

Waste Analysis On Patient Care In The Emergency Installation Of Government Hospital X Of Riau Province

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Abstract: The researcher wishes to analyze the existence of waste with a lean hospital management approach on the process of patient care in the Emergency Installation (IGD) of Government Hospital X of Riau Province. Congestive Heart Failure was chosen to describe the flow of the patients-care process starting from the registration until the patient was ready to be delivered to the treatment room. This study employed a qualitative type utilizing a descriptive analytic approach. Primary data were obtained through the observations to 20 patients delivered by families, supplemented by in-depth and unstructured interviews of with the patient's family and emergency installation staff as a respondent. In addition, the primary respondent is a head of the emergency installation and a person who carry out role as a coordinator as well as in charge of the emergency installation. Secondary data was obtained from the collection of documents, journals, and reference books related to the research topic. The results showed that the Emergency Installation of the Government Hospital X of Riau Province had not implemented Lean Management yet. The care process flow had a non-value added ratio of 31.8% for recent patients and a non-value added ratio of 31.5% for preceding patients. Over-processing, over-motion, unused employee creativity, waiting, defects, unnecessary transportation and unnecessary inventory were the forms of waste found during research. Adding the Human Resources (HR), optimizing managerial activities, implementing 5S work culture (Seiri/Concise; Seiton/Neat; Seiso/Clean; Seiketsu/Care; Shitsuke/Diligent) and error proofing, adding visual management, improving the ability of Hospital Management Information System using E-Kanban, and planning re-layout with line balancing analysis were expected to reduce waste of the patient care process in the Emergency Installation of the Government Hospital X of Riau Province.

Index Terms: Lean hospital management, waste, line balancing

1 INTRODUCTION

A hospital is an institution providing health services performing the function as an integral part of the health care system. The increase of sophisticated scientific developments and technological advances has an influence on the health services implementation in hospitals, in which the hospitals are required to remain able to provide and improve quality health services so as to realize the highest level of health. 1 Health services can be said to have a good quality if they are able to meet professional standards and codes of ethics, and they are able to provide satisfaction to service users. 2 Good resources and managements are the main requirements for achieving efficient health services quality. 3. Government Hospital X of Riau Province is located in Pekanbaru City and is designated as an Education Hospital, Class B, functioning as an education center as well as a health referral center in the Region of Riau Province. 4 Government Hospital X Ria Province has participated in the era of National health insurance (NHI) for achieve Universal Health Coverage (UHC) in 2019 having purpose that every citizen has fair access to quality and affordable health services. 5 Emergency Installation (IGD) is the primary service of hospitals with the principle of providing effective, efficient and professional services. The various patients in the Emergency Installation (IGD) certainly have different conditions. The standard response time for handling patients in Emergency Installation (IGD) established by the Ministry of Health of the Republic of

Indonesia is ≤ 5 minutes with a definitive time is ≤ 2 hours. 6

The researcher conducted preliminary surveys showing that the morbidity and mortality rates of patients in the Emergency Installation (IGD) of the Government Hospital X of Riau Province have increased significantly over the past two years. The number of morbidity or of patients coming to the IGD of Government Hospital X Riau Province amounted to 22,783 patients in 2016; 24,142 patients were in 2017; And it increased to 25,509 patients in 2018. In addition, the most case occurred was Congestive Heart Failure (CHF). Meanwhile, the mortality rate or death was recorded at 41 patients in 2016; It increased to 203 patients in 2017; And the number of patient's death in the Emergency Installation (IGD) reached 253 patients in 2018. The Increase of morbidity rate indicates the need for effective and efficient service improvement, while one of the causes of the increase of the mortality rate is presumed to be because the services provided to patients in the Emergency Installation (IGD) of Government Hospital X have not been sufficiently maximal. Therefore, it is necessary to evaluate the service management having been conducted so far. It is supported by the results of the nursing audit of Government Hospital X in 2016, in which the Emergency Installation (IGD) has the lowest average value compared to other rooms. It means that the performance of a nurse for the Emergency Installation (IGD) does not reach the set standards. Researcher identified a gap occurred between a layout of the Emergency Installation (IGD) of the Government Hospital X of Riau Province and the ideal conditions set by the Ministry of Health (2012), so that the potential for causing waste in the provision of emergency services for patients. One of them is over-motion caused by a quite bad layout. Over-motion also often occurs due to the patient care flow in the IGD of Government Hospital X of Riau Province which is considered not sufficiently representative such as the flow of activities in the Emergency Installation recommended by the Ministry of Health. 7 The researcher wants to analyze the existence of waste using lean hospital

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management approach on the patient care process in the IGD of Government Hospital X of Riau Province. The Congestive Heart Failure (CHF) as the sequence of most illnesses suffered by patients in the Emergency Installation (IGD) of Government Hospital X in 2018 was chosen to describe the flow of Patient-care process starting from the registration to the patient is ready to be delivered to the treatment room. The researcher plans the existence of Future State Value Stream Mapping. Therefore, it can reduce waste in the patient care process at the IGD of Government Hospital X of Riau Province so that hospital conditions are much more effective and efficient. The hospital's service quality and customer satisfaction increase and improves life-saving.

2 LITERATURE REVIEW

2.1 Emergency Installation of Hospital

Emergency Installation (IGD) is one of the units in the hospital providing services to emergency patients and is part of a flow of response efforts for emergency patients needing to be organized. Law Number 44 of 2009 regarding Hospital explained that the emergency is defined as the patients' clinical condition needing immediate medical treatment to save lives and to prevent further disability.1Decree of the Minister of Health (Kepmenkes) 856/Menkes/SK/IX/2009 concerning Standards of IGD in hospital said that patients who were admitted to the emergency installation of the hospital certainly needed quick and appropriate help. For this reason, there is a need for standards in providing emergency services in accordance with their competencies and abilities so as to guarantee an emergency treatment with fast response times and appropriate treatment.8The role of the emergency installation is critically important in health services because it provides particular services for emergency patients for 24 hours a day

2.2 Lean Management

A lean production system which is identical to Toyota's Production Systems (TPS) is a production system developed and promoted by Toyota Motor Corporation, and it has been used by many Japanese companies as the impact of the oil crisis in 1973.9This systems has been widely applied successfully in many disciplines such as manufacturing systems, service facilities, and health service systems.10The production system aims at reducing or even getting rid of waste of the company. In addition, lean uses not only the consumers' perspective to define quality, but it also focus on the active elimination of activities that do not provide added value.11Therefore, it is concluded that the lean principle has the primary goal of reducing costs or improving productivity that can be achieved by eliminating various wastes.12In 2002, the health care sector began applying lean principles which came to be called lean health care. In the health care system, lean gives good expectations by placing patients as the top priority, reducing errors, reducing waiting times, giving health workers the opportunity to redesign activities to be more effective.12,13An organization applying lean has five basic principles, focusing on waste within its system. It means understanding the value of the work, the importance of staff training and their role in the team's progress to bring a change. Five lean principles applied are identifying values, establishing value stream mapping, conducting flow, developing a Pull system and achieving continuous improvement.13-15The idea

of the eighth waste - to complete Ohno's (1988) theory - over-production, waiting, defect, unnecessary transportation, unnecessary inventory, unnecessary motion, and over-processing - has been discussed in Lean's literatures but with a different explanation. Liker (2004), an academic specializing in TPS, suggests the eighth waste is "unused employee creativity. Losing time, ideas, skills, development, and learning opportunities by not involving or listening to your employees." Through a holistic approach to develop lean frameworks, the eighth waste is seen as a core element for applying conceptual frameworks that are in harmony with previous lean theories.16Sarkar (2008) argued that the classification of 8 wastes can be applied universally and does not require specific categorization in certain fields.17

2.3 Troubleshooting using Lean Management

Lean explains that problems are more effectively resolved at the place where problems occur (gemba/the actual place) than discussing in a meeting room because these way managers have the opportunity to see problems directly. The next step is discussing with officers working in the area where the problem occurs. The third step is to find the cause of the problem after the problem is revealed first with 5 whys (fishbone diagram). After the fishbone diagram is completed, it is planned to create a future state map to increase confidence that the change from the current state map to a future state map addresses the real problem, not eliminating symptoms.18Line balancing aiming at obtaining a smooth production flow to obtain high utilization of facilities, labor, and equipment through work time balancing between work stations, where each task element in a product activity is grouped in such a way in several predetermined work stations so that a good work time balance is obtained.19General requirements that must be used in a balanced production line are to minimize idle time and also minimize balance of free time.20A balanced production line can balance the workload allocated to each workstation (a combination of machines, tools and equipment, and the people needed to complete the work) so that it is finished at a balanced time, and it prevents the occurrence of bottle neck (an operation that limits output and production frequency) and achieves the ultimate goal of increasing efficiency or productivity.20, 21

3 METHOD AND MATERIAL

This study employed a qualitative research utilizing a descriptive analytic approach carried out at the IGD of Government Hospital X of Riau Province. Primary data collection was carried out through observation of 20 patients experienced Congestive Heart Failure (CHF) accompanied by families, both patients who were first to the IGD of Government Hospital X of Riau Province, as well as patients who had repeatedly visited IGD of Government Hospital X of Riau Province. Observations to map the value stream of the service process in the emergency installation of Government Hospital X of Riau Province were carried out on Monday to Sunday in service activities hours by dividing into three service shifts (morning shift: 08.00-14.00 WIB; afternoon shift: 14.00-21.00 WIB; night shift 21.00-08.00 WIB), with the assumption to avoid bias in the process of patient service in the Emergency Installation of the Government Hospital X Riau Province. The observation is supported by documenting every activity that occurs in the emergency installation during the study. Activities having value for patients (value added

activities) and activities causing waste/non-value added activities both in terms of over-production, waiting, defect, unnecessary transportation, unnecessary inventory, unnecessary motion, over-processing and used employee creativity using fishbone diagrams are identified in each process. The method of Root Cause Analysis (RCA) by asking 5 whys is carried out to examine in detail to find trigger to the existence of a problem, a discrepancy, and existing gaps. 18 In-depth and unstructured interviews were conducted to find out things that could be unfound in the observation process. 22 Respondents for Interview were selected through purposive sampling techniques based on predetermined inclusion criteria. The selected respondents included the patient's family, TPPGD/medical records officers, laboratory officers, pharmacy officers, radiology officers, nurses and guardians, with the main respondent is the head of the emergency installation, as well as a coordinator and person in charge of the IGD of Government Hospital X of Riau Province. For the patient's family, the criteria chosen were productive age. The patient had gone through a critical stage and were in the ward, and she/he be able to read and write. The inclusion criteria for the staff involved were working in the emergency installation with a service period of ≥ 1 year. Meanwhile, the main respondent had additional criteria, which are a structural official and decision maker for emergency services. In this study, secondary data were obtained from primary data collected by other parties beforehand, including documents owned by IGD of Government Hospital X of Riau Province, journals, and reference books related to the research topic. Brainstorming improvement ideas was carried out by triangulating sources and methods that combine information obtained from primary and secondary data. Furthermore, data analysis was carried out the 3 stages, which are data reduction, data display and conclusion drawing/verification. Data reduction means to summarize all information that has been obtained and choose relevantly to research; (2) data display presenting data in the form of a brief description, making charts, relationships between categories, flowcharts, and interview matrices so that it is easy to understand the phenomena that occur and plan the next steps; and (3) conclusion drawing/verification means drawing conclusions by making a new finding. 22 The design of the re-layout to support the Future State Value Stream Mapping is a proposed improvement in reducing waste in the patient service care at the Government Hospital X of Riau Province.

4 RESULT AND DISCUSSIONS

4.1 General Description of Emergency Installation (IGD) of Government Hospital X Riau Province

Emergency Installation (IGD) of Government Hospital X of Riau Province provides services to emergency patients for 24 hours a day, 7 days a week continuously, with a form of service is in the form of primary care and henceforth is coordinated with other sections or units in accordance with the case the disease. The function of the Emergency Installation (IGD) is to prioritize patient safety and provide quality, appropriate, rapid, affordable services to the community. The process of patient care at the IGD of Government Hospital X of Riau Province begins when the patients arrive by being accompanied by family, or they are referred by ambulance from another health facility. After that, triage is carried out as a screening process to categorize patients into one group: triage

scale 1: 0 minutes; triage scale 2: 10 minutes; triage scale 3: 30 minutes; triage scale 4: 60 minutes; and triage scale 5: 120 minutes. Subsequently, the triage is carried out for patients, then they will be placed to trauma room, observation room, resuscitation room or non-trauma room. One patient's family will register to a special registration room for emergency patients. The on-duty doctor will conduct an examination and provide action as first aid for the emergency patient, instruct the nurse to monitor vital signs, observe the patient's condition, and consult a specialist doctor for further treatment of the patient.

4.2 Respondent's Characteristic

Respondents taken were 34 people according to the inclusion criteria set by the researcher. Respondents consisted of 10 families of preceding patients of Government Hospital X of Riau Province and 10 families of patients who had visited the Government Hospital X of Riau Province for the first time, as well as each of two of on duty doctors, nurses, laboratory officers, pharmacists, radiographers, TPPGD (Emergency Patient Registration Place)/medical records. In this study, the primary respondents are the head of the emergency installation and the person who is as the coordinator and in charge of the emergency installation of Government Hospital X of Riau Province.

4.3 Value Stream Mapping

Value stream mapping illustrates the flow of the patient care process in the emergency installation of Government Hospital X of Riau Province which is as the result of the researcher observation during the study. The researcher conducted direct observations in the field to map the value streams of activities in the emergency installation as one of the tools to determine the composition of value added and non-value added activities. The flow of the process of new patient care experienced Congestive Heart Failure in the IGD of Government Hospital X of Riau Province from the observations can be seen in the following figure:

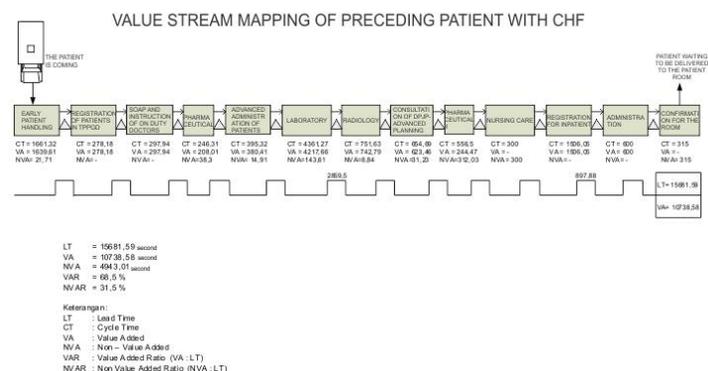


FIGURE 1. VALUE STREAM MAPPING OF NEW PATIENT WITH CHF

The flow of the process of preceding patient care experienced Congestive Heart Failure in the IGD of Government Hospital X of Riau Province from the observations can be seen in the following figure:

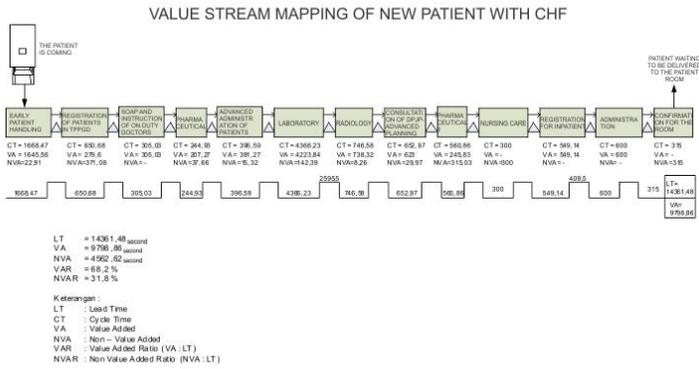


FIGURE 2. VALUE STREAM MAPPING OF PRECEDING PATIENT WITH CHF

Based on the results of observations and interviews conducted by the researcher in the patient care process with Congestive Heart Failure in IGD of Government Hospital X of Riau Province starting from the patient arrives until the patient is ready to be delivered to the inpatient room shows that the IGD of Government Hospital X of Riau Province has not implemented Lean management, where a series of the service process for new patients takes 239.35 minutes with a non-value added activity ratio of 31.8% and a series of service processes for preceding patients takes 261.35 minutes with a non-value added activity ratio of 31.5%.

4.4 Design for Proposed Improvements

Proposed improvement is given to improving the flow of the patient care process so that the service process can run smoothly, effectively and efficiently. Improvements in the process are expected to accelerate the flow of services to patients in the IGD.

TABLE 1.
Distribution of Problems and Proposed Improvements

No.	Waste Category	Waste Source	What's found	Solutions
1.	Over-processing	Man	The habit of recording repeatedly	- There is an agreement/policy to make standardized work so that services are effective and efficient
		Method	Standard Operating Procedures (SOP) for patient registration where the patient's family fills in RM.01 containing the patient's identity but the data will later be entered into the computer system by the TPPGD officer by looking at the patient's identity card	- There is an agreement/policy to make standardized work so that services are effective and efficient
2.	Over-motion	Method	The supporting room of IGD is at a different door from the IGD center.	- There are considerations to improve layout with line balancing analysis to create a one-door emergency installation building, where the access to supporting rooms is on the same line as the IGD center.
			The lack of directions signs to the supporting room	- The adding of the number of directions sign makes easy-to-see directions to a location.
			Pharmacy officials pile up prescription requests, especially at afternoon and night shifts.	- There is a regulation/policy from the directors of service board to consider providing a separate supporting room for

				Patient of the inpatient.
			Procedures of the inpatient are well uncoordinated in which the nurse must confirm the inpatient department before the patient will be delivered to the room. This procedure should be carried out by the TPPGD information officer when the patient's family registers the patient as a care patient.	- There is an agreement/policy to make standardized work so that services are effective and efficient
			DPJP's monthly schedule does not have a special place so the on-duty doctor always looks for a schedule before consulting	- Implementing 5S system to create orderly and efficient work behavior
3.	Unused employee creativity	Man	Distribution of officers and shifts evenly	- There is an internal meeting of each supporting section of IGD to discuss the even distribution of the number of officers as needed to optimize managerial activities
			The lack of professional nurses is due to the attending physician's instructions for initial actions even though the nurse has received prior training	- Meeting to discuss standardized work so that nurses can apply the results of the training maximumly
		Method	Triage in front of the doctor's desk	- The meeting to discuss standardized work, so that the triage room as well as doctors and nurses equipped with training to determine triage scores can carry out their functions.
No.	Waste Category	Waste Source	What's found	Solutions
4.	Waiting	Man	Total of Limited HR	- There are considerations to increase the number of human resources, for example helper to help the emergency installation and medical records warehouse - There is a regulation/policy from the directors of service board to consider providing a separate supporting room for Patient of the inpatient. - Optimization of Information and Technology (E-Kanban) systems so that the results of supporting examinations can be read directly by the on-duty doctor without waiting for the officer to deliver the results
		Method	The registration room of IGD is at a different door from the IGD center.	- There is consideration for layout improvement with line balancing analysis so that the TPPGD and IGD center are in the same door and room
5.	Defect	Man	There is no prescription from the doctor to the nurse when the nurse takes the equipments/medicines for the patient so that there is often a mismatch of requests on behalf of the patient and the need for the equipments/medicines having been dispensed	- There is an agreement/policy to make standardized work so that services are effective and efficient
		Method	The error made by officer of the medical record warehouse in retrieving the file because he was looking for several medical records at once	- Medical record markers with tracer system to minimize errors when retrieving/returning medical records to their original place
		Method	Storage shelf for medical record file is narrow. Therefore, many files are forcibly inserted so that files become corrupted	- Divide the storage shelf for medical record file according to patient classification - Monitoring and evaluation of medical record files belonging to patients who are no longer active so that they are sorted and destroyed
6	Un-necessary transportation	Method	Delegation for delivering laboratory samples from nurses to the patient's family due to the limited number of HR of laboratory analyst	- Recruitment of new employees, for example helper in charge of delivering laboratory samples

7.	Unnecessary inventory	Method	Inactive medical record files are still in the medical record warehouse	- Improve periodic monitoring and evaluation of expired medical record files (every 5 years)
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5 STATE VALUE STREAM MAPPING (FSVSM)

The results of root cause analysis using fishbone diagrams are used as a reference in providing design proposals for improvement with the aim of making Future State Value Stream Mapping, so as to simplify the number of stages of the process to be smaller, reduce complexity in the flow of information, and shorten the waiting time between processes. Future State Value Stream Mapping (FSVSM) is created by eliminating waste thereby reducing the cycle time that occurs in each process. The making of FSVSM has the aim to improve the quality of service to be more effective and efficient by applying existing tools in lean management, among others, applying the culture of Toyota way to optimize managerial activities, implement 5S work culture, and error proofing to optimize and implement work behavior that is orderly, add visual management to create good service process procedures and implement E-Kanban to increase the efficiency and effectiveness of inventory and workload. Figure 4. Future State Value Stream Mapping of preceding patient with Congestive Heart Failure (CHF).

6 RESEARCH LIMITATION

In this study, the researcher created a value stream mapping in the care process for patient with Congestive Heart Failure which is the most diagnosed disease in the IGD of Government Hospital X of Riau Province in 2018. The selection of patients with Congestive Heart Failure is expected to be able to illustrate the flow of the service process for patients in IGD of Government Hospital X of Riau Province as a whole because The researcher has been observing for approximately 3 months in the emergency installation and see the same flow of service processes occur in every patient who comes delivered by their family. The researcher did not examine the cause of the delay in the patient being delivered to the treatment room because of the limited time the researcher had. Therefore, there is the need for further research about the causes of the delay in the readiness of the treatment room to receive patients from the Emergency Installation. In this study, the researcher conducted in-depth interviews with key respondents directly involved in service activities in the IGD. they are the head of the emergency installation and the person who is as coordinator and in charge of the emergency installation of Government Hospital X of Riau Province, so that they can help provide alternative inputs for solving problems regarding the results observations that the researcher has done before. It would be better if for further research, the in-depth interviews could be conducted with the Directors, especially related to the service department to be able to provide views and input to improve the process of patient services in the emergency installation so as to help creating a more effective and efficient service quality improvement.

7 CONCLUSIONS AND SUGGESTIONS

7.1 Conclusion

1. The results of Value Stream Mapping in the flow of service for the patient with Congestive Heart Failure (CHF) at the Emergency Installation of Government

Hospital X of Riau Province shows that they have not yet implemented Lean management.

2. The results of the identification of activities during the service process for the patient with Congestive Heart Failure (CHF) in Government Hospital X of Riau Province found the existence of waste, including over-processing, over-motion, unused employee creativity, waiting, defects, unnecessary transportation and unnecessary inventory. Over-processing and over-motion are the most type of waste among other wastes.
3. The results of a root cause analysis using a fishbone diagram found that:
 - a. The habit of making repeated records in pharmacy, laboratory, and radiology units as well as the process of registering new patients in TPPGD is the cause of over-processing.
 - b. The layout of the IGD center and supporting rooms (pharmacy, laboratory, registration/TPPGD, medical record warehouse) that has been unrepresentative as recommended by the Ministry of Health (2012) accompanied by the lack of directions sign to the supporting room is the cause of over-motion. The division of tasks and responsibilities that are not in accordance with the SOP between the nurse of emergency installation and the information officer at the emergency installation regarding the condition of the inpatient room for the patient is also one of the causes of over-motion.
 - c. The lack of standardized work accompanied by a lack of professionalism of staff in IGD center and supporting units (pharmacy, laboratory, radiology, medical records warehouse) is the root cause of the emergence of unused employee creativity.
 - d. The limited amount of human resource in the IGD center and the supporting room accompanied by the layout of the IGD that is unrepresentative is the cause of the waiting in the process of patient care in the IGD.
 - e. Standard Operating Procedure (SOP) of the IGD center and medical record warehouse that is not carried out properly is as a cause of defects.
 - f. The use of shared laboratory services between the emergency installation and the inpatient room is the cause of unnecessary transportation.
 - g. Lack of monitoring and evaluation of expired medical record files is the basic emergence of unnecessary inventory.
4. Proposed improvement is based on the root cause of the problem by estimating the ability of the hospital and the factors that influence it. The proposed improvements include:
 - a. There is an agreement/policy to create a standardized work to prevent over-processing in the pharmaceutical, laboratory and radiology units and TPPGD.
 - b. The application of 5S culture, considerations for layout improvement along with adding directions to the IGD centralized space and supporting rooms to reduce waste due to over-motion.
 - c. Internal meetings between units to discuss tasks, responsibilities, and difficulties experienced by

officers so as to prevent unused employee creativity. The results of the internal meeting can later be delivered through regular and periodic meetings with the service director.

- d. Consideration of increasing the number of couriers/helper and optimizing the Information and Technology (E-Kanban) system to reduce the occurrence of waiting.
 - e. Adding visual management and optimizing 5S culture along with error proofing at the emergency center and medical record warehouse to avoid defects.
 - f. Unnecessary transportation can be reduced by the addition of a courier/helper.
 - g. Periodic monitoring and evaluation of medical record files that have expired to prevent unnecessary inventory.
5. The results of flowchart of Future State Value Stream Mapping of new and preceding patients with Congestive Heart Failure shows that by applying lean tools in the design of proposed improvements, a reduction in the number of stages of the service process becomes simpler and is followed by a reduction in waiting time between processes, so that it is expected to increase patient satisfaction with services in IGD of Government Hospital X Riau Province.variable?

1.2 Suggestions

1. The addition of Human Resources (HR) personnel such as couriers/helper in the medical records warehouse, pharmaceutical, laboratory, radiology, and IGD center.
2. Optimizing managerial activities by holding regular internal meetings between the head of the unit and members within the unit, which are IGD center, pharmaceutical, laboratory, radiology, medical records warehouse, and registration. The results of the internal meeting can later be delivered through a meeting with the service director section.
3. The application of 5S work culture and implement error proofing to optimize and implement orderly work behavior in the IGD center as well as medical and non-medical supporting units.
4. Reviewing the procedure of the service process by adding visual management, such as adding directions sign to the IGD section or making a banner in front of the entrance containing the instructions on registration requirements. The drug queue number at the pharmacy should be included when the patient's family will take the drug, so that the processing and distribution of the drug can be more organized and efficient.
5. Improve the ability of the Hospital Management Information System by using E-Kanban indicating when/has the goods been returned or where the item is.
6. Rearrangement of IGD layout by using line balancing through work time balancing among work stations, where each task element in a product activity is grouped in several work stations that have been determined so that a good work time balance is obtained.

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