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Lean Healthcare Analysis at Airlangga Health Service Center

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Abstract

Dental is one of the polyclinics whose biggest problems are waiting times and patient queues. The waiting time and patient queues are *a waste in Hospitals*. This study aims to identify any waste that occurs in the dental polyclinic at the Airlangga University Health Service Center (PLK) by implementing lean healthcare. Then, provide suggestions for improvements to reduce or eliminate the identified waste. The researcher used a qualitative approach with the results of the big-picture mapping to illustrate the flow of patient care in the dental clinic and determined which activities were value-added (VA) and which were not value-added (NVA). Interviews and questionnaires were distributed in this study to parties who have a role in the service delivery process to patients, namely the dental clinic coordinator, dentist, dental nurse, and service admin. The study's results found 7 value-added activities and 4 non-value-added activities. Then, the researcher used VALSAT to choose the right tools and process activity mapping with the highest score. The results of the waste identification show the weight of waste overproduction at 0.21, waiting at 0.33, transportation at 0.12, inappropriate process at 0.05, unnecessary inventory at 0.12, unnecessary motion at 0.07, and defect at 0.10. Then, a fishbone diagram is used to find the root cause of the waste, and then lean hospital to propose improvements to reduce or eliminate waste in PLK.

Keywords: Lean healthcare, Waste, Big Picture Mapping, VALSAT, Dental Clinic

JEL Classification: M11, I11, L23

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1. Introduction

The COVID-19 pandemic continues to shock the world with a significant death toll. Our World in Data on November 6, 2021, recorded 7,021 deaths in the last seven days. Despite the high number, Indonesia has seen a decline in casualties. Health facilities, including hospitals, are intensifying preventive measures. In the Health Law, hospitals are recognized as an important pillar of improving the health of the Indonesian people, serving as a place for healing diseases and restoring health, with the government's responsibility to improve the welfare of the community.

Hospitals or clinics are considered to be of good quality when they provide excellent service with a high level of effectiveness and efficiency. Focus on resource management and rapid response to patients determine the quality of service (Arietta, 2011; Inge Dhamanti, 2003; Wijono, 1999). Patient satisfaction is related to the balanced value between cost of care and quality of service. Hospital leaders need to design strategies to improve service efficiency (MOH No: 129/Menkes/SK/II 2008). Patient waiting time is a critical assessment of quality, with an ideal outpatient waiting time standard of ≤60 minutes (MOH No: 129/Menkes/SK/II 2008). Meeting this standard demonstrates a full commitment to service quality (MOH No: 129/Menkes/SK/II 2008).

The COVID-19 pandemic has raised concerns among patients and medical personnel regarding aerosolized transmission. Data from the Indonesian Dental Association (PDGI) notes that as of March 2021, 396 dentists were exposed to COVID-19, with 94 of them dying. Health protocols have been implemented, including antigen swab tests before follow-up treatment, although this extends patient visit times. Dental clinics often experience problems related to non-value-added processes that appear in patient complaints/dissatisfaction or patient interview results. Referring to Lean theory, this method is an effective solution to improve efficiency in company operations, focusing on streamlining resources and increasing added value for customers. The concept of Lean Healthcare, applying Lean in healthcare, can improve the quality of care and collaboration between departments and eliminate waste in operational processes (Godinho Filho et al., 2016; Graban, 2018; Costa & Godinho Filho, 2016).

Lean healthcare is an important approach to improving the efficiency of healthcare services by reducing or eliminating waste, in accordance with the focus on customer satisfaction (Costa & Godinho Filho, 2016). Inefficiencies in hospital operational processes can result in increased costs, potential errors, stress on workers, delays, and duplication (Hussain et al., 2016). Lean implementation can save costs, eliminate unnecessary movements, reduce waiting time, and improve customer satisfaction. This research was conducted at the Airlangga University Health Service Center (PLK), focusing on the dental clinic PLK Campus B. The main waste problem is seen in the waiting time, which causes complaints from patients. Although the number of patients at PLK Universitas Airlangga's dental clinic has decreased due to the COVID-19 pandemic, the average monthly number of patients remains significant, indicating the need for improvement. By implementing lean healthcare methods, PLK hopes to improve service quality and minimize waste, especially in queues that have the potential to reduce patient satisfaction. PLK's vision to be the best first-level health facility in Indonesia drives the need to improve service quality.

2. Literature Review

2.1. Lean Definition

Lean thinking, introduced by Toyota, prioritizes the elimination of waste for organizational efficiency (Costa & Godinho Filho, 2016). Chiarini (2016) identified seven wastes, including inventory, overproduction, transportation, motion, defects, waiting, and overprocessing. Meier & Liker (2006) detail the 4Ps - philosophy, process, people, and problem-solving - as the basic principles of Lean. Graban (2018) describes Lean in Lean Hospital as a tool and management system that encourages

continuous improvement through the involvement of all employees. Lean implementation requires commitment from the top level and active participation of staff (Ilangakoon et al., 2021; Womack et al., 2005).

2.2. Lean Healthcare

Lean was originally developed for car production but can be applied in various sectors, including healthcare. Lean healthcare tools and techniques are evolving with the growth of publications. Demographic factors and changing health needs are driving the use of lean in healthcare. Unlike manufacturing, healthcare is more complex and requires different process changes (Rees & Gauld, 2017; Young and McClean, 2009). Lean enables frontline staff to define and sustain process improvements. Lean healthcare focuses on efficiency and customer satisfaction, applying five principles of process improvement. Waste in healthcare can result in inconsistent service and constant interruptions (Hallam & Contreras, 2018).

2.3. Waste in Hospital

Lean thinking aims to generate added value, eliminate waste in the industry, and is applied in healthcare. Waste, a continuous problem, is described by Graban (2018) with seven or eight types of waste that can also be used in hospitals, namely Defects, Overproduction, Transport, Waiting, Unnecessary Inventory, Unnecessary Motion, Inappropriate Processing, and Human Potential.

2.4. Value Stream Mapping Tools (VSM)Top of Form

Value Stream Mapping (VSM) is an important tool in implementing lean concepts, first used by Toyota. VSM identifies value-added and non-value-added steps to minimize waste. VSM provides process data prior to Lean Six Sigma initiatives with supporting tools, such as Value Stream Analysis Tools (VALSAT), which help identify waste (Jasti & Sharma, 2014).

2.5. Fishbone Diagram

Fishbone diagrams/Ishikawa diagrams, developed by Kaoru Ishikawa, help identify the root causes of problems. It provides a systematic way to understand the effects and contributing causes of a problem. With a fishbone-like design, the effects of the problem are placed at the head of the fish, while possible causes are placed at the vertebrae and branch out to more detailed causes. The cause categories involve 5M+1E: Man, Methods, Machines, Materials, Measurement, and Environment (Liliana, 2016). Fishbone diagrams help the brainstorming process to systematically identify and address the causes of problems.

2.6. Healthcare

Health services are a subsystem with a focus on prevention and improvement of public health. According to the Indonesian Ministry of Health (2009), health services are "any effort organized alone or jointly in an organization to maintain and improve health, prevent and cure diseases and restore the health of individuals, families, groups or communities". Health services are produced and consumed together, difficult to control quality because they cannot be stored to be assessed after consumption (Mosadeghrad, 2013).

2.7. Previous Research

a. Improving the registration process in a healthcare facility with lean principles by Valentina Nino, Kenneth J. Martínez, Karina Gómez, and David Claudio (2021) with the Journal of Industrial Engineering and Management, which has an index value of Q2. The research was conducted using the same tools, namely the value stream map (VSM) and fishbone diagram. However, the object of research is the Monata healthcare facility and focuses on the

registration process. In addition, the previous study used a survey of patients while this study used the results of interviews and questionnaires with informants (internal parties).

b. Lean Hospital Management, Empirical Study on Emergency Services (2017) by Indrianawati Usman and Mira Ardiyana Nandini with the Journal of Management Theory and Applied Year 10. No. 3, December 2017 which has a S2 sinta score. The approach used in visualizing the process flow is the same, namely value stream mapping. Then, the tools used are fishbone diagrams to find out the cause-effect of the problem. The research object of the previous study was conducted at the Emergency Room of Jemursari Islamic Hospital Surabaya. While in this study, the object of research is focused on the dental clinic at the Airlangga University Health Service Center.
c. Lean Healthcare Analysis to Identify Waste in the Gynecology Poly of Hospital X (2021) with the MEA Scientific Journal (Management, Economics, and Accounting) Vol. 5 No. 3, 2021 by Nurullaily Kartika, Indah Puspita Melati and Faradilah Hanum (2021) which has a sinta score of S4. The approach used in previous research is value stream mapping which is used to visualize process flow. The research object in the previous study was the Gynecology Specialist Poly X Jombang Hospital, while in this study the research object used was the Airlangga University Health Service Center. Then the tools used use 5 Why's.

3. Data and Methodology

This research approach adopts a qualitative approach with descriptive and case study types. By using this method, the research involved direct observation and interviews to extract information in a natural way. Case studies help test theories as well as refine existing theories so that this approach can help researchers understand the context in depth and generate greater insight. The scope of the research focuses on minimizing waste in the dental clinic of PLK Universitas Airlangga using lean healthcare. Data were obtained from primary sources through interviews with relevant parties and secondary data from documentation. The observation was carried out by researchers by directly visiting the object of research, namely PLK, and observing the service delivery process, especially in the dental clinic. The observation and recording process is carried out starting from the patient's arrival and registering until the patient leaves the dental clinic. Interviews and distribution of questionnaires in this study were conducted to parties who have a role in the service delivery process to patients, namely the dental clinic coordinator, dentist, dental nurse, and service admin in charge of the patient administration service process, which of course can be accounted for the validity of the data through these parties.

Analysis techniques include value stream mapping, identification of causes by interview, waste ranking, Fishbone Diagram analysis, and lean healthcare improvement proposals. The research stages involved preliminary surveys, field studies, value stream map creation, cause identification, Fishbone Diagram creation, proposed improvements, and conclusion drawing. Data triangulation was used to ensure the validity of the data obtained.

4. Results and Discussion

4.1. Big Picture Mapping of Dental Services Process at Universitas Airlangga Health Service Center

The research focused on the service process at the Dental Clinic of Airlangga University Health Service Center Campus B, which starts from the patient registration process at the counter until the patient leaves the PLK Campus B Airlangga University. The following is the process of handling patients at the Dental Clinic of PLK Universitas Airlangga from the beginning of entering the PLK to leaving the PLK based on observation and interview data:

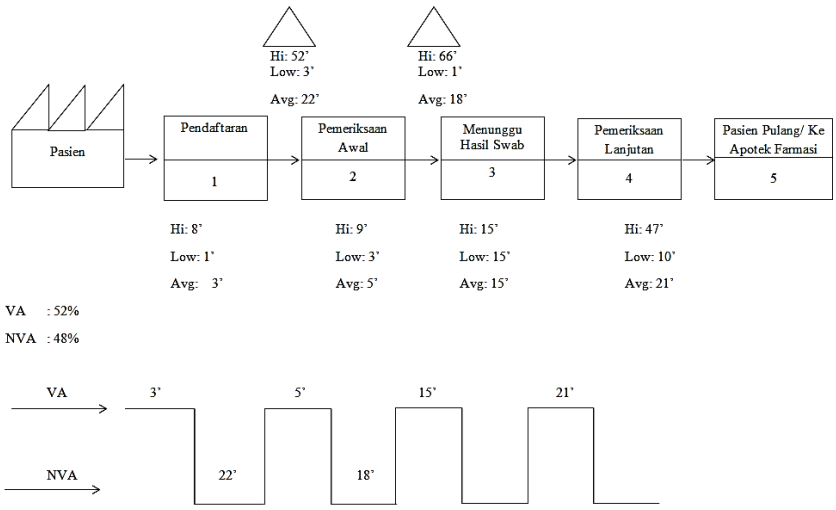

Figure 1. Big Picture Mapping of Patient Handling at the Dental Clinic

4.2. Waste Identification

Identification of waste in PLK Universitas Airlangga through observation, interviews, and questionnaires that have been distributed to four respondents who are directly related to the operation process in the dental clinic PLK Universitas Airlangga Campus B. Types of waste such as overproduction, waiting, transportation, inappropriate processing, unnecessary inventory, unnecessary motion, and defects were identified. The results of the questionnaire determined a score of 0-5 for each type of waste to select value stream mapping tools, thus obtaining the following results:

Table 1. Waste Identification Results and Waste Ranking in Hospital

Waste Type	Total Score	Average Score	Weights	Ranking
Overproduction	9	2,25	0,21	2
Waiting	14	3,5	0,33	1
Transportation	5	1,25	0,12	3
Inappropriate Process	2	0,5	0,05	6
Unnecessary Inventory	5	1,25	0,12	3
Unnecessary Motions	3	0,75	0,07	5
Defect	4	1	0,10	4

Source: Data Processing Results

4.3. Value Stream Analysis Tools (VALSAT)

After weighting the waste, the tools are selected using the VALSAT table. The results are entered into the correlation table between waste and seven mapping tools, multiplied by the correlation value (H = 9, M = 3, L = 1), and then summed up.

Table 2. Value Stream Analysis Tools (VALSAT) Calculation Results

Value Stream Mapping Tools	Total Weight	Ranking

Process Activity Mapping	5,52	1
Supply Chain Response Matrix	4,79	2
Production Variety Funnel	0,83	6
Quality Filter Mapping	0,98	5
Demand Amplification Mapping	2,71	3
Decision Point Analysis	2,05	4
Physical Structure Mapping	0,24	7

Source: Data Processing Results

Based on the table above, it is known that the selected process activity mapping, with the highest weight value of 5.52, was used to analyze waste in the dental clinic. Process activity mapping was chosen as the main tool. Table 3 outlines the activities in the dental clinic of PLK Universitas Airlangga Campus B. The average time was obtained from observations of 37 patients.

4.4. Process Activity Mapping Analysis

Process activity mapping was chosen as the main tool. Table 3 outlines the activities in the dental clinic of PLK Universitas Airlangga Campus B. The average time was obtained from observations of 37 patients.

Table 3. Process Activity Mapping in Dental Clinic PLK Universitas Airlangga Campus B

Process Activity Mapping					
Activities	**Flow**	**Time (minutes)**	**Category**		
			VA	**NVA**	**NNVA**
Patients queuing at the registration machine	D	1		1	
Patients register at the registration machine or service admin	O	2	2		
Patients who have never come to PLK register or fill in the registration form	D	5		7	
Service admin takes the medical record file to be given to the dental clinic department	T	1			1
Waiting time for inspection	D	14		14	
Initial examination/consultation	O	5	5		
SWAB antigen waiting time as a condition for further action	D	11		18	
Waiting time for antigen SWAB results	O	15	15		
Follow-up examination after antigen SWAB	O	18	18		
Explanation of treatment, medication, and control schedule if needed	I	2			2
Prescribe medication or referral to the laboratory	O	1	1		
Total Time	**84**	**41**	**40**	**3**	**Total Time**
Percentage	**100%**	**49%**	**48%**	**3%**	**Percentage**

Source: Data Processing Results

4.5. Fishbone Diagram Analysis

Waste in the dental clinic of PLK Universitas Airlangga that will be analyzed is taken from the two wastes that have the greatest weight in the process activity mapping: waiting time and overproduction.

4.5.1. Waiting

The biggest waste is waiting, causing patients to wait longer, reaching 41% of activities. The following are the factors that cause waste waiting based on the fishbone diagram:

1. Man
    - The dental clinic coordinator revealed a lack of dentists in PLK B and C, which should be four, causing an excessive workload on the available doctors.
    - The availability of general nurses for antigen swabs is inconsistent, causing patient waiting times. This suggests the need for more effective scheduling or additional personnel.
2. Method
    - The service admin should retrieve the medical record cards according to the queue. Sometimes, missing data also requires reprinting.
    - The patient registration process using the queuing machine is sometimes hampered because new patients are usually confused about how to use the queuing machine.
    - There is a process of sterilizing tools used by previous patients before being used by the next patient.
    - Patients need a SWAB test before further treatment, such as tooth extraction. This extends waiting time and adds to waste.
3. Material
    - There is equipment that is damaged and is being repaired, so patients are given a choice between waiting until the equipment is repaired or leaving first.
4. Machine
    - Patients need a SWAB test before further treatment, such as tooth extraction. This extends waiting time and adds to waste.
    - An Internet connection error causes the queuing machine and patient data input to be hampered.

4.5.2. Overproduction

Overproduction, the second largest waste, takes second place with a weight of 0.21 and an average score of 2.25. This waste is caused by repetitive activities that result in the accumulation of non-value added. The following are the factors that cause overproduction waste based on the fishbone diagram:

1. Man
    - Lack of communication between staff has led to repetitive printing of medical records and a buildup of files.
2. Method
    - Filling inpatient data at the dental clinic has three administrative steps, namely SIM, P-care, and register books filled in by dental nurses and added by doctors who have to fill in medical record cards.

5. Conclusion

The research results at PLK Dental Clinic Universitas Airlangga show that the highest waste is waiting and overproduction. Factors such as a shortage of dentists and nurses, as well as patients' lack of

understanding of the queuing machine and internet connections that are often problematic, are the main causes of waste. Suggestions include adding manpower to overcome the shortage of human resources, creating guidelines for using the queue machine, and providing information about the mandatory antigen swab test to patients. Future research should use more diverse analytical tools to get more comprehensive and in-depth results. In addition, a comparison of waste between the pandemic period that requires antigen swab tests and the post-pandemic period is also expected to be carried out to provide better insight into the efficiency of service processes in different times.

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