IMPLEMENTATION OF LEAN MANAGEMENT IN ED PKU MUHAMMADIYAH PURBALINGGA HOSPITAL

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ABSTRACT

ED is a unit that determines patient satisfaction in-hospital services so that the good or bad of the services provided will affect other departments related to it. Therefore, the ED needs to implement lean management to streamline the waste that occurs. This study uses case study with qualitative data analysis. This study's data were collected using interviews and observations, with data analysis using the 5why method, which then identified the causal factors and used root cause analysis. The implementation of lean management in streamlining the waste that occurs in the ED of PKU Muhammadiyah Purbalingga Hospital is as follows: procurement of pharmacy depots and emergency unique patient registration places, to overcome excessive movement in reaching registration places and pharmacy depots on the ground floor; Making regulations in the form of rewards or bonuses for medical personnel, especially doctors, so that they are motivated to provide the best medical services; Additional human resources so that laboratory, radiology and other medical services can be provided every day; Prepare a budget for repair or procurement of new medical equipment to replace damaged ones, as well as procurement of computer equipment for each unit so that medical personnel do not have to queue for a long time to input patient data and examination results; Making SOPs for the use of drugs and consumables is also necessary so that medical personnel can control their use and avoid wasting the use of drugs and consumables.

Keyword: lean hospital, ED

I. INTRODUCTION

Hospitals, as health service providers, must have good service quality and increase continuously. Emergency Unit (ED) services in hospitals are one part that provides initial treatment for patients suffering from illness and injury, which can threaten their survival. The Emergency Department has doctors from various specialties along with several nurses and doctors on duty. The Emergency Unit functions to provide emergency and emergency medical services 24 hours a day, seven days a week. Patients with acute illness admitted to the ER can be categorized into emergency and emergency, crisis but not an emergency, emergency but not severe, not severe and not an emergency. An emergency is a condition related to a disease or other life-threatening illness. In contrast, the crisis is a situation that occurs suddenly and is not foreseen, an accident, an immediate or urgent need.

The ED unit is a unit that determines patient satisfaction in-hospital services so that the good and bad services provided will affect other teams associated with it. ED, as a part of the hospital, is also required to continuously improve the quality of its services (continuous improvement) considering the significant contribution of pharmaceutical management in quality and economy (1).

Lean management is one of the methods used to improve management so as to produce high quality service to customers. The lean concept is adopted as a systematic system to improve service quality and perform efficiency while maintaining quality and safety. Lean management has five principles that can be applied in service systems, namely determining value (value based on the customer's point of view), identifying value streams (identifying all stages in making products that can provide added value), flow (determining the flow or steps that create added value can flow), pull (following the needs and demands of its consumers), perfection (emphasizing the continuous improvement process) (2). Putri & Susanto's research (3) identifies critical waste, the root cause of critical waste, and proposes improvements to minimize critical waste. An overview of the service process is mapped through value stream mapping, the determination of critical waste is obtained through distributing questionnaires, the root causes of critical waste are obtained through in-depth interviews with the five why method. Proposals for improvement were obtained through team discussions and expert panels.

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Lean can be defined as an ongoing effort to reduce or eliminate waste that can occur and increase added value for customers (customer value). Lean itself aims to improve customer added value by increasing the value-to-waste ratio (4). When lean is used in the health sector, there is a decrease in medical errors and an increase in the use of available resources for better patient service (5).

Researchers see that several lean hospital systems have been studied in advance, both in the inpatient service unit (6) or in other departments. Usman & Ardiyana's research (7) found that the implementation of lean hospital management in emergency services can eliminate waste in terms of waiting, defects and procedures that are not following the standard, so it is necessary to recommend the improvement of skills that officers have owned to minimize errors that may occur.

Graban (2) explains that waste can be grouped into eight forms, namely over production (producing too many items), waiting (waiting time), over processing (doing work that exceeds the value), inventory (waiting for inpatient beds, and test results.), motion (unnecessary movement of employees), defects (error in checking), transportation (transportation of materials, equipment, information and patients), human potential / talent (not involving employees). This waste can be streamlined by implementing lean hospital management. Research by Friskasari, Suryawati, & Setyawan (8) concluded that the implementation of lean hospital management in the process of submitting health insurance claims can reduce the cycle time of the outpatient claim submission process. Research by Nugroho, Fitriasari, Ekasari, & Prasanti (9) concluded that waste elimination can be a solution to efficiency in production costs and quality costs in hospitals.

This research will focus on the services of the ED Unit PKU Muhammadiyah Purbalingga Hospital. Implementing a lean hospital is intended so that PKU Muhammadiyah Purbalingga Hospital can fulfill the needs and provide optimal service to patients by reducing waste to create added value (10).

IGD services are one of the mainstays of PKU Muhammadiyah Purbalingga Hospital in increasing income for other units. The problems that arise in services at the IGD PKU Muhammadiyah Purbalingga Hospital are the patient activities in following the medical service process which is quite a lot with a very long waiting time for each process, and this is one of the things that affects patient satisfaction. Patients who wait too long will result in a decreased level of satisfaction with the service, so a lean concept is needed to streamline time and provide satisfying service that is oriented to added value (11).

Research by Theroto & Nadjib (12) concluded that the waste that often occurs is stagnation of patients with indications of hospitalization in the ER (boarding). The high number of patient visits to the ER, both for emergency patients and non-emergency patients, exceeds the emergency room and services' capacity. The leading cause of boarding is outflow obstruction, meaning that patients who are indicated to be hospitalized have not been able to leave the emergency room because the inpatient room is not ready to accept patients from the emergency room.

This boarding can increase morbidity and mortality, delay in providing adequate treatment to patients according to the illness, disruption of the patient's comfort (unable to rest correctly) due to the bustle of the crowded emergency room so that it has an impact on the healing process, decreased quality of service and the quality of patient safety activities, as well as the emergency room, will experience difficulties if there are disaster victims who will enter the emergency room at any time.

The results of the preliminary study at the IGD section of the PKU Muhammadiyah Purbalingga Hospital still had a problem with the waiting time for the patient's boarding process to be hospitalized. Patient waiting time occurs from the time the patient registers at the registration counter to meeting the doctor for therapy is still quite long. Patients also need to wait for the results of supporting examinations, such as laboratory results, for hours and even wait until the next day. Waste also often occurs in the use of consumables (kassa, O2). Based on these problems, the researcher took the title "Implementation of Lean Management in the IGD Service Unit of PKU Muhammadiyah Purbalingga Hospital". The application of Lean Management at PKU Muhammadiyah Purbalingga Hospital, especially during the Covid 19 Pandemic, so that this research can clearly implement a lean hospital system or efficiency in the emergency room.

Based on the background that has been described, the purpose of this study is to analyze the factors causing the waste that occurs based on the lean management approach in the IGD Services at PKU Muhammadiyah.
Purbalingga Hospital. This study also aims to analyze the appropriate efforts made to make this waste more efficient.

II. RESEARCH METHODS

The method used in this research is a case study with a qualitative data analysis approach. A case study is research that focuses on gathering information about certain objects, events or activities such as a particular business unit or organization (13). The idea behind the case study is to get a clear picture of a problem, in this study the implementation of lean hospital management in the IGD services at PKU Muhammadiyah Purbalingga Hospital, which is seen from various angles and perspectives using various data collection methods.

This study used seven informants, namely the Head of the Medical Support and Services Section, the Head of the Nursing Section, the Head of the Emergency Unit, the Doctor on duty, the ED nurse, the Head of the Inpatient Unit, the inpatient nurse. The instruments used were interview and observation guidelines. The interview guide contains a list of selected informants’ questions with the question indicators referring to the eight wastes (2). Observation sheet, containing observation guidance on service activities at PKU Muhammadiyah Purbalingga Hospital

The recap results obtained from interviews on the service process can show critical waste in the service process. Based on these results, we can build a root cause analysis (RCA) to identify the factors causing the waste experienced and find the root cause of critical waste; the 5-whys method is used. The RCA process can be carried out in several stages, namely identifying problems, identifying cause-and-effect relationships, collecting data that strengthen and support cause-and-effect relationships, identifying all root causes, developing corrective or mitigating actions, and effective communication (14).

III. RESULT & DISCUSSION

Causes of Waste in the ED

ED patient services at PKU Muhammadiyah Purbalingga Hospital go through several procedures. This procedure can be described as value stream mapping (VSM) to avoid medical personnel's medical activities and actions to patients. The hospital can see that value-added and non-value-added during the service process are provided by taking into account waiting time, value-added time and non-value-added time. We can see VSM mapping for ER patients in the following Figure.

![Figure 1. VSM of emergency room services without supporting examination](image)

Based on Figure 1, we can calculate the percentage of value-added and non-value added for patients’ emergency service activities without supporting examination. We can see the results of these calculations in Table 1.

1 Total waktu VA = 3,00 = total waktu dari kegiatan yang menambah value pada ruang triase
Total waktu NVA = 5,00 = total waktu dari kegiatan yang tidak menambah value pada ruang triase
(Total waktu VA dan NVA digunakan untuk menghitung VA (%) dan NVA (%) pada Tabel 4.1

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Table 1. Emergency Patient Service Activities without Supporting Examination

<table>
<thead>
<tr>
<th>Activity</th>
<th>VA (%)</th>
<th>NVA (%)</th>
<th>Waiting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triase Room</td>
<td>37.50%</td>
<td>62.50%</td>
<td>3.00</td>
</tr>
<tr>
<td>Registration</td>
<td>16.67%</td>
<td>83.33%</td>
<td>2.00</td>
</tr>
<tr>
<td>Examination</td>
<td>28.57%</td>
<td>71.43%</td>
<td>2.00</td>
</tr>
<tr>
<td>Medical Action</td>
<td>29.41%</td>
<td>70.59%</td>
<td>5.00</td>
</tr>
<tr>
<td>Administration</td>
<td>28.57%</td>
<td>71.43%</td>
<td>2.00</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>16.67%</td>
<td>83.33%</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Table 4.1 shows value-added (VA) value, non-value-added (NVA), and waiting time for emergency room patients' service process without supporting examination in each service unit. The value-added percentage is obtained by dividing the value added by the sum of the value-added time and the non-value added time then multiplying by 100%. The non-value-added value in percentage is obtained by dividing the non-value-added time by the sum of the non-value-added time and the value-added time multiplied by 100%. The highest value-added rate was in the triage room for initial examination (37.50%), and non-value added values were in patient registration and pharmacy activities or taking drugs by patients (83.33%). The longest waiting time is the medical activity given to the patient (5 minutes).

Figure 2. VSM of Emergency Room Services with Supporting Examinations

Figure 2 shows we can calculate the percentage of value-added and non-value added for emergency service activities with supporting examinations. We can see the results of these calculations in Table 2.

Table 2. ED Patient Service Activities with Supporting Examinations

<table>
<thead>
<tr>
<th>Activity</th>
<th>VA (%)</th>
<th>NVA (%)</th>
<th>Waiting Time</th>
</tr>
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<tr>
<td>Examination</td>
<td>28.57%</td>
<td>71.43%</td>
<td>5.00</td>
</tr>
<tr>
<td>Laboratory</td>
<td>37.50%</td>
<td>62.50%</td>
<td>3.00</td>
</tr>
<tr>
<td>Radiology</td>
<td>33.33%</td>
<td>66.67%</td>
<td>10.00</td>
</tr>
<tr>
<td>Medical Action</td>
<td>29.41%</td>
<td>70.59%</td>
<td>5.00</td>
</tr>
<tr>
<td>Administration</td>
<td>28.57%</td>
<td>71.43%</td>
<td>2.00</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>16.67%</td>
<td>83.33%</td>
<td>2.00</td>
</tr>
</tbody>
</table>

\[
2 \quad VA(\%) = \frac{\text{total waktu VA}}{\text{total waktu VA} + \text{total waktu NVA}} \times 100\% = \frac{3.00}{3.00 + 5.00} \times 100\% = 37.50\%
\]

\[
NVA(\%) = \frac{\text{total waktu NVA}}{\text{total waktu NVA} + \text{total waktu VA}} \times 100\% = \frac{5.00}{5.00 + 3.00} \times 100\% = 65.50\%
\]
Table 2 shows that the highest percentage of value-added was in the triage room and laboratory (37.50%), while the highest rate of non-value-added was in the action of registering patients and pharmacy by patients (83.33%). The longest waiting time was in radiological activity (10 minutes).

Based on the results of calculations that have been carried out, both in emergency room patients without supporting examination or supporting examination, the highest percentage or ratio of non-value-added is in registration and pharmacy activities, while the longest waiting time is in medical action. It means that high wasteful process activity occurs in patient registration and drug-taking at the pharmacy, which can be caused by various factors, such as entering patient data and diagnosis or doctor's examination, while long waiting times can be caused by doctors arriving late to the ED room. The waste in the emergency room service process is then analyzed for the causes so that department can determine efforts to overcome them.

Based on the results of interviews and observations that have been made, a root cause analysis can be carried out to determine the root causes of the problems that occur. The root cause analysis process can be described as follows.

1. **Identify the problem**

The problem in this study was identifying the emergency room service procedures, starting from the patient coming to the patient going home. Based on the results of identification, value stream mapping (VSM) mapping and value added calculations, it is known that the main problem that occurs in the ER is related to patient waiting time to obtain medical services.

2. **Identify causal relationships**

Based on the identified problems, then identification of the causes of the patient's waiting time during the medical service process in the ER is carried out. The identification of this causal relationship was carried out using the in-depth interview method which was conducted with five informants who were considered to be aware of medical service activities in the ER, namely the Head of Nursing, Head of Medical Services and Support, Head of Inpatient Unit (Kanit), IGD Nurse and Head of Unit (Kanit). IGD. The results of the interviews show that the waste that occurs can be grouped into eight types, namely over production, waiting, over processing, inventory, motion, defects, transportation, and human potential.

3. **Collecting supporting data**

The results of previous interviews showed a cause and effect relationship that occurred in the emergency room related to waste. Furthermore, data collection was carried out using other methods to support and strengthen the causal relationship that had been obtained from the interviews, namely using focus group discussions and observations. The results of the identification are summarized in Table 3.

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Wasteful Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Over production</em></td>
<td>1) Repeating the explanation of laboratory results</td>
</tr>
<tr>
<td></td>
<td>2) Repeating the explanation of the ECG results</td>
</tr>
<tr>
<td></td>
<td>3) Repeating the explanation of Covid-19 screening</td>
</tr>
<tr>
<td><em>Waiting</em></td>
<td>1) Waiting for the doctor on duty to come</td>
</tr>
<tr>
<td></td>
<td>2) Waiting for laboratory results for hours or days</td>
</tr>
<tr>
<td></td>
<td>3) Waiting for the inpatient room to be available according to the patient's condition</td>
</tr>
<tr>
<td></td>
<td>4) Waiting for the initial concurrent registration of general patients</td>
</tr>
<tr>
<td></td>
<td>5) Waiting for the drug queue together with general patients</td>
</tr>
<tr>
<td><em>Over processing</em></td>
<td>1) Medical examinations that are performed repeatedly on one patient</td>
</tr>
<tr>
<td></td>
<td>2) Repetition of the ECG examination</td>
</tr>
<tr>
<td><em>Inventory</em></td>
<td>1) Medical record files are presented separately for one patient</td>
</tr>
<tr>
<td></td>
<td>2) Transfer of patients from the emergency room to hospitalization can take up to 1-2 hours</td>
</tr>
<tr>
<td></td>
<td>3) Giving excessive intravenous fluids</td>
</tr>
<tr>
<td>Type of Waste</td>
<td>Wasteful Activities</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>4)</td>
<td>Excessive use of handscoonds</td>
</tr>
<tr>
<td>5)</td>
<td>Excessive use of gauze</td>
</tr>
<tr>
<td>6)</td>
<td>Excessive alcohol and betadine</td>
</tr>
<tr>
<td>7)</td>
<td>Use of drugs that do not match the stock</td>
</tr>
</tbody>
</table>

**Motion**

1) The emergency room nurse takes the medicine herself at the pharmacy depot located on the ground floor
2) Registration of emergency patients must be on the ground floor

**Defects**

1) The patient lacks medical information in the ER
2) New patients who do not know the service process in the ER
3) Gloves or handscoond (consumables) that are easily damaged
4) The oxygen cylinder is still manual so that oxygen leaks often occur

**Transportation**

1) The nurse delivers the necessary medicine himself to the ER
2) SIMRS input takes a long time

**Human potential**

1) Nurses must wait for decisions from medical personnel who have higher authority to be able to provide medical services to patients

Waste is not only on cost efficiency, but also on the efficiency of the movement of medical personnel in providing health services. The results showed that the emergency room was not equipped with a Pharmacy Depot and a place for registration itself. Medical personnel have to take medicines at the Pharmacy Depot located on the ground floor, so they have to go up and down repeatedly as needed. Registration of emergency room patients is also carried out on the ground floor for all patients, both general and emergency patients. This is consistent with what was stated by Graban (2) that waste can occur in excessive movements to create value. Waste related to this motion does not only occur when a pandemic occurs, but also since the pandemic has not yet hit Indonesia. The motion can be seen in Figure 4 and Figure 5.

![Figure 4. The flow of the emergency room before the Covid-19 pandemic](image-url)
Waste also occurs in some consumables and medicines. Consumables such as intravenous fluids, handscoond, gauze, and alcohol and betadine often experience less availability in the ER. Another waste occurs on the handscoond, and the oxygen cylinder used. The handscoonds used are considered low quality, so they can easily be damaged even if they have only been used for a while. Besides, the oxygen cylinder used is still manual in installation and closure, so that leaks often occur, reducing the volume of oxygen in the tube.

The transfer of patients and inefficient materials is also a waste. Graban (2) explained that waste in transportation could be in transporting materials, equipment, information or patients that do not create value. The transfer, which is a waste of time in the hospital, is that the nurses take and deliver the medicines themselves from the Pharmacy Depot on the ground floor to the ER on the second floor. Long SIMRS input. The input is also waiting for the patient to move from the emergency room to the inpatient room, which takes a long time.

4. Identify the root cause of the unwanted results

Based on the results of interviews and observations that have been described, it can be seen the factors that cause the frequent occurrence of waste in IGD PKU Muhammadiyah Purbalingga. The factors causing this waste can be illustrated the root cause of the waiting time through the fishbone diagram which can be seen in Figure 3.

Analysis of the causes of waste in this study was carried out using observation and interviews based on the identification of 8 wastes with the lean hospital approach. The results of the label are summarized in Table 3 below.

5. Development of corrective actions and countermeasures

After knowing the root cause of waste in the ER, then developing countermeasures to prevent or minimize the waste that occurs. What countermeasures are appropriate in this research is obtained by conducting FGD. The
results of the FGDs conducted indicated that suggestions that could be made to improve waste were related to manual oxygen cylinders, because there was no central oxygen yet. With regard to consumables that are easily damaged or whose use or supply cannot be controlled, a unit can be formed to be in charge of controlling them. Another suggestion given is the provision of computer equipment for each unit so there is no need to wait for its use. Inpatient care also needs to use the consent form and the selection of the room or class desired by the patient's family. Provision of tissue for indoors only. In addition, the provision of a registration place and pharmacy in the IGD.

**Improvement Efforts to Increase Efficiency in ED Services**

Based on the waste that has been identified using the lean hospital, it can be seen that some of the waste that needs to be addressed immediately so as not to cause even greater waste and can be detrimental to the hospital. Some of the waste is then looked for the root of the problem and suggestions for improvements that the hospital can implement to minimize waste. The improvement proposals can be grouped into two stages, namely short-term and long-term recommendations.

1. Short-term recommendations that can be recommended to overcome waste that can be implemented immediately and without large costs, namely creating a flow or procedure of medical services for emergency room patients that the patient's family can easily understand; compile standard operating procedures (SOPs) related to the amount of use of consumables and drugs and medical measures; hold regular meetings between doctors and nurses to discuss the patient's condition and medical actions that can be performed immediately on emergency room patients; implementing a shift system for medical personnel so that holidays can still provide medical services; separating registration services for IGD patients so that they can be served immediately and patients can immediately receive the necessary medical services; repairing damaged medical equipment; fixing the position of medical equipment and equipment in the emergency room so that it is easy and quick to reach by medical personnel.

2. Long-term recommendations that can be recommended to overcome waste that can be implemented in the long term and require large costs, namely preparing a budget for the following year related to the procurement of medical equipment, construction of oxygen centers, procurement of computer equipment in each unit, compiling a budget for resource procurement human beings as well as regular trainings to improve the competence of medical personnel; create a registration and payment room as well as a special pharmacy depot located in the IGD area; hold or involve medical personnel, both doctors and nurses, in seminars that can increase motivation and leadership on a regular basis; make regulations or policies that can increase the work motivation of medical personnel.

**Research Limitations**

This study has several limitations in its implementation, including recording the waiting time required by the patient. Researchers calculated and recorded the time alone for each activity that the patient had to go through in order to get medical services in the ER. These limitations make it difficult for researchers to find the right time for each medical service activity. In addition, with the existence of Covid-19, there is limited access for researchers to be able to make direct observations, such as in laboratory rooms and inpatient rooms.

**IV. CONCLUSION**

Based on the results of the research and discussion previously described, it can be concluded that there are two main things, namely the factors that cause waste and efforts to streamline waste based on the lean management approach in the IGD PKU Muhamadiyah Purbalingga Hospital. Factors causing waste in general are: 1) IGDs that do not yet have pharmacy depots and registration counters themselves. 2) Damaged medical equipment and an inadequate number of computer equipment. 3) There is no SOP regulating the use of drugs and consumables so that they run out quickly. 4) The absence of a supporting inspection officer on duty on holidays. 5) The number of medical personnel is insufficient. 6) Lack of doctor's commitment and discipline.

Efforts made to reduce waste based on lean management hospital are carried out in a number of ways, namely: 1) Procurement of pharmacy depots and emergency special patient registration centers as work efficiency for emergency room nurses, to overcome excessive movement in reaching registration places and pharmacy depots located in ground floor. 2) Making regulations in the form of rewards or bonuses for medical personnel, especially doctors, as the efficiency of patient waiting time, so that they are motivated to provide the best medical
services. 3) Adding human resources. 4) Develop a budget for repair or procurement of new medical equipment to replace damaged ones. 5) Procurement of computer equipment for each unit so that medical personnel do not have to queue for a long time to input patient data and examination results. 6) Making SOPs for the use of medicines and consumables in order to avoid wasteful use of medicines and consumables.

V. ACKNOWLEDGMENTS

In the writing of this scientific publication journal, the writer received assistance from various parties. The author would like to thank fellow medical personnel at the ED PKU Muhammadiyah Purbalingga. They were willing to be a resource and provide the information needed in the research. The author would also like to thank those who have helped and cannot be mentioned one by one.

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