costs, and ensure high-quality outcomes that enhance customer satisfaction (Womack, 2005).

Hospitals, as service-based organizations, have also adopted lean methodology to improve their operational performance. The application of lean in hospitals focuses on enhancing service quality for patients by minimizing waste such as long waiting times, complex administrative procedures, non-transparent inpatient booking systems, and unclear directions to consulting rooms (Grabau, 2009). Patients generally expect fast service, minimal waiting time, and affordable healthcare costs (Rexhepi, 2011).

According to Black and Miller, as cited by Wickramasinghe (2014), the following are the Seven Wastes commonly found in hospitals:

1. Overproduction – performing redundant tests or procedures.
2. Waiting – patients experiencing delays in receiving medical treatment.
3. Inventory – excess stock of unused medical supplies that may expire.
4. Transportation – inefficient layout causing long distances between service points.
5. Defects – errors in patient information or documentation.
6. Motion – unnecessary movement of patients or staff for non-essential reasons.
7. Overprocessing – repetitive form filling or redundant administrative tasks.

## Lean Pharmacy

Lean Pharmacy refers to the application of lean management principles in pharmaceutical services, including drug production, distribution, and dispensing. Its main objective is to improve operational efficiency, reduce waste, and ensure that pharmaceutical products and services deliver maximum value to patients. According to Santos (2014), several lean principles can be applied in pharmacies, as outlined by Jones and Mitchell:

1. Creating value-added activities – identifying actions that directly contribute to patient satisfaction as the primary focus.
2. Value Stream Mapping (VSM) – mapping out current processes within the hospital to identify and analyze non-value-added activities.
3. Creating flow – developing smooth and uninterrupted workflows throughout the pharmacy and hospital services.
4. Pull planning – implementing pull systems to minimize overproduction and reduce waste.
5. Continuous improvement – establishing service standards based on PDCA (Plan-Do-Check-Act) cycles and engaging all hospital staff in ongoing improvements.

In practice, lean pharmacy identifies non-value-added activities such as long waiting times, overstocking, packaging errors, and non-standardized procedures, and eliminates them to create more streamlined and responsive workflows. Tools such as Value Stream Mapping (VSM), 5S, and Kaizen are commonly used to drive quality improvement, ensure regulatory compliance, and enhance patient safety and service speed. This approach is particularly relevant in today's healthcare systems, where high efficiency is expected without compromising service quality.

### Value Stream Mapping (VSM)

Value Stream Mapping (VSM) is a tool used to visually represent the entire flow of materials and information throughout a process. Its main purpose is to identify and eliminate non-value-added activities in order to streamline the process (Jackson, 2013). According to Rother (2003), VSM is crucial because it integrates lean concepts and techniques into a single framework, helps visualize the entire process flow, facilitates the identification of waste and its root causes, serves as a foundation for lean implementation, clarifies the relationship between material and information flows, and communicates process dynamics in an easy-to-understand format. VSM is a qualitative tool that provides a detailed view of how each facility or service should ideally operate to achieve a

continuous, uninterrupted workflow. There are four fundamental steps in creating a value stream map, there are identify value-added activities based on the specifications of the service group, create and analyze the current state map to understand the existing process flow, develop a future state map by selecting processes that align with lean principles, including the use of pull systems and implement the proposed improvements and continuously refine the process.

After implementing lean tools, the improved processes can be remapped to reflect the new system. According to Jackson (2013), the refinement of value stream maps should focus on:

1. Combining two or more activities where appropriate,
2. Eliminating non-value-added steps,
3. Minimizing or eliminating unnecessary waiting times.

## 3. METHODOLOGY

### 3.1 Initial Data Observation

The initial stage conducted in the BPJS pharmacy service was direct observation of on-site conditions. The activities included the following:

1. Collecting secondary data from the pharmacy unit, including unit profiles, organizational structure, and information on the number of patients served.
2. Conducting preliminary interviews aimed at understanding the pharmacy's initial conditions, identifying common problems encountered by staff and patients, and documenting reported errors or staff-related issues.
3. Performing direct observation to examine the flow of the process from the patient's arrival until the medication is dispensed.

### 3.2 Time Data Collection

Time data were collected using the stopwatch method. Timing was recorded by observing the patient's activities, starting from registration at the pharmacy until the medication was handed over.

This included measuring the waiting time for each activity and the compounding process (Rico, 2015). Time data were gathered during peak hours early weekdays from morning to afternoon. A total of 30 measurements were recorded for each process activity.

Observations from the time measurements aimed to determine the percentage of non-value-adding activities (Greena, 2014). In addition to time measurement, observations were also made of the compounding activities and patient service processes. The recorded time data were then averaged and analyzed for the duration range of each activity. Furthermore, the data were evaluated for consistency and sufficiency.

### 3.3 Initial Mapping Using Value Stream Mapping (VSM)

The initial field condition mapping was conducted using Value Stream Mapping (VSM). This mapping was supplemented with process time and cycle time data obtained from previous time measurements. The subsequent stage involved calculating the percentage of processing time and waiting time, which facilitated the identification of the proportion of activities contributing to waste in each stage of the pharmacy workflow.

### 3.4 Activity Identification

The purpose of activity identification is to examine and determine which activities can be categorized as value-added and which are considered non-value-added. This stage refers to the previously developed Value Stream Mapping (VSM). In this study, the analysis focuses solely on non-value-added activities, serving as the basis for identifying the root causes of problems occurring within the pharmacy service process.

## 4. RRESULTS AND DISCUSSION

The BPJS pharmacy service at XYZ Hospital serves patients who receive healthcare coverage through Indonesia's national health insurance program, in accordance with the applicable regulations and procedures. The prescription processing workflow in the BPJS pharmacy is carried out in groups or batches. This approach is adopted due to the high volume of BPJS patients and to facilitate more efficient medication processing by the pharmacy staff.

The operating hours of the BPJS pharmacy are from 08:00 to 16:00, with 8 to 12 staff members on duty. Based on field data, the monthly volume of prescriptions served at the BPJS pharmacy can be summarized as follows:

**Table 1. Summary of Monthly Prescription Volume at the BPJS Pharmacy**

No	Periode	Jumlah Resep Apotek BPJS
1	Agustus 2023	11990
2	September 2023	14507
3	Oktober 2023	14824
4	November 2023	13227
5	Desember 2023	15011
6	Januari 2023	16398
7	Februari 2023	16398
8	Maret 2023	16976

The initial observation involved identifying all activities within the service process flow, beginning

from the moment staff receive the patient's prescription to the point when the patient receives the medication. Each activity was measured for its service duration using a stopwatch time study method. These measurements were conducted during working hours, from 08:00 to 16:00 WIB, at the beginning of each week periods typically characterized by higher patient volume and activity density.

The calculation of service processing time at the regular and BPJS pharmacies is divided into two activities: compounded medication and standard medication. This division of activities aims to clarify which tasks contribute more significantly to longer processing times. The reference for calculating service time is the activities performed by the pharmacy staff.

**Table 2. Average Time per Activity in the BPJS Pharmacy**

No	AKTIVITAS PETUGAS	Waktu rata-rata/unit (detik)	Rentang
1	Patient reception	35	21-48
2	Waiting for data verification	23	9-51
3	Patient data verification	30	9-42
4	Prescription entry	36	8-62
5	Collecting printed prescription	70	23-127
6	Medication retrieval	283	178-378
<b>Regular Drugs</b>			
	- Packaging	321	86-454
<b>Compounded Drugs</b>			
7	- Transfer to compounding	31	11-73
	- Compounding process	638	268-1508
	- Delivery to dispensing counter	35	20-65
8	Batch patient calling	27	15-61
9	Preparation for dispensing	124	48-287
10	Medication dispensing	39	12-80

**Table 3. Total Average Processing Times**

	Total Time	Second	Minute
a. Compounded		1371	23
b. Regular		988	17

Based on the measured service times and the identification of activities from the beginning to the end of the BPJS pharmacy service process, a Value Stream Mapping (VSM) can be constructed. VSM is employed to understand, analyze, and improve processes by focusing on value-added activities from the customer's perspective. This mapping will help identify specific activities that are candidates for improvement. The following illustration presents the initial condition of the pharmacy as mapped through the activity identification process on figure 1.

Mapping using Value Stream Mapping (VSM) illustrates the various activities observable in the BPJS pharmacy. Additionally, the service time has been calculated using downtime measurement. Based on this VSM mapping, it is possible to identify which activities add value (value-added) and which do not add value (non-value-added). In this study, the identification focuses solely on non-value-added activities, with the aim of proposing improvements to reduce the service time at the BPJS pharmacy. The following is a summary table identifying the non-value-added activities at the BPJS pharmacy.

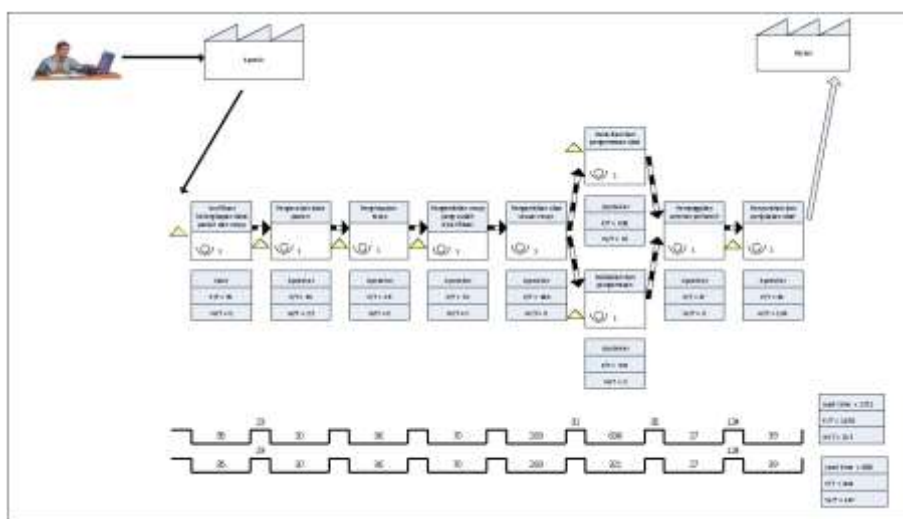


Figure 1. Value Stream Mapping of the Initial Condition in the BPJS Pharmacy

Table 4. Categorization of Non-Value-Added Activities in the BPJS Pharmacy

NON-VALUE ADDED ACTIVITIES				
NO	ACTIVITIES	BPJS		
		PATIENT	STAFF	SUPPORTING EQUIPMENT
1	Patient arrives at Counter	Patients do not queue and form crowds		
2	Taking queue number and submitting prescription at the counter	Patients do not queue		
3	Submit Prescription and get queue number	Incomplete patient data	Staff lack thoroughness, repeated checks	
		Patients do not queue	Staff managing the queue	
4	Waiting for medication preparation	Patients leave without confirmation		
5	Patient data verification		Staff leaves counter to check documents	
6	Prescription entry and printing of order proof		Interrupted by other staff for checking	
7	Handover of queue number to the staff	Patients leave without confirmation		
8	Waiting for medication collection	Patients leave without confirmation		
9	Staff collects verified prescriptions for medication		Prescriptions not taken sequentially	

	preparation		Priority given to TNI (military) patient prescriptions	
10	Staff collects medications according to prescriptions			Disorganized medication storage
				Work area cluttered with empty medicine boxes
				Medication stockouts
				Medications not yet arranged on shelves
11	Medication compounding and packaging		Staff repeats compounding due to incorrect dosage	Incomplete equipment
				Broken equipment leading to manual processing
				Disorganized compounding area
12	Delivery of compounded medications			Disorganized storage
13	Packaging of non-compounded medications			Incomplete equipment
14	Group-based patient calls for medication dispensing		Staff does not clearly explain medication usage	Storage order does not match patient queue
15	Patient collects medication	Repeated explanation due to lack of patient attention		

## 5. IMPROVEMENT PROPOSALS

Based on the data processing and discussion presented previously, an analysis was conducted to identify improvement opportunities using the Lean method. The basis for these improvements is derived from the Value Stream Mapping (VSM) and the identification of non-value-added (NVA) activities. The primary goal of these proposed improvements is to develop a new process map after implementing changes, as well as to build upon developments using various Lean tools (Machado, 2010). The following are improvement proposals aimed at reducing service time for each activity using several Lean methods:

### a. Reduction of Waste

Some of the seven types of waste identified in the BPJS pharmacy service process include:

#### 1. Waiting

There are many waiting points within the service flow.

The average service time for compounded drugs is 23 minutes and for regular drugs is 17 minutes. These durations are considered lengthy due to several non-value-adding activities involving both patients and staff. The improvement proposed is to evaluate and restructure the prescription service flow. Non-value-adding activities should be eliminated or modified using technology or

other process enhancements.

#### 2. Overprocessing

This is evident when staff leave their station for extended periods to retrieve or deliver medications to the compounding area. The suggested improvement is to establish standardized service procedures aligned with each staff member's job description.

#### 3. Defects

Errors in compounding medications lead to rework and additional time.

The proposed solution is to provide adequate training to improve staff skills in medication compounding.

### b. Implementation of 5S Methodology (*Seiri, Seiton, Seiso, Seiketsu, Shitsuke*)

#### 1. *Seiri* (Sort)

Sort unnecessary tools, documents, inventory, or anything unrelated to work activities from the workspace. For example, organizing medicine stock promptly after procurement ensures medications are readily accessible, thus saving time. All necessary tools must be complete and available to avoid delays caused by tool-hunting.

#### 2. *Seiton* (Set in Order)

Arrange items so they are easy to find and use. Suggestions include:

- Systematically organizing drug inventory in cabinets before working hours, prioritizing frequently used drugs closer to the work area.
  - Using a dual bin Kanban system to manage inventory levels and automate reordering when the first bin is depleted.
  - Implementing visual controls, such as color-coded markings, to designate where tools should be placed on workstations and where patients should line up.
  - Displaying clear procedural instructions at pharmacy counters to guide patients through the prescription process.
3. *Seiso* (Shine)  
Maintain cleanliness in work areas, particularly in compounding rooms where hygiene and accuracy are critical. Assign cleaning responsibilities using a 5S task map that ensures routine cleaning by designated staff.
  4. *Seiketsu* (Standardize)  
Standardize procedures and ensure consistency by using visual indicators like yellow boundary lines for tool placement, designated waste collection zones, and reminders to uphold workplace standards.
  5. *Shitsuke* (Sustain)  
Instill discipline so that employees follow 5S principles as part of daily culture. Once these practices become habitual, constant supervision is no longer necessary.

#### c. Technology Integration

Several technological improvements proposed for pharmacy operations include:

1. Pre-packaged containers for compounded drugs to reduce manual folding time.
2. E-prescription system to reduce errors and avoid issues like lost or damaged prescriptions.  
Doctors would submit prescriptions digitally, and the pharmacy would prepare medications upon patient request.
3. Integrated pharmacy application systems that automatically input patient data from hospital records, facilitating faster access during dispensing.
4. Computerized queue system that allows patients to take a queue number via a touchscreen kiosk and wait comfortably, thus minimizing physical crowding and non-value-adding queue management by

staff. Security personnel could assist in guiding patients.

#### d. Use of Safety Stock and Kanban Systems.

The presence of non-value-added activities in the disorganized arrangement of prepared medications causes difficulties for staff in locating patients' medications during dispensing. Additionally, the staff responsible for dispensing compounded medications often fail to organize them according to the patient queue order. These inefficiencies contribute significantly to increased patient waiting times. The proposed improvement is the implementation of visual control management. This involves designing the storage area by assigning queue numbers to each medication storage container. Medications are stored in batches, aligned with the patient queue numbers. This system allows staff to identify the correct storage box by simply referring to the batch number, eliminating the need for manual verification of each patient's queue number.

Queue numbering follows the First In, First Out (FIFO) principle, with separation between patients scheduled for collection at different times. The numbering is designed to be non-permanent, allowing for flexible updates based on the batch queue order being served. Additionally, color-coded storage boxes can be used to indicate batch groups, with clearly 93labelled and interchangeable queue numbers corresponding to the active batch being processed.

#### e. *Heijunka* (Workload Leveling)

The Heijunka concept refers to the process of workload leveling—balancing workflow and avoiding sudden spikes in work volume. In this context, the workload refers to the types of patients served, namely general patients and special-category patients. The main objective is to prevent staff fatigue and minimize excessive patient waiting times. The proposed improvement based on the Heijunka principle involves adjusting the number of staff scheduled to work during peak service hours. It is important to note that the BPJS pharmacy typically experiences peak hours at the beginning of the week, from 08:00 to 16:00 WIB. Additionally, implementing a fair rotation of tasks among staff is recommended to ensure workload is evenly distributed and to prevent any single staff member from being overburdened.

**f. Work Schedule Management**

Work schedule adjustments are necessary due to delays in warehouse deliveries and the absence of reception staff at the payment counter. The proposed solution is to initiate behavioral changes among the involved personnel (Beard, 2010). This improvement has a significant impact on the efficiency of pharmacy service activities. Several development initiatives may be undertaken to support staff improvement, such as seminars, training programs, benchmarking, and other professional development activities (Protzman, 2015). Therefore, this aspect of improvement is considered one of the most critical components for effective service enhancement.

**g. CONCLUSION**

Based on the proposed improvements and recommendations previously outlined, several non-value-added activities were identified that could be either eliminated or merged with other activities. However, these activities cannot be modified without confirmation and approval from the pharmacy department. The following are improvement actions that have been approved by the pharmacy and are proposed for implementation:

- Eliminating the activity of waiting for initial data verification by merging patient data verification with prescription entry.
- Eliminating the activity of medication preparation before dispensing by merging it with the process of locating and preparing the medication for handover to the patient
- Several other non-value-added activities can also be improved and have the potential to reduce service processing time; however, these proposed improvements must first be

implemented and subsequently re-evaluated to determine their actual impact on service duration.

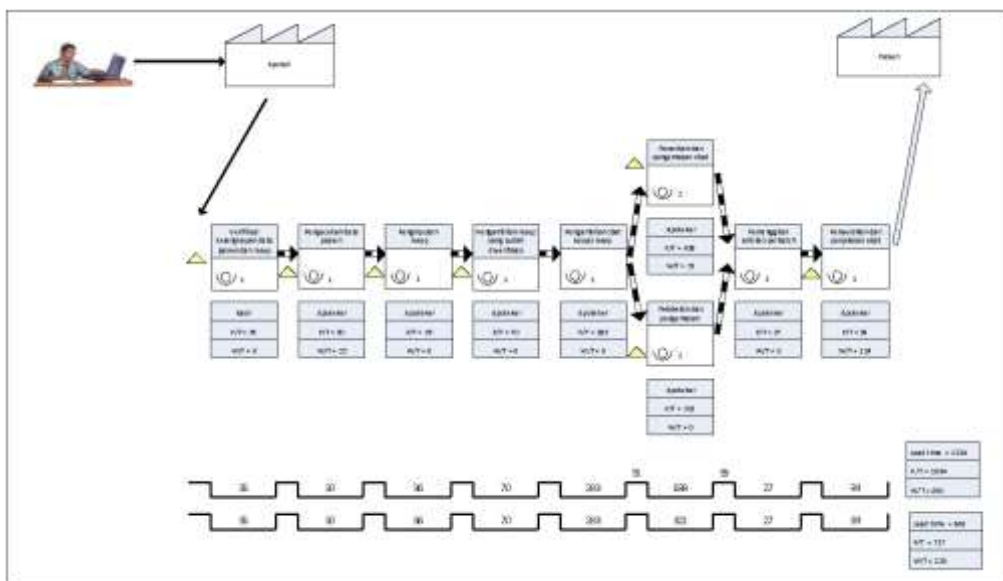
The updated average service time following these improvements is as follows:

**Table 5. Average Time per Activity in the BPJS Pharmacy**

No	AKTIVITAS PETUGAS	Waktu rata-rata/unit (detik)	Rentang
1	Patient reception	35	21-48
2	Patient data verification	30	9-42
3	Prescription entry	36	8-62
4	Collecting printed prescription	70	23-127
5	Medication retrieval	283	178-378
<b>Regular Drugs</b>			
	- Packaging	321	86-454
<b>Compounded Drugs</b>			
6	- Transfer to compounding	31	11-73
	- Compounding process	638	268-1508
	- Delivery to dispensing counter	35	20-65
7	Batch patient calling	27	15-61
8	Medication dispensing	39	12-80

**Table 6. Total Average Processing Times**

Total Waktu	Detik	Menit
a. Compounded	1224	20
b. Reguler	841	14



**Figure 2. Proposed Value Stream Mapping for the BPJS Pharmacy**

Based on the proposed Value Stream Mapping (VSM) (Figure 2) developed in this study, the following key conclusions can be drawn:

1. The implementation of the Lean method in improving the performance of the BPJS pharmacy at XYZ Hospital resulted in a reduction of 180 seconds in total service time for both compounded and regular medications, including a 124-second reduction in processing time and a 23-second reduction in waiting time. These improvements were achieved by eliminating two non-value-added activities :
  - a. The waiting activity for initial data verification was eliminated by integrating it with the patient data verification process. The proposed improvement involves centralizing patient data with the hospital system, enabling automatic synchronization with the pharmacy.
  - b. The activity of medication preparation prior to dispensing was eliminated through the implementation of a dual-bin Kanban system, allowing pre-packaged medications to be more organized and efficiently managed.
2. Other proposed improvements can also be implemented and are expected to significantly reduce service processing times at the BPJS pharmacy. However, these improvements require implementation followed by re-measurement of service durations to ensure data accuracy.
3. The proposed improvements may serve as a foundation for XYZ Hospital to initiate systematic pharmacy service enhancements, and can be extended to other hospitals that are operationally integrated.

## REFERENCES

- Abdullah, F., Rajgopal, J., Needy, K.L. (2002): *A taxonomy of the process industry with a view to lean manufacturing*. Proceedings of the American Society for Engineering Management, Tampa, FL, pp. 314–321.
- Al-Araidah, O., Momani, A., Khasawneh, M., Momani, M. (2010): *Lead-Time Reduction Utilizing Lean Tools Applied to Healthcare: The Inpatient Pharmacy at a Local Hospital*
- Beard, J. dan Wood, D. (2010): *Application of Lean Principles can Reduce Inpatient Prescription Dispensing Times*. The Pharmaceutical Journal (Vol. 284)
- Graban, M. (2009); *Lean Hospitals: Improving Quality, Patient Safety, and Employee Satisfaction*, CRC Press, New York
- Greena, C.F., Crawford, V., Bresnen, G. dan Rowe, P.H. (2014): *A Waste Walk through Clinical Pharmacy: How do the ‘Seven Wastes’ of Lean Techniques Apply to the Practice of Clinical Pharmacists*, International Journal of Pharmacy Practice
- Halsall, D., Noyce, P.R. dan Ashcroft, D.M. (2012): *Characterizing Healthcare Quality in the Community Pharmacy Setting: Insights from a Focus Group Study*
- Jackson, T.L. (2013): *Mapping Clinical Value Streams*, Rona Consulting Group & Productivity Press
- Liker, J.K. (2002): *The Toyota Way: 14 Prinsip Manajemen dari Perusahaan Manufaktur Terhebat di Dunia*. Jakarta: Penerbit Erlangga.
- Machado, V.C. dan Leitner, U. (2010): *Lean Tools and Lean Transformation Process in Health Care*
- Rexhepi, L. dan Shrestha, P. (2011): *Lean Service Implementation in Hospital: A Case study conducted in “University Clinical Centre of Kosovo, Rheumatology department”*, Masters in Strategic Project Management, European
- Permenkes RI, (2014): *Standar Pelayanan Kefarmasian di Apotek No. 35*, Menteri Kesehatan Republik Indonesia
- Rico, R.A. dan Jagwani, J.M. (2015): *Application of Lean Methods to Compounding Services in Hospital Pharmacy*
- Rother, M. dan John, S. (2003): *Learning To See - Value Stream Mapping to Create Value and Eliminate Muda*, The lean Enterprose Institute, Brookline, Massachusetts, USA.
- Santos, J.P.F. (2014): *Improvement of Pharmaceutical Services in Hospitals through Kaizen Lean Methodology*, Kaizen Institute
- The Pharmaceutical Journal (2009): *Using the Lean Approach to Transform Pharmacy Services in an Acute Trust*
- Thomas L.J. (2009): *5S for Healthcare*, Rona Consulting Group & Productivity Press, New York
- Wickramasinghe, N., Al-Hakim, L., Gonzalez, C. dan Tan, J. (2014) : *Lean Thinking for Healthcare*, New York

- Womack, J.P., Jones, D.T dan Ross, D (1990):  
*The Machine That Changed The World.*  
Machimillan Publishing Company, Canada.
- Womack, P.J. dan Jones, D.T. (1996): *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*, Simon & Schuster, New York
- Womack, P.J. dan Jones, T.D. (2005): *Lean Solution*, New York: Free Press.