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The Evaluation Of Waste Management At Regional General Hospital Bengkayang District

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Abstract: Waste generated by hospitals is categorized as hazardous and toxic waste, thus requiring proper management to prevent adverse impacts on public health and the environment. This study aims to analyze the medical waste management system at Drs. Jacobus Luna Regional General Hospital, focusing on aspects of waste segregation, containment, transportation, and storage of both medical and non-medical waste. The research employed an observational method with a descriptive approach. Data collection was conducted through structured interviews, field observations, and the use of observation checklists. The sample in this study was 25 respondents, consisting of 2 respondents who were waste collectors and transporters and 23 respondents who were cleaning service personnel who worked in various service units. Data analysis was conducted through processing the results of interviews obtained from medical waste management officers and sanitarian staff, which were then combined with field observation data. The data were analyzed descriptively and compared with applicable medical waste management standards, as stated in national regulations. The data were presented narratively to describe the overall waste management system. The results showed that the average volume of medical waste managed by the hospital reached 314.6 kg per day, 471.7 kg per week, and 1,886.8 kg per month. Meanwhile, the average volume of non-medical waste managed was 375.2 kg per day, 2,814.5 kg per week, and 2,251.4 kg per month. In general, waste management at Drs. Jacobus Luna Regional General Hospital has referred to the provisions of the Regulation of the Minister of Health of the Republic of Indonesia Number 7 of 2019 concerning Hospital Environmental Health, although several aspects still require improvement to enhance the effectiveness and efficiency of the waste management system.

Keywords: hospital, medical waste, waste management.

INTRODUCTION

Healthcare is a basic human need, with hospitals serving as the primary healthcare facility. The quality of hospital services is influenced by various factors, such as affordability, the application of the latest medical technology, the availability of adequate facilities and infrastructure, the competence of healthcare workers, and optimal environmental management. One crucial aspect of hospital environmental management is the management of medical and non-medical waste generated from healthcare activities [1]. Based on Regulation of the Minister of Health of the Republic of Indonesia number 7 of 2019 concerning hospital environmental health, environmental health management aims to prevent disease and other health problems by creating a healthy hospital environment. The quality of the hospital environment is a crucial indicator in ensuring the safety of patients, healthcare workers, and the surrounding community. Therefore, every hospital is required to comply with the technical requirements and waste management provisions stipulated in this regulation [2] [3].

Hospital waste management has been found to be inconsistent with statutory regulations. Research indicates that evaluations of waste management in a number of hospitals do not fully meet the standards set out in Regulation of the Minister of Health of the Republic of Indonesia number 7 of 2019 concerning hospital environmental health. Frequently encountered problems include non-

compliance with hazardous and toxic waste storage procedures. Furthermore, there is still low awareness among cleaning staff regarding the proper use of personal protective equipment (PPE) during waste handling. This situation indicates the need for improvements and more intensive supervision of hospital waste management to minimize negative impacts on the environment and public health [4].

According to the 2021 Indonesian health profile, of the 12,831 healthcare facilities in indonesia, including hospitals and community health centers, only around 3,421 meet medical waste management standards. On the islands of Java and Bali, the average hospital solid waste production is recorded at 3.2 kg per bed per day, while liquid waste reaches 416.8 liters per bed per day. Hospital solid waste consists of 76.8% domestic waste and 23.2% infectious waste. Nationally, the estimated solid waste production from all hospitals in Indonesia reaches 376,089 tons per day, while liquid waste production is around 48,985.70 tons per day [5] [6].

The significant potential for pollution from hospital activities demonstrates the importance of standardized and integrated waste management. Suboptimal waste management can negatively impact the health of medical personnel, patients, and the communities surrounding healthcare facilities. Therefore, implementing a waste management system that complies with legal requirements is a strategic step in preventing environmental and health risks [7].

Hospital waste management has been found to be inconsistent with statutory regulations. Research shows that evaluations of waste management in a number of hospitals do not fully meet the standards set out in Regulation of the Minister of Health of the Republic of Indonesia number 7 of 2019 concerning Hospital Environmental Health. Frequently encountered problems include non-compliance with hazardous and toxic waste storage procedures [8]. Furthermore, there is still low awareness among cleaning staff regarding the proper use of personal protective equipment (PPE) during waste handling. This situation indicates the need for improvements and more intensive supervision of hospital waste management to minimize negative impacts on the environment and public health.

Drs. Jacobus Luna, M.Si. Regional General Hospital, is owned by the Bengkayang Regency Government. This hospital serves as a referral hospital for 4 inpatient health centers, 13 outpatient health centers, several clinics, and several private hospitals in Bengkayang Regency. The production of non-medical waste reaches 375.2 kg per day, 2,814.5 kg per week, and 2,251.4 kg per month [9]. Seeing this waste condition, it must be a concern for the hospital.

Initial observations made by researchers indicate that the hospital's geographic location is between hills and residential areas. The production of waste from the hospital will negatively impact the surrounding community, particularly regarding the potential for environmental pollution. The hospital has an incinerator, but it is currently not operating due to the construction of a new building. Instead, the hospital has partnered with a third party for waste management.

The waste management process at this hospital encompasses collection, sorting, and disposal. However, several challenges remain, such as the mixing of medical and non-medical waste. This increases the health risks for waste handlers. Furthermore, training for waste management staff has not been implemented, leaving their knowledge and skills limited to daily practices without a thorough understanding of the risks of nosocomial infections.

This study aims to evaluate the waste management system at the Bengkayang District General Hospital, specifically at Drs. Jacobus Luna, M.Si. Aspects analyzed include the sorting, containerization, transportation, and storage of medical and non-medical waste. Furthermore, this study also identifies the sources, quantity, and composition of waste generated as a basis for formulating a more effective and sustainable hospital waste management strategy.

METHODS

This study is an observational study with a quantitative approach and descriptive design that aims to describe the waste management system at Drs. Jacobus Luna, M.Si Regional General Hospital, Bengkayang Regency. Data collection was conducted through structured interviews using interview guidelines, direct observation using observation sheets, and field surveys. The

instruments used in this study included stationery, observation sheets to directly monitor the medical waste management process from the source point to the final storage stage, and questionnaires in the form of a list of closed and open questions used in interviews with waste management officers and other related parties. The sample in this study was 25 respondents, consisting of 2 respondents who were waste collectors and transporters and 23 respondents who were cleaning service personnel who worked in various service units.

Data analysis was conducted through processing the results of interviews obtained from medical waste management officers and sanitarian staff, which were then combined with field observation data. The data were analyzed descriptively and compared with applicable medical waste management standards, as stated in national regulations. The data were presented narratively to describe the overall waste management system at Drs. Jacobus Luna, M.Si. Regional General Hospital.

RESULTS AND DISCUSSION

A. Results

1. Characteristics of Hospital Waste

Hospitals are a major source of waste, with every unit having the potential to generate waste. This waste can originate from various activities carried out by employees, visitors, healthcare workers, and patients. Medical waste, specifically, refers to waste from laboratory activities, nursing services, medical procedures, and objects contaminated with blood or body fluids. This waste requires proper and careful management to prevent risks to health and the environment.

Table 1. Distribution of waste types

Waste Source	Types of Waste
Inpatient room/ outpatient room	Ampulvial, disposible syringe/syringe, catheter, infusion set, iv catheter, urine bag, blood set, scalpel blade, gauze, cotton, and the remains of medical procedures.
IBS operating room, IGD, and IPI	Ampulvial, disposible syringe/syringe, catheter, infusion set, iv catheter, urine bag, blood set, scalpel blade, Gauze, Cotton, and medical waste, human tissue/amputation, disposable masks, gloves.
Laboratory room, laundry, CSSD, morgue	Cotton, gauze, and other things that are carried along with dirty linen, instrument remains, specimen remains, disposable syringes, autopsy podruman.

Waste generation at Drs. Jacobus Luna, M.Si Regional General Hospital includes medical and non-medical waste in various categories.

Table 2. Distribution of Medical Waste

No	Month	Medical	Total (kg)
1	Jan	1738.5	1738.5 kg
2	Feb	1681	1681 kg
3	Mrt	1984	1984 kg
4	Apr	1969	1969 kg
5	May	2061.5	2061.5 kg
Total		9434	9434 kg
Average per month			1886.8 kg

The average medical waste generated at Drs. Jacobus Luna, M.Si Regional General Hospital is 1886.8 kg/month.

Table 3. Distribution of Non-Medical Waste

No	Month	Non-Medical	Total (kg)
1	Jan	2546	2546 kg
2	Feb	2202	2202 kg
3	Mrt	2454	2454 kg
4	Apr	2189	2189 kg
5	May	1866	1866 kg
Total		11257	11257 kg
Average per month			2251 kg

The average non-medical waste generated at Drs. Jacobus Luna, M.Si Regional General Hospital is 2251 kg/month.

2. Medical Waste Management Resources at Drs. Jacobus Luna Regional Hospital, M.Si

Medical waste management at Drs. Jacobus Luna, M.Si. Regional General Hospital is carried out by cleaning staff under the supervision of the hospital facilities and infrastructure maintenance unit. The person primarily responsible for waste management activities in the hospital facilities and infrastructure maintenance unit is a sanitarian with a bachelor's degree, assisted by waste management officers who generally have a senior high school education. This organizational structure is designed to ensure that waste management is carried out in accordance with applicable procedures and standards.

In its operations, Drs. Jacobus Luna, M.Si Regional General Hospital collaborates with third parties who have official permits for the transportation and disposal of medical waste, in accordance with applicable laws and regulations. Meanwhile, non-medical waste management is carried out in collaboration with the Bengkayang Regency Environmental Agency. Waste management is carried out routinely every day with a work schedule of officers starting from 06.00 to 14.00 WIB. Medical waste management officers are tasked with collecting medical waste from each service unit (waste source) and transferring it to the temporary storage site that has been provided.

Medical waste management facilities and infrastructure at the hospital are adequately provided, with equipment deemed adequate and functioning properly. To ensure workplace safety, all waste management staff are equipped with standard Personal Protective Equipment (PPE), such as gloves, boots, and masks. This PPE is intended to minimize the risk of direct exposure to hazardous medical waste.

However, Drs. Jacobus Luna, M.Si. Regional General Hospital does not yet have an incinerator for its own medical waste disposal. Therefore, the waste disposal process is entirely outsourced to a third party with a licensed incineration facility. Medical waste collected at the temporary storage area.will be periodically transported by the third party for subsequent destruction.

The bins used for medical waste are mostly yellow plastic wheeled trolleys, compliant with medical waste classification standards, and equipped with a top lid to prevent the spread of contaminants. Some medical waste bins also have identification labels to distinguish them from non-medical waste bins. However, because medical waste is not transported from the landfill to the disposal facility daily, waste often accumulates in the landfill area. This situation requires more serious attention to prevent potential environmental pollution and health risks to workers and the surrounding community.

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3. Implementation of Waste Management at Drs. Jacobus Luna Regional Hospital, M.Si

Hospital waste can generally be classified into two main categories: medical waste and non-medical waste. Waste management at Drs. Jacobus Luna, M.Si. Regional General Hospital involves sorting medical and non-medical waste from the source. This process is followed by storage using standardized waste bins, transportation to a temporary storage facility (Temporary Shelter), and further management towards final disposal. Medical waste is transported using specially designated trolleys, while non-medical waste is managed in collaboration with relevant local government agencies.

Based on field observations, information regarding the waste management system at Drs. Jacobus Luna, M.Si. Regional General Hospital can be summarized in a table containing management data based on waste category, transportation method, temporary storage system, and final disposal method. With structured waste management data, the hospital is expected to conduct regular evaluations of the implemented management system, in order to improve the effectiveness, efficiency, and compliance with regulations on medical and non-medical waste management in healthcare facilities. As shown in the table below:

ATable 4. Observation Results of Waste Management Implementation

No	Items under study	Current condition	Minister of Health Regulation No. 7 of 2019	Minister of Health Regulation No. 7 of 2019	
				Yes	No
1	Sorting	Medical and non-medical waste has been separated according to type.	Medical and non-medical waste must be separated from the source	✓	
		The trash can has a lid and is easy to open.	Has a lid that is intact and easy to open	✓	
		Each trash bag has a color for the type of trash.	Have the appropriate plastic bag color and specified symbol	✓	
2	Shelter	Trash cans are made from materials that are waterproof, strong and do not rust	Made from material that does not rust easily, is strong and waterproof	✓	
		Easy to clean trash can	Easy to clean and empty	✓	
		The trash can is resistant to sharp objects	Resistant to sharp and pointed objects	✓	
		Each room is equipped with a trash can.	Each room must be equipped with a trash can according to the type of waste produced	✓	
		There was more than one garbage collection in 24 hours, and on several occasions, the garbage bags were overfilled.	Waste should not be left in the container for more than 1x24 hours or when the bag is 2/3 full, the waste must be transported immediately.		✓

			Trash cans must be placed in safe and strategic locations.		
		The placement of trash cans has been well considered.	Trash cans must be placed in safe and strategic locations.	✓	
		Trash cans are not cleaned regularly. Cleaning only uses water and is done irregularly.	Trash cans must be cleaned regularly using water and disinfectant		✓
		Some of the trash cans that have been damaged are not used.	Trash cans that are damaged or not functioning must be replaced with ones that meet standard requirements.	✓	
3	Transportation	Garbage transportation is carried out using special trolleys.	Domestic solid waste must be transported periodically from the source area to the temporary storage area. using special trolleys. Household waste must remain wrapped in black plastic bags during transport.	✓	
		Waste collection is sometimes carried out during peak hours, and through corridors or paths that are busy with patients and hospital visitors.	Garbage collection must be carried out during off-peak hours (morning and evening) and not through routes that are busy with patients and hospital visitors.		✓
		There is no special route for transporting waste to the temporary storage area.	Transportation of waste to the temporary storage area. must not pass through service rooms or work rooms that are crowded with patients, visitors or hospital employees.		✓
		Garbage transportation is not carried out when it rains.	If the waste transportation route to the temporary storage area. passes through an open route, transportation must not be carried out during rain to avoid contamination.	✓	
4	Storage	Temporary Storage Places are still	temporary storage area. for domestic solid waste must be located in a		✓

		placed close to the service area.	service area that is far from inpatient care, outpatient care, emergency installation, operating room, nutrition kitchen, canteen, laundry, and other important rooms.		
		There is no special Non-Medical temporary storage area.building in the hospital.	Polling stations temporary storage area. should be designed as enclosed or semi-open buildings with waterproof roofs, adequate ventilation and air circulation, and adequate lighting. They should also be equipped with sanitation facilities such as water taps and identification signs. Polling stations should be cleaned regularly every day to maintain sanitation and prevent potential infections.		✓
5	Final Disposal	No incinerator	Waste is destroyed in an incinerator at temperatures above 1000ºC.		✓
		There is cooperation with the Regency Cleaning Service	Final disposal of non-medical waste in collaboration with the Sanitation Department	✓	
		Medical waste is stored at temporary storage area hazardous and toxic materials.	Medical waste is stored at temporary storage area hazardous and toxic materials.	✓	
	Total	20 items		13	7

Information :

Number of items observed = 20 items

Based on the results of an evaluation of the waste management system at Drs. Jacobus Luna, M.Si. Regional General Hospital using the Regulation of the Minister of Health of the Republic of Indonesia Number 7 of 2019 concerning Hospital Environmental Health as a reference, an overview of the current condition of waste management was obtained compared to the established standards. Of the 20 indicators evaluated, 13 indicators (65%) have met the standards, while 7 indicators (35%) have not met the applicable provisions.

In general, the waste management system at Drs. Jacobus Luna, M.Si. Regional General Hospital has been running quite well, with a regulatory compliance rate of 65%. However, several important aspects still require improvement, particularly related to daily operational management such as transportation frequency, transportation routes and times,

cleaning of storage facilities, and arrangement of temporary storage areas. Optimization of the waste management system is needed immediately to minimize the risk of environmental pollution and negative impacts on the health of the community surrounding the hospital.

Drs. Jacobus Luna, M.Si. Regional General Hospital implements a waste management system by sorting waste based on the type of waste in each service unit or room, which is generally divided into two main categories: medical waste and non-medical waste. This classification is in accordance with the indonesian hospital sanitation guidelines, where waste is grouped based on the function of the generating unit and the design of its disposal system. Although there are several subcategories in waste management, in principle, hospital waste remains divided into medical and non-medical waste. The waste management system in each hospital is developed based on the objectives, management capacity, and resource capabilities of each healthcare facility.

The total amount of waste generated at Drs. Jacobus Luna, M.Si. Regional General Hospital is influenced by several variables, such as the number of available beds, frequency of patient visits, length of stay, number of healthcare workers, and the type of medical services provided. This aligns with the theory that hospital waste production volume is directly correlated with service capacity, number of beds, complexity of healthcare services, patient socioeconomic status, workforce size, and the hospital's geographic location.

Non-medical waste management at Drs. Jacobus Luna, M.Si. Regional General Hospital is carried out by transporting waste from service units to a temporary disposal site within the hospital. The non-medical waste is then transported to the final disposal site by the Bengkayang Regency Environmental Agency. The frequency of non-medical waste transportation is every 2 to 3 days, which causes waste accumulation at the temporary storage area, so supervision is necessary to prevent potential pollution.

For medical waste, temporary storage is carried out at a separate hazardous and toxic materials waste disposal site, before being transported by a third party officially licensed to manage and dispose of medical waste in accordance with regulations. Effective medical waste management is crucial to prevent the risk of exposure to infectious agents among healthcare workers, patients, and the community surrounding the hospital.

Referring to the Regulation of the Minister of Health of the Republic of Indonesia Number 7 of 2019 concerning Hospital Environmental Health, every hospital is required to implement waste management principles which include: waste reduction at the source of generation through efficient use of medical materials and equipment, monitoring and management of hazardous and toxic chemicals to minimize risks to health and the environment and control of chemical and pharmaceutical supplies to ensure safe, targeted, and controlled use. The implementation of this policy is the basis for Drs. Jacobus Luna, M.Si Regional General Hospital in developing a medical waste management system that is safe, effective, and in accordance with national regulatory standards.

B. Discussion

Drs. Jacobus Luna, M.Si. Regional General Hospital has complied with the Regulation of the Minister of Health of the Republic of Indonesia No. 7 of 2019 concerning Hospital Environmental Health Requirements, which regulates hospital waste management standards. Furthermore, the hospital has implemented an internal policy in the form of a standard operating procedure to guide cleaning staff in carrying out waste management tasks, from separation to transportation.

The standard operating procedure is designed as a guideline for healthcare workers in managing solid waste, covering the stages of separation, collection, transportation, and disposal. The goal is to prevent the transmission of diseases that can occur through solid waste. This aligns with hospital waste management practices in Jordan, which has adopted similar regulations to ensure medical waste management that minimizes risks to health and the environment [10]. Observations show that overall, the implementation of waste management by cleaning staff at Drs. Jacobus Luna, M.Si., Regional General Hospital has complied with the guidelines set by the hospital. This supports the theory that one of the effective efforts in hospital waste management is through the development of regulations, guidelines, and policies that regulate waste management comprehensively, while

simultaneously improving the quality of environmental health in the hospital area [11].

The implementation of medical and non-medical waste management at Bengkayang District Hospital is carried out by cleaning staff with the most educational background being high school graduates, namely 23 people, and there are two officers with the latest education of junior high school. This condition is in line with the results of research at Dr. Moewardi Surakarta Regional Hospital, which emphasizes the importance of equalizing education levels through special and additional training to improve the creativity and technical skills of officers in carrying out their duties as hospital waste managers [12].

According to the data, there are eight cleaning staff with less than five years of service, while 17 have more than five years of service. However, those with less than five years of service have never received specific training on hospital waste management. This leads to a lack of understanding of standard operating procedures, as well as low knowledge and awareness in carrying out their duties. When first hired, staff did not receive adequate training on hospital waste management.

This finding is consistent with the results of on the evaluation of solid and liquid waste management at Mimika Regional Hospital. The results of his research stated that improving workforce quality can be achieved through training. This training aims to improve the expertise and technical skills of staff so that waste management can run optimally. Therefore, efforts to improve human resource quality at Bengkayang Regency Hospital through continuous training are essential to ensure waste management meets established standards [13].

Hospital waste at Drs. Jacobus Luna, M.Si. Regional General Hospital is classified into medical and non-medical waste, as regulated in the Indonesian Hospital Sanitation Guidelines Ministry of Health, 2002. Medical waste, which includes infectious, pharmaceutical, sharps, and anatomical waste, is collected at the Temporary Storage Area for Hazardous and Toxic Materials.

Hospitals classify 85% of non-medical waste as either easily decomposed by microorganisms and easily rotting, or as non-decomposing waste. This is consistent with research that shows non-medical waste is a semi-solid, useless substance, whether rotting or non-rotting. Non-medical waste management involves collection, transfer, and temporary storage at waste disposal sites. Although procedures for separating medical and non-medical waste have been established, their implementation remains inconsistent. Several obstacles identified include inconsistencies in waste separation in certain units due to a lack of education and awareness among staff. The waste transfer process without disinfecting waste bins risks spreading contamination.

Waste management at Drs. Jacobus Luna, M.Si. Regional General Hospital still faces various challenges, including a lack of compliance with standard operating procedures (SOPs), limited education, and obstacles in waste monitoring. By implementing a comprehensive improvement strategy, the hospital can ensure more effective and efficient waste management, and support the creation of a clean, safe, and healthy environment in accordance with Minister of Health Regulation No. 7 of 2019 .

The amount of waste generated by Drs. Jacobus Luna, M.Si Regional General Hospital is influenced by various factors, including the number of beds, the number of employees, the volume of visits, and the duration of patient hospitalization. This is in line with the theory that states that waste generation in hospitals is influenced by various factors, such as bed capacity, hospital capacity, the number of medical personnel, the type of health services provided, as well as the economic, social, and cultural status of patients, and the geographical conditions of the hospital location [14].

Medical waste bins also require increased cleaning frequency. Currently, medical waste bins are only disinfected once every three days. However, medical waste bins should be disinfected each time they are reused to prevent the buildup of germs and disease-transmitting vectors. Therefore, increasing the frequency of cleaning medical waste bins needs to be a priority.

To improve the effectiveness of waste management, it is recommended that hospitals have a separate budget specifically for waste management. With separate funding allocations, budget planning and distribution can be carried out more clearly and in detail. This will ensure that waste management needs are fully met in accordance with applicable regulatory standards.

Proper waste management should be a top priority because it plays a crucial role in creating a clean, comfortable hospital

environment that supports patient healing. Furthermore, optimal waste management can also prevent nosocomial infections, which can potentially harm patients and healthcare workers.

Drs. Jacobus Luna, M.Si. Regional General Hospital has adopted waste management standards as stipulated in the Minister of Health Regulation No. 7 of 2019 concerning Hospital Environmental Health Requirements. Waste management in this hospital includes stages of collection, transportation, and final disposal, tailored to the type of waste generated and the hospital's management capacity. This process is carried out based on the guidelines set out in the Indonesian Hospital Sanitation Guidelines from the Ministry of Health.

Although waste management has adhered to established principles, several challenges remain that require attention to achieve optimal implementation. One major obstacle is the limited number of human resources involved in waste management. Furthermore, the frequency of waste collection from temporary storage sites has not been adequate, potentially reducing the effectiveness of the management system.

Research and evaluation of waste management implementation at Drs. Jacobus Luna, M.Si., Regional General Hospital concluded that improvements in several operational aspects are essential. Increasing human resource capacity, adjusting transportation frequency, and strengthening oversight of all stages of waste management are strategic steps that can support the hospital's compliance with applicable standards.

CONCLUSION

The average volume of medical waste managed by Drs. Jacobus Luna, M.Si. Regional General Hospital was recorded at 314.6 kg per day, 471.7 kg per week, and 1,886.8 kg per month. Meanwhile, the average non-medical waste managed reached 375.2 kg per day, 2,814.5 kg per week, and 2,251.4 kg per month. This data indicates that the volume of waste generated by the hospital is quite significant, thus requiring a structured and sustainable management system.

Planning for human resource (HR) requirements for waste management at Drs. Jacobus Luna, M.Si., Regional General Hospital (RSUD) remains suboptimal. Current waste management relies solely on available personnel without considering ideal needs based on workload and waste volume, impacting the effectiveness of implementation in the field.

Hospital waste management procedures do not fully comply with established standard operating procedures (SOPs), including sorting, containerization, transportation, and temporary storage. This highlights the need to strengthen internal systems and regulations to ensure safe and compliant waste management.

To address existing waste management issues, comprehensive management improvements are needed. This includes strengthening human resource planning, developing more detailed standard operating procedures (SOPs), improving infrastructure, and implementing regular evaluation and monitoring. This approach is expected to sustainably improve the quality and effectiveness of the waste management system at Drs. Jacobus Luna, M.Si. Regional General Hospital.

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