

# Implementing Lean Healthcare for Identifying and Minimizing Waste

## Case Study: Eye Hospital's Outpatient Installation in Indonesia

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**Abstract**—In this paper, the lean healthcare is implemented to identify and reduce waste. There are many wastes which appear in regular polyclinic, Cicendo Eye Hospital in Indonesia. The research is focusing on reducing critical waste. The critical waste is chosen after mapping the existing of patient flow measurement by using the current state mapping and identifying the eight wastes in every process. The problem tree method is used to identify the causes of waste. The design of the best suggestions can be determined by applying the 5W+1H method. The suggestions are classified into three categories namely the suggestions that suitable to be implemented in the short term, medium term and long term. The results obtained shows that implementing the lean healthcare can save 67,24% of total time of non value added activity and also saving 56.28% time of waiting time

**Keywords**—lean healthcare; current state mapping; minimizing waste; problem tree; 5W+1H method

### I. INTRODUCTION

Indonesia has two types of hospital based on the status of ownership, namely the government hospital and the non-government hospital. Both of them have to fulfill the qualifications of services for the patient's needs. The services refer to Minimum standards of service hospital 2008 which is issued by The ministry of health, Indonesia. The Cicendo Eye Hospital is the one and only government hospital, which has become a national eye center in Indonesia since 2014. The number of patient is increasing significantly from 2006 there are about 118.818 of outpatient installation's patients, 9.904 of inpatient installation's patients, 2.687 Lasik's patients and 14.880 of the emergency room's patients. The best service should be implemented in an efficient and effective way to avoid the loss of physical and materials. The hospital is an ideal setting for use of the lean production method, which could significantly affect how health care is delivered to patients [5].

Regular Polyclinic of Cicendo Eye Hospital's Outpatient Installation doesn't support a satisfying service proven by patient's lining time reached more than 3600 seconds, which is actually beyond

expectation. The standard of waiting time based on Minimum standards of service hospital 2008 is less than 3600 seconds. This problem affects the whole process of services, one of the reason is doing an activity without value added.

### II. LITERATUR REVIEW

#### A. Lean Healthcare

In the beginning of the year 2000 the lean healthcare introduced in the world health services, exactly four years after the term lean start popularized that is in 1996 [10]. Reference [2], the lean healthcare is defined as elimination extravagance in any field activities with the purpose of reducing supply, cyclical time services, and the cost, so in the end patient cares high quality can be given as efficient and responsive, but keep the economic value organization.

Since applying in the Ministry Health in early 2000, in 2005 lean new applied as a whole. The hospital dare to apply lean healthcare overall at Virginia Mason in Seattle, [1]. On the project the application of lean in the hospital shows the positive progress. So after the project, lean healthcare starts to spread on other hospitals along with many research related to the lean that is indicative of the positive impact after the application of lean healthcare. Lean has the potential to improve health care delivery. At the same time, there are methodological and practical considerations that need to be taken into account. Otherwise, lean implementation will be superficial and fail, adding to existing resistance and making it more difficult to improve health care in the long term [8]. An example of application of the lean in healthcare is given in this research [6]. They use lean techniques to improve hospital performance in Brazil. A study that analyze the process of implementing lean healthcare in three Brazilian hospitals had developed [9]. The use of lean tools to reduce the patient waiting time had proposed [4]. They can reduce the waiting time by 4.5 hours, and the per cent complete and accurate increased by 50 per cent. A review of lean in healthcare can be found in this research [3].

Waste in the health care system is no different from waste in manufacturing systems. That's why Lean can provide the solution in healthcare as well as in manufacturing. Nowadays, there are eight wastes in lean healthcare namely: defects, overproduction,

waiting, non-utilized talent, transportation, inventory, motion, and over processing.

**B. Value Stream Mapping**

The value stream mapping is a tool which used for identifying and mapping the process flow [7]. Value stream mapping also defines as a special type of flow chart uses symbols known as “the language of Lean” to depict and improve the flow of inventory and information. Current State Mapping uses for mapping the existing conditions and future state mapping uses for mapping the condition after improvement.

In order to establish a perfect process, organization key processes (primary and internal) that support core product such as an office visit, or an inpatient stay, or a visit to the emergency department need to be identified. Then it is followed by selecting the person that responsible to improve each process.

Lean specialists notice that the sustainable process is one that participants have confidence in. The most ideal approach to make confidence in a procedure is for participants to have the capacity to see it completely and to comprehend its rationale. Participants also needs to be included in enhancing the processes in order to create vision and comprehension.

Lean experts note that the only sustainable process is one that participants believe in. The best way to create belief in a process is for participants to be able to see it in its entirety and to understand its logic.

**C. Problem Tree and 5W + 1H Method**

The problem tree is a method or an approach that is used to identify and analyze the root of the problem or the cause of an issue. The problem tree has three parts, namely the branch, stems and roots. The branch is an interpretation of the impact of problems, stems is an interpretation of the main problem and roots is an interpretation of the problem

A method of 5W+1H is one of the methods that can be used to determine solution or repair proposal on the problem. A method of 5W+1H can also be used to identify the problem in detail. A method of 5W+1H consisting of what, when, where, who, why and how.

**III. CASE STUDY**

The common data for this study was collected by conducting observation, interview, documentation and brainstorming. Steps in processing data are as follows; map the existing condition with current state mapping; make a value assessment to know the percentage of nonvalue added activity, necessary but non value added activity and value added activity, identify waste in every process and find the critical waste using Pareto chart and the causes of critical waste using the problem tree.

The critical waste need to be minimized to find the most optimized solution for minimizing waste using 5W+1H method. Mapping the new condition is necessary after having result by using future state mapping.

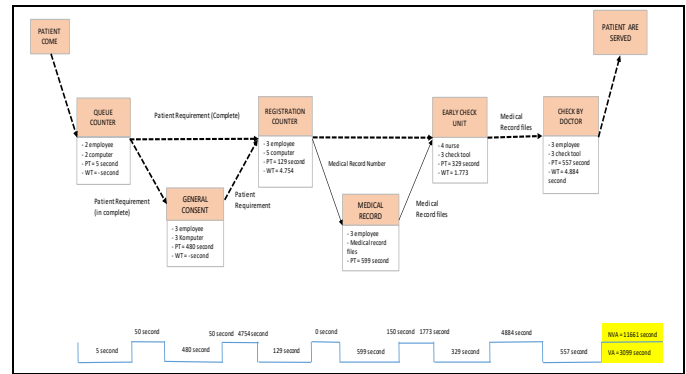


Fig. 1. Current state mapping

Based on the current state mapping, the patient takes 11661 seconds for non-value added activity (include searching and distributing medical record) and 3099 seconds for value added activity. Non value added activity is an activity which don't give value or make time of patient service longer.

**A. Value Assessment**

Here is the value assessment for new patient and patient control. Both of them have a similar total time of non-value added, 11411 seconds. The differences between them are the activity that patient takes, new patient needs to do longer activity. New patient needs to fill the registration form at General Consent. Value assessment of new patient and patient control can be seen in Table I and Table II

TABLE I. VALUE ASSESSMENT OF NEW PATIENT

NEW PATIENT					
No	Activity	Average of time (second)	Value Added (second)	Necessary but Non Value Added (second)	Non Value Added (second)
1	Patient coming				
2	Patient take the queue number	5	5		
3	Patient go to General Consent	50		50	
4	Patient fill the registration form	480	480		
5	Patient go to registration counter's waiting room	50		50	
6	Patient wait in registration counter's waiting room	4754			4757
7	Verify patient's data in registration counter	129	129		
8	Patient go to polyclinic	150		150	
9	Patient wait in polyclinic's waiting room	1773			1773
10	Patient is examined by nurse	329	329		
11	Patient wait in specialist doctor's waiting room	4884			4884
12	Patient is examined by specialist doctor	557	557		
13	Patient is done				
Total		13161	1500	250	11411
Value Added (VA)		: (1500/13161) x 100%		: 11.40%	
Necessary but Non Value Added (NNVA)		: (250/13161) x 100%		: 1.9%	
Non Value Added (NVA)		: (11411/13161) x 100%		: 86.70%	

TABLE II. VALUE ASSESSMENT OF PATIENT CONTROL









PATIENT CONTROL					
No	Activity	Average of time (second)	Value Added (second)	Necessary but Non Value Added (second)	Non Value Added (second)
1	Patient coming				
2	Patient take the queue number	5	5		
3	Patient go to General Consent	50		50	
4	Patient fill the registration form	4754			4754
5	Patient go to registration counter's waiting room	129	129		
6	Patient wait in registration counter's waiting room	150		150	
7	Verify patient's data in registration counter	1773			1773
8	Patient go to polyclinic	329	329		
9	Patient wait in polyclinic's waiting room	4884			4884
10	Patient is examined by nurse	557	557		
11	Patient is done				
Total		12631	1020	200	11411
Value Added (VA)		: (1015/12631) x 100%		: 8.08%	
Necessary but Non Value Added (NNVA)		: (200/12631) x 100%		: 1.58%	
Non Value Added (NVA)		: (11411/12631) x 100%		: 90.34%	

Based on Table 2 and Table 3, the percentage of non-value added is >85%, it means that there are so many wastes (non-value added activity) in the Regular Polyclinic. Waste makes patient to have long waiting time. The standard Waiting time's is ≤ 3600 seconds, but Table 1 and Table 2 show that patient's waiting time is > 3600 seconds. Long waiting time that patient take will impact to total patient's service time.

**B. Identify Waste**

Before reducing waste, the first thing to do is to identify waste in each process from the registration's counter, Medical Record Department, Polyclinic Department and also specialist doctor's polyclinic. Then, separate them into 8 categories of waste. The 8 categories of waste can be seen in Table III.

TABLE III. 8 CATEGORIES OF WASTE

No	Category of Waste	Waste	Place of Waste Appear	Time (Second)
1		Unaccommodated patient (not enough chair for patient in waiting room)	Specialist Doctor's Polyclinic	-
2		The Counter's official is being distracted by another patient, who ask about flow of the queue.	Registration's counter	20-30
		Polyclinic's official repeat to call the patient. Polyclinic's official calls back patient, which called in the previous section		15-25 10-15
3		Unuseful banner, some patient still asks to official or other patient about the flow of patient service.	Registration's counter	-
4		Incomplete patient's rule and regulations when the patient arrives at the registration's counter.	Registration's counter	30-60
		The Medical record is distributed to wrong polyclinic.	Medical Record	240-600
		Patient visits wrong polyclinic	Polyclinic	240-600
5		Patient's companion uses the patient's chair in the waiting room.	Specialist Doctor's Polyclinic	-
		The Medical record is being distributed from 1st floor to 3rd floor.	Medical Record	150
6		The Specialist doctor walks into polyclinic's waiting room to call patient which does not wait in the specialist doctor's waiting room.	Specialist Doctor's Polyclinic	20-40
7		Patient waits in registration counter's waiting room.	Registration's Counter	4754
		Patient waits in polyclinic's waiting room.	Polyclinic	1773
		Patient waits in registration counter's waiting room.	Specialist Doctor's polyclinic	4884
8		Receptionist's table sometimes is empty, so make some patients feel confuse and hard to get information.	Polyclinic	-

After identifying all wastes, then find a critical waste is the Waiting. Waiting is a waste that gives a big contribution to the long of patient's time service. It occurs in registration's counter, polyclinic and also specialist doctor's polyclinic.

**C. ProblemTree**

Before finding a suggestion for reducing critical waste, the causes of the critical waste need to figure out using Problem Tree. Result about the causes of critical waste, which can be seen in Table IV

TABLE IV. RESULT OF PROBLEM TREE

No	Critical Waste	Causes
1.	Patient waits in registration counter's waiting room.	Online registration needs to be checked before being implemented and needs support from patient and also hospital policy.
		The Cicendo eye hospital is one and only hospital of the eye center in Indonesia. Restrictiveness of human and equipments.
2.	Patient waits in polyclinic's waiting room.	Medical record's official distributes the medical record from 1st floor to 3th floor.
		Restrictiveness of human and equipments (only 3-4 nurse and 3 equipment)
		Unavailable loud speaker.
		Patient waits in wrong polyclinic. The Patient goes to another room (example: toilet)
3.	Patient waits in the specialist doctor's waiting room.	The Specialist doctor doesn't prepare all the equipment before examining patients. Restrictiveness of waiting room.
		The Nurse is waiting for another medical record (do not distribute one by one, but distribute more than one because they want to make it more efficient)
		Restrictiveness of specialist doctor.

**IV. RECOMENDATION**

To find what a suit recommendation in the case, there are several steps should be finished, first use 5W+1H method to find the suggestions from the problem and then analyze every suggestion. Then, every suggestion, is divided into three categories namely, suggestion which can be implemented in the short term, middle term and long term. Below are some suggestions for minimizing critical waste using 5W+1H. The suggestion can be seen in Table V.

TABLE V. SUGGESTIONS

No	Critical Waste	Causes	Suggestion	Time of Implement
1.	Patient waits in registration counter's waiting room.	Online registration needs to be investigated before being implemented and needs support from patient and also hospital policy.	Online Registration	Medium term
		The Cicendo eye hospital is one and only hospital of the eye center in Indonesia. Restrictiveness of human and equipment.		
		Medical record's official distributes the medical record from 1st floor to 3th floor.		
2.	Patient waits in polyclinic's waiting room.	Restrictiveness of human and equipment (only 3-4 nurse and 3 equipment)	Adding personnel and instrument for examining the patient	Medium term
		Unavailable loud speaker.	Need loud speaker	Medium term
		Patient waits in wrong polyclinic.	Footprint display	Medium term
		The patient goes to another room (ex: toilet)	Visual display	Medium term

TABLE V. SUGGESTIONS

No	Critical Waste	Causes	Suggestion	Time of Implement
3.	Patient waits in the specialist doctor's waiting room.	The Specialist doctor doesn't prepare all the equipment before examining patients.	Checklist	Short term
		Restrictiveness of waiting room.	Maximize corridor	Medium term
		The nurse is waiting for another medical record (do not distribute one by one, but distribute more than one because they want to make it more efficient)	Direct distribution from nurse to specialist doctor	Short term
		Restrictiveness of specialist doctor.	Adding personnel (specialist doctor)	Long term

The application of the proposed improvement can reduce waste (non-value added activities) on the patient service flow up to 67.25% of the total waste time. In addition, there was a decrease in the percentage of waiting time by 56.28%. The percentage of reduced time does not reach 100% because the focus of research is to reduce critical waste. Waste can be reduced as a whole if it is identified in critical waste and noncritical. The root of the problem and the proposed improvement are evaluated for each waste. The process is done gradually so as to eliminate all waste and reach 100% with reference to continuous improvement.

#### V. CONCLUSION

We implement the lean healthcare approach to reduce waste in a hospital in Indonesia. The approach contains several steps. The results obtained shows that implementing the lean healthcare can save 67,24% of total time of non value added activity and also save 56.28% time of waiting time (from 7265 seconds to 3176 seconds). It means that the application of the lean healthcare can help the hospital fulfils the standard (waiting time  $\leq$  3600 seconds). In order to obtain a better result all waste needs to be reduced (not only the critical waste) and make continuous improvement. For future research, we suggest to add more sample, determine the cost of the improvements, more detail in identifying waste in Medical Record and design the online registration's system

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