



Strategy for Managing Solid Medical Waste at Health Care Facilities (Fasyankes) Within the Working Area of the Balai Jaya Community Health Center, Rokan Hilir Regency

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ABSTRACT

This research aims to analyze the existing conditions of solid medical waste management, identify internal and external factors influencing medical waste management, and formulate a solid medical waste management strategy in health care facilities (fasyankes) within the working area of the Balai Jaya Community Health Center (Puskesmas), Rokan Hilir Regency. The research employed a descriptive approach using SWOT analysis. Data were obtained through observations, in-depth interviews, and documentation studies conducted at various types of health care facilities within the working area of the Balai Jaya Community Health Center. The analysis was performed using the IFAS and EFAS matrices to determine the strategic position of solid medical waste management. The results indicate that solid medical waste management in the Balai Jaya Community Health Center's working area is not yet optimal. The improper mixing of medical and nonmedical waste is still observed, waste containers do not fully comply with established standards, Temporary Storage Facilities (Tempat Penyimpanan Sementara [TPS]) for hazardous and toxic waste (Bahan Berbahaya dan Beracun [B3]) do not meet requirements in some health care facilities, dedicated waste management personnel are unavailable, and regular training on medical waste management has not been implemented. Furthermore, most health care facilities do not routinely weigh and record waste generation, resulting in inadequate documentation of waste management practices. Internal factor analysis indicates that the primary strengths include health care workers' knowledge of medical and hazardous waste management, the use of personal protective equipment, and their awareness of occupational health and safety.

INTRODUCTION

Based on Government Regulation Number 47 of 2016, health service facilities are tools and/or places used to carry out health service efforts, including promotive, preventive, curative, and rehabilitative activities conducted by the central government, local governments, and/or the community. Types of health service facilities include independent practice facilities for health workers, public health centers, clinics, hospitals, pharmacies, blood transfusion units, health laboratories, optical facilities, medical service facilities for legal purposes, and traditional health service facilities.

In carrying out health service activities, health care facilities generate medical waste that has the potential to cause disease transmission, other health problems, and environmental pollution; therefore, proper medical waste management is required. Waste refers to the residual products of an activity that may contain hazardous or toxic substances due to their

characteristics, concentration, and quantity, which can indirectly endanger environmental health as well as human and living organism health (Barik et al. 2025; Dehghani et al. 2021; Kareem et al. 2023; Obuzor et al. 2023). Health care medical waste includes all waste generated from health care facilities, research centers, and laboratories associated with medical procedures (Tarigan and Pou, 2024).

According to the Ministry of Health of the Republic of Indonesia (2024), health service facilities generate medical waste, which consists of all residual materials from health service activities that are no longer used and may exist in solid, liquid, or gaseous forms. Solid medical waste consists of infectious waste, pathological waste, sharps waste, pharmaceutical waste, chemical waste, radioactive waste, pressurized containers, and heavy metal waste. Liquid medical waste includes all wastewater, including feces, that may contain microorganisms, toxic chemicals, and radioactive substances that are harmful to health (Attrah et al. 2022; Ramírez-Coronel et al. 2024).

Based on the profile of the Ministry of Health of the Republic of Indonesia in 2023, the number of health centers in Indonesia was 10,180, consisting of 4,210 inpatient health centers and 5,970 non-inpatient health centers. There were 17,261 registered clinics in Indonesia owned by the government (ministries/institutions, the Indonesian National Armed Forces [TNI], the Indonesian National Police [Polri], and regional governments) and the private sector (community). Additionally, 12,411 independent medical practice facilities had been registered, along with 408 registered blood transfusion units (Unit Transfusi Darah [UTD]) organized by the government, local governments, and the Indonesian Red Cross (Palang Merah Indonesia [PMI]). The total number of health laboratories in Indonesia was 1,487 (Ministry of Health of the Republic of Indonesia, 2024).

According to ECO (2018), health service facilities, such as hospitals, clinics, health centers, and similar facilities, have become important necessities for communities. The services provided by these facilities aim to serve the community and improve health quality and human living standards. However, these health service facilities also generate negative impacts, particularly through the waste they produce. Therefore, it is necessary to understand health care facility waste (*fasyankes*) in Indonesia and implement appropriate management practices. The amount of waste generated by *fasyankes* varies depending on the location and characteristics of each facility.

The Ombudsman of the Republic of Indonesia noted that a significant amount of medical waste is not managed properly. In one day, medical waste generated by health service facilities (*fasyankes*) can reach hundreds of kilograms. In many cases, medical waste is disposed of improperly, including being dumped on roads, into rivers, seas, and general waste disposal sites. Medical waste, liquid waste, and hazardous and toxic waste (*Bahan Berbahaya dan Beracun [B3]*) generated from activities in health facilities, such as hospitals, health centers, clinics, and similar facilities, may negatively affect human health and cause environmental pollution if not properly managed. To prevent excessive generation of medical waste and hazardous and toxic waste (*limbah B3 [LB3]*), waste reduction measures should be implemented as part of the management process. However, many health facilities still lack standard operating procedures (SOPs) and have not implemented waste reduction efforts. Furthermore, health facilities often have limited human resources with adequate competence in medical waste management (Achmadi, 2021).

Based on the Ministry of Health Profile (2024), nationally, the percentage of health facilities (hospitals and health centers) that implemented waste management according to standards in 2023 was 46.6%, while Riau Province recorded 36.8%, which was below the national average. These data indicate that the number of health facilities that have not managed medical waste according to standards remains higher than those that have implemented appropriate management practices. According to Maulia et al. (2022), the amount of medical waste generated in Riau Province in 2022 was estimated at 24 tons per month, consisting of solid medical waste and hazardous and toxic waste (limbah B3) generated from approximately 700 hospitals and health centers. Currently, Riau Province does not have an independent medical waste treatment facility; therefore, accumulated medical waste is managed by third-party providers.

Healthcare waste, particularly medical waste, can pose risks to human health and the environment if it is not properly managed. Environmental pollution caused by medical waste can adversely affect the health of individuals and surrounding communities. Various regulations and standards have been established to ensure that waste management is implemented correctly and optimally, with the aim of controlling potential hazards that may negatively impact society and the environment. One environmental issue of concern is infectious waste, commonly referred to as “medical waste.” In addition, nonmedical waste and hazardous and toxic waste (Bahan Berbahaya dan Beracun [B3]) are also generated and require appropriate handling. Potential hazards associated with medical waste management may occur during the stages of collection, storage, transportation, treatment, and disposal. The impacts caused by improperly managed waste include environmental pollution, reduced environmental quality, and adverse effects on public health. Furthermore, this waste may cause aesthetic disturbances, unpleasant odors, and serve as a breeding ground for vectors and pest animals (Tarigan & Pou, 2024).

Riau Province, as one of the provinces experiencing rapid economic growth, faces increasing challenges in medical waste management. Rokan Hilir Regency, particularly within the working area of the Balai Jaya Community Health Center (Puskesmas), has various health care facilities, including Puskesmas, Auxiliary Health Centers (Puskesmas Pembantu), Village Health Posts (Poskesdes), clinics, and independent health worker practices, which have the potential to generate substantial amounts of medical waste. The geographical characteristics of Rokan Hilir Regency, which is predominantly a coastal area with sensitive ecosystems, make medical waste management an important issue requiring serious attention.

The Community Health Center (Puskesmas), as a primary health care institution at the forefront of providing services to the community, plays an important role in managing waste generated by health care facilities. In Indonesia, although regulations have been established to regulate waste management in health care facilities, including Law No. 32 of 2009 concerning Environmental Protection and Management, which includes the management of hazardous and toxic waste (B3 waste), Government Regulation No. 22 of 2021 concerning the Implementation of Environmental Protection and Management, which also regulates B3 waste management, and Regulation of the Minister of Health of the Republic of Indonesia No. 18 of 2020 concerning the Management of Medical Waste in Health Service Facilities, implementation challenges remain in practice.

The working area of the Balai Jaya Community Health Center (Puskesmas), one of the health centers located in Balai Jaya District, Rokan Hilir Regency, has a significant responsibility in maintaining cleanliness and environmental safety. However, health care facility waste management within the Balai Jaya Community Health Center's working area still faces various challenges related to the proper and compliant management of medical waste. Through this research, a strategy is expected to be formulated to improve the effectiveness of medical waste management in health care facilities within the working area of the Balai Jaya Community Health Center, Rokan Hilir Regency.

This research focuses on solid medical waste because, based on field conditions, its management remains a significant challenge in many health service facilities (*fasyankes*), particularly at the level of health centers, clinics, and independent health worker practices. Solid medical waste, such as used syringes, masks, gloves, contaminated cotton, intravenous (IV) bottles, and other consumable materials, is generated daily in considerable quantities and has infectious and hazardous characteristics. Compared with liquid medical waste, solid medical waste is easier to identify physically in the field, can be directly observed during the segregation and storage processes, and can be analyzed through observation, interviews, and document evaluation without requiring laboratory testing.

Although various studies on medical waste management have been conducted, most previous research has focused on evaluating compliance levels of medical waste management in individual hospitals or health centers, as well as identifying factors influencing medical waste management, such as health worker knowledge, infrastructure availability, budget allocation, and regulations. Research by Marlina et al. (2023), Aziza et al. (2022), Chandra and Sarwoko (2025), and Setiawan et al. (2025) primarily examines the relationship between health workers' knowledge, attitudes, and behaviors and medical waste management practices. Meanwhile, studies by Juliastini et al. (2024), Welliana et al. (2022), and Andolo et al. (2023) focus on evaluating medical waste management systems and identifying constraints faced by health care facilities. Therefore, a research gap remains because limited studies have comprehensively examined solid medical waste management across various types of health service facilities within a single health care service area, including health centers, clinics, and independent health worker practices.

The novelty of this research lies in its comprehensive approach, which not only analyzes the existing conditions of solid medical waste management across various types of health care facilities within one working area but also formulates an effective solid medical waste management strategy through the identification of strengths, weaknesses, opportunities, and threats (SWOT) factors. This study provides a comprehensive overview of the solid medical waste management system, including segregation, containerization, storage, transportation, and final treatment processes across various types of health care facilities within a primary health care system. Thus, the findings of this research not only provide information regarding existing problems but also generate strategic recommendations that can be implemented by local governments, health centers, and other health service facilities.

The selection of the Balai Jaya Community Health Center working area in Rokan Hilir Regency as the research location was based on several considerations. First, this region contains various types of health service facilities that generate solid medical waste. Second, based on national data, Riau Province still has a percentage of health service facilities implementing

waste management according to standards that is below the national average, indicating the need for more in-depth regional-level studies. Third, no previous research has specifically examined strategies for managing solid medical waste in health service facilities within the working area of the Balai Jaya Community Health Center. Fourth, the geographical characteristics of Rokan Hilir Regency, particularly the relatively long distance between the Balai Jaya Community Health Center working area and licensed medical waste treatment facilities, as well as dependence on third parties for waste transportation and processing, may create challenges in medical waste management.

regulations regarding health care facility waste management have been clearly established, implementation gaps remain in practice. This research is important for identifying effective strategies for managing solid medical waste in health care facilities within the Balai Jaya Community Health Center working area to reduce the risks of disease transmission and environmental pollution. Based on initial observations in the working area of the Balai Jaya Community Health Center, several issues require further investigation, including the existing conditions of medical waste management in health care facilities within the Balai Jaya Community Health Center's working area in Rokan Hilir Regency and the effective strategies required to improve medical waste management practices. Therefore, this research aims to analyze the existing conditions of medical waste management and formulate an effective medical waste management strategy for health care facilities within the working area of the Balai Jaya Community Health Center, Rokan Hilir Regency. This research is expected to provide significant theoretical and practical benefits. Theoretically, this study contributes to the development of knowledge in environmental health, particularly regarding solid medical waste management strategies in primary health care facilities. Furthermore, the findings may serve as a reference for future researchers investigating similar topics using more comprehensive approaches. Practically, this research benefits local governments, particularly the Rokan Hilir Regency Health Office, by providing input for developing policies and guidance programs related to medical waste management in health care facilities. For the Balai Jaya Community Health Center, the findings can serve as guidelines for improving medical waste management systems within its working area, including human resource development, strengthening monitoring systems, and improving facilities and infrastructure. For other health care facilities, such as clinics, independent physician practices, and independent midwife practices, this research provides an overview of existing medical waste management conditions and applicable strategies to improve compliance and management effectiveness. Ultimately, these improvements will contribute to protecting health workers, patients, communities, and the surrounding environment from pollution risks and disease transmission caused by improperly managed medical waste.

METHOD

Research Approach

This research employed a qualitative approach with a case study design. The qualitative approach was selected because the study aimed to gain an in-depth and comprehensive understanding of solid medical waste management strategies in health service facilities within the working area of the Balai Jaya Health Center, Rokan Hilir Regency. This approach enabled the researchers to explore the phenomenon within its natural context and examine the

perspectives, experiences, and practices of stakeholders involved in medical waste management.

The case study design was used to investigate solid medical waste management practices within a specific setting through detailed data collection from multiple sources. This design allowed the researchers to comprehensively explore various aspects of medical waste management, including policies, procedures, challenges, and strategies implemented in the field (Murdiyanto, 2020).

Place and Time of Research

This research will be carried out in the health facilities of the Balai Jaya Health Center, which is located in Balai Jaya District, Rokan Hilir Regency. The work area of the Balai Jaya Health Center was chosen because it has several primary health facilities that serve the community such as the Primary Clinic, Independent Doctor Practice and Independent Midwife Practice. The number of health facilities in the working area of the Balai Jaya Health Center is 49 health facilities consisting of 1 Health Center, 3 primary clinics, 5 independent doctor practices and 40 independent midwife practices. This research will be conducted for 4 (four) months from November 2025 to March 2026.

Data Types and Sources

The types of data used in this study are primary data and secondary data. Primary data is data obtained directly from the first source through data collection techniques such as questionnaires, interviews, and direct observation. In this study, primary data will be used to obtain information on existing conditions consisting of sorting, storage, transportation, processing, availability of infrastructure and budget facilities, human resource (HR) competence, monitoring and evaluation, as well as the implementation of SOPs and compliance with regulations. Primary data on solid medical waste management in health facilities was obtained from in-depth interviews with health facility leaders and related officers. Meanwhile, secondary data is obtained from official documents, reports, laws and regulations, and previous research, which can be used to support research.

The data sources in this study come from:

1. Leaders of Health Facilities and health workers in the work area of the Balai Jaya Health Center, such as doctors, nurses, midwives, analysts and other health workers, who are used as informants to provide primary data regarding the existing conditions of medical waste management in the Health Facility work area of the Balai Jaya Health Center
2. Official documents about medical waste management at the Balai Jaya Health Center work area that can provide information about applicable procedures.
3. Direct observation of officers involved in medical waste management and observation of the environment of the Health Facility in the work area of the Balai Jaya Health Center

Population and Sampling Techniques

Population according to (Scott, 2024), is a generalized area consisting of objects or subjects that have certain qualities and characteristics that are determined by the researcher to be studied and then drawn conclusions. The population in this study is all leaders of health facilities and officers who are directly involved in waste management in Health Service Facilities (Fasyankes) who are in the work area Balai Jaya Health Center, Rokan Hilir Regency, as well as other related parties who have a role in the solid medical waste management process ranging from sorting, containerization, temporary storage, transportation, to medical waste

processing. The number of health facilities in the working area of the Balai Jaya Health Center is 49 health facilities.

The selection of the population is based on the consideration that the group is a party that has knowledge, experience, and direct involvement in the implementation of solid medical waste management so that it is able to provide in-depth information in accordance with the research objectives.

The sample in this study was determined secara purposif (*purposive sampling*) By considering the representation of the types of health facilities and the availability of data on solid medical waste management. According to Sugiyono (2024) *purposive sampling* is a sampling technique in which researchers consciously select samples based on specific research considerations and objectives. In other words, the researcher has specific criteria about who will be sampled, not randomly like other sampling techniques. This technique is especially useful when researchers want to get in-depth information from informants who actually understand or have experience related to the research topic. In this study, The researcher determined himself as many as 7 (Seven) health facilities As a sample of the study, this number was chosen because:

- Representing a variety of types of health facilities (health centers, clinics, and independent practices).
- Have understanding, experience, and direct involvement in the solid medical waste management process
- Health facilities have been operating $\geq$ the last 2 years consistently, so that there is waste management data that can be researched.
- Health facilities with a fairly high number of patients because they are directly proportional to the volume of solid medical waste produced
- Health facilities that provide services for invasive medical procedures (such as immunization, childbirth, minor surgery, wound care), because they have the potential to produce hazardous medical waste.

According to (Nur et al. 2022), that the informant is a research subject who can provide information about the phenomenon/problem raised in the research. In qualitative research, informants are divided into three, namely:

a. Key informants

Key informants are informants who have comprehensive information about the problems raised by researchers. Key informants not only know about conditions/phenomena in society in general, but also understand information about the main informants. In the selection of key informants depends on the unit of analysis to be studied.

b. Key informants

The main informants in qualitative research are similar to people who know technically and in detail about the research problem to be studied

c. Supporting Informants

Supporting informants are people who can provide additional information as a complement to analysis and discussion in qualitative research. Additional informants sometimes provide information that is not given by the main informant or key informant. The basis for selecting informants in this study includes:

1. Direct involvement in solid medical waste management, both in sorting, containerization, temporary storage, transportation, and medical waste processing.
2. Have adequate knowledge and experience regarding solid medical waste management systems in healthcare facilities.
3. Have authority in decision-making or supervision, so that it can provide information related to policies, planning, and implementation of medical waste management.
4. Understand the conditions and problems of medical waste management that occur in the work area of the Balai Jaya Health Center.

Considerations in determining the number of informants are as follows:

1. Puskesmas 1 unit: the number of informants is more, namely 4 people consisting of 1 key informant, 2 main informants and 1 supporting informant, because the number of patient visits is higher, more staff, and more varied service units.
2. Rokan Hilir Regency Health Office 1 person
3. There are 2 units of clinics: the number of informants is 1 person each
4. There are 2 units of Independent Practice Doctors: the number of informants is 1 person each
5. There are 2 units of Independent Practice Midwives: 1 number of informants each
6. 3rd party waste transporter 1 person

Data Collection Techniques

In this study, a qualitative approach with SWOT analysis is used which is oriented towards an in-depth understanding of the real conditions of solid medical waste management in health service facilities (fasyankes) in the work area of the Balai Jaya Health Center. Data collection in this study was carried out through three main techniques, namely in-depth interviews, field observations, and documentation studies. The three techniques are used in an integrated manner to obtain accurate data through the process of triangulating sources and methods.

1. In-Depth Interviews

In-depth interviews are the main technique in collecting data for this research. The interview was conducted in a semi-structured manner, namely by using pre-prepared question guidelines but still giving the researcher the freedom to develop follow-up questions according to the direction of the conversation and the context of the informant's answer. Interviews were conducted with three groups of informants, namely key informants, main informants, and supporting informants. The main purpose of this interview is to obtain comprehensive information about strengths, weaknesses, opportunities, and threats in the implementation of solid medical waste management strategies in the Balai Jaya Health Center work area.

2. Field Observation

The researcher conducted direct observations at health facilities, the aspects observed included: the process of sorting medical waste, temporary storage systems, waste transportation facilities, the use of personal protective equipment (PPE) by officers, and the cleanliness and safety of the work environment due to.

3. Document Review

The data collection technique for documentation studies is carried out by examining various documents and archives related to solid medical waste management. These documents include internal policies of health facilities, reports on the volume of medical waste, records of waste transportation by third parties, environmental audit results, and other supporting documents such as SOPs, technical guidelines, and regulations from the Ministry of Health or the Rokan Hilir Regency Health Office.

4. Data Triangulation

Source triangulation was carried out by comparing the results of interviews between key, main, and supporting informants, while the triangulation method was carried out by combining the results of interviews, observations, and documentation. This step aims to ensure that the data obtained is complementary and consistent between one source and another, so that the research results become more objective and accountable.

Data Analysis Techniques

The data analysis in this study was carried out qualitatively from the data collection stage to the drawing of conclusions. The data obtained through in-depth interviews, field observations, and document review were analyzed through the stages of data reduction, data presentation, and conclusion drawn. The analysis was carried out to identify the existing conditions of solid medical waste management as well as internal and external factors that affect its management in the Health Facilities work area of the Balai Jaya Health Center.

RESULTS AND DISCUSSION

The Impact of Solid Medical Waste Management of Health Facilities

Medical waste management is one of the important aspects in the implementation of health services because medical waste produced by health care facilities has the potential to have environmental, economic, and social impacts if not managed according to standards. In the health service facility of the Balai Jaya Health Center, medical waste management is still found to have several obstacles such as the implementation of SOPs, internal supervision, officer compliance, and limited competence of medical waste management human resources.

This condition shows that the management of medical waste in health service facilities in the Balai Jaya Health Center work area still needs improvement so that the entire medical waste management process can run according to standards and does not cause negative impacts. Non-optimal management of medical waste can affect the quality of the environment, increase the burden of management costs, and pose risks to public health and unrest.

1. Impact on the Environment

Medical waste management in health care facilities (fasyankes) has a huge influence on the quality of the environment. Solid medical waste such as syringes, used bandages, IV bottles, drug residues, and infectious waste contains pathogenic microorganisms and harmful chemicals that can contaminate soil, water, and air if not managed according to standards.

In the work area of the Balai Jaya Health Center, non-optimal management of medical waste can increase the risk of environmental pollution, especially if the process of sorting, temporary storage, and transportation of waste has not been carried out

consistently. This condition can cause infectious waste to mix with domestic waste, potentially causing pollution and public health problems around health facilities.

This research is in line with research on Journal of Indonesian Public Health Research and Development stated that hospital medical waste can have a negative impact on the environment such as causing corrosion to water if its management is not in accordance with operational standards (Prila Arlinda et al. 2022). Likewise, Setiawati's (2019) research in Irawati et al., (2024) that the management of medical waste from health care facilities can have a positive impact if managed according to the required provisions, but it can have a negative impact where the environment can be contaminated and have an impact on the transmission of diseases both directly and indirectly, if waste management is not carried out according to the provisions.

2. Impact on the Economy

Medical waste management also has an economic impact on health facilities. The procurement of special garbage cans, personal protective equipment (PPE), waste transportation costs, and cooperation with third parties to B3 waste processors require considerable operational costs. The cost of transportation and destruction of waste paid by health facilities in the work area of the Balai Jaya Health Center to third parties ranges from Rp 22,000 – 35,000 / Kg of waste. When health facilities mix solid medical waste with domestic waste, the costs incurred by the health facilities for transportation and waste destruction are even greater. According to Ciawi et al., (2024) One of the efforts to reduce costs is through Waste sorting at source, because only a small part of the waste is actually hazardous medical waste. This means that if the sorting is not optimal, then the management cost will increase because the volume of B3 waste will also increase.

Although in the early stages of medical waste management requires considerable costs for the procurement of facilities, infrastructure, and management operations according to standards, in the long term this is an important form of investment for health care facilities. Good medical waste management can prevent environmental pollution and reduce the risk of disease transmission that can have an impact on the wider community. If medical waste is not managed properly, it can cause much greater economic losses, such as increased medical costs due to environment-based diseases, the cost of restoring polluted environments, and the potential for a decrease in community productivity due to health problems.

3. Social Impact

Medical waste management also has an impact on social aspects, especially on the sense of community safety, safety of health workers, and the image of health service facilities. In the work area of the Balai Jaya Health Center, medical waste that is not handled properly can cause public anxiety because it has the potential to be a source of disease transmission. The public will feel uncomfortable if they find medical waste that is not managed properly.

This is in accordance with research Anatoliaa & Bakta (2022) which states that waste management in health facilities is an important part of protecting the public from the dangers of environmental pollution and the risk of disease infections.

Thus, good medical waste management will increase public safety, protect health workers and cleaners from the risk of exposure to infectious waste, and increase public confidence in the quality of health facility services. Medical waste management is also related to the aspect of environmental justice, because the community around health facilities has the right to a clean environment and free from the risk of pollution. Therefore, non-standard medical waste management not only has an impact on individual health, but can also cause social conflicts between the community and health facility managers if there is pollution or negligence in waste management.

Solid Medical Waste Management Strategy in Health Facilities in the Balai Jaya Health Center Working Area

The management of solid medical waste in health service facilities (fasyankes) in the Balai Jaya Health Center work area is an important part of efforts to maintain public health and environmental sustainability. Solid medical waste produced from health service activities has the potential to pose a risk of infection, environmental pollution, and danger to health workers and the community if not managed properly. Therefore, an effective, planned, and sustainable management strategy is needed so that all stages of waste management can run according to applicable standards and regulations.

In its implementation, solid medical waste management includes several important stages, namely waste sorting according to its type, collection, temporary storage, transportation, and destruction or final processing. Each stage requires good supervision and coordination so that the risk of pollution and disease transmission can be minimized. In addition, increasing the capacity of officers through training and socialization is also an important part in supporting the success of solid medical waste management.

The solid medical waste management strategy is prepared based on internal and external conditions that affect the implementation of waste management in the health facilities of the Balai Jaya Health Center work area. Internal factors include human resources, facilities and infrastructure, internal policies, funding, and officers' compliance with waste management procedures. Meanwhile, external factors include government support, regulations, cooperation with third parties in waste processing, developments in waste management technology, and supervision from relevant agencies.

To formulate the right strategy, an analysis of internal and external factors is carried out through the IFAS (Internal Factors Analysis Summary) and EFAS (External Factors Analysis Summary) approaches. This analysis aims to identify the strengths and weaknesses that health facilities have in the management of solid medical waste, as well as opportunities and threats originating from the external environment. The results of the IFAS and EFAS analysis are then used as a basis for the preparation of a solid medical waste management strategy that is more effective and in accordance with the conditions in the working area of the Balai Jaya Health Center.

1. Analisis IFAS (Internal Factors Analysis Summary)

IFAS (Internal Factors Analysis Summary) analysis is a stage carried out to identify and evaluate internal factors that affect the management of solid medical waste in health service facilities in the Balai Jaya Health Center work area. This analysis aims to find out the internal condition of the organization through the identification of strengths and weaknesses in the implementation of solid medical waste management.

The first stage in the preparation of the IFAS analysis is to identify various internal factors related to solid medical waste management. These factors include human resources, availability of facilities and infrastructure, policies or standard operating procedures (SOPs), funding, supervision systems, and compliance of officers in carrying out medical waste management. Factors that have a positive impact are categorized as strengths, while factors that become obstacles or obstacles are categorized as weaknesses.

The second stage is to give weight to each internal factor. The weight determination process is carried out through in-depth discussions and interviews with experts. Each factor that has been identified from observations, interviews, and document reviews is then assessed for its importance by experts using a specific assessment scale. The values given are then averaged and normalized so that the weight of each factor is obtained with a total weight of 1.00.

The third stage is to provide ratings or assessments of each internal factor. Ratings are used to show the condition or ability of health facilities to respond to these factors obtained from the results of in-depth interviews, field observations, and document reviews. In the strength factor, a higher rating indicates better conditions, while in the weakness factor, a lower rating indicates weaknesses that still need to be improved.

The results of the IFAS analysis were used to determine the internal position of health service facilities in the management of solid medical waste. Through this analysis, it can be known the factors that are the main strengths and main weaknesses in the management of solid medical waste in the working area of the Balai Jaya Health Center. These results are then used as the basis for the preparation of a solid medical waste management strategy that is more effective, safe, and sustainable.

Based on the results of the IFAS analysis, a total score of 2,43. This value shows that the internal condition of medical waste management is in the category moderate, because it is still below the average value of 2.5. According to the theory of strategic management put forward by Fred R. David (2009) in Pussy et al., (2020) The IFAS matrix score is in the range of 1.0–4.0, where the Ifas score below 2.5 indicates that the organization's internal condition is in an average position or not optimal. The higher the IFAS score, the stronger the organization's ability to leverage strengths and overcome internal weaknesses. This means that the organization already has several strength factors that support medical waste management, such as the knowledge of health workers, the attitude of officers, the availability of PPE, infrastructure, and concern for K3. However, there are still some weaknesses that need to be improved, especially in the aspects of management commitment, SOP compliance, internal supervision, recording and reporting, as well as the incentive and sanction system.

2. EFAS (External Factors Analysis Summary)

EFAS (*External Factors Analysis Summary*) analysis is a method used to identify and evaluate external factors that affect the management of solid medical waste in health service facilities in the Balai Jaya Health Center work area. External factors consist of opportunities and threats that come from outside the organization and can affect the successful implementation of solid medical waste management.

The first stage in the preparation of the EFAS analysis is to identify external factors related to solid medical waste management. These external factors include government

policies, regulatory support, the development of waste management technology, cooperation with third parties medical waste processors, guidance and supervision from related agencies, and the level of public awareness of the importance of safe medical waste management. Factors that have a positive impact on waste management are categorized as opportunities, while factors that have the potential to hinder or pose a risk are categorized as threats. The second stage is to give weight to each external factor based on the level of influence on solid medical waste management. The weight value ranges from 0.0 to 1.0 with a total total weight of 1.0. External factors that have a major influence on the success of medical waste management are given higher weight than other factors. The third stage is to give ratings to each external factor. Ratings are given to show the extent to which healthcare facilities are able to respond to opportunities and face existing threats. In the opportunity factor, a high rating indicates a good ability to take advantage of opportunities, while in the threat factor, a low rating indicates that the threat is still an obstacle in the management of solid medical waste. Next, the score calculation was carried out by multiplying the weight and rating of each external factor. The score results are then added up to obtain the total EFAS score. The total score value is used to determine external conditions that affect the management of solid medical waste in the work area of the Balai Jaya Health Center. The following are the results of the identification of external factors for the management of solid medical waste in the work area of the Balai Jaya Health Center.

The results of EFAS' analysis show that external conditions affecting the management of solid medical waste in the Balai Jaya Health Center work area are in a relatively favorable position. This can be seen from the dominance of opportunity factors compared to existing threats, so that in general the external environment still supports efforts to improve solid medical waste management, but the right strategy is still needed to anticipate various existing threats so that the management system can run more effectively, safely, and sustainably.

3. Position of Strategies in SWOT Analysis

Based on the results of the IFAS and EFAS analysis, it can be seen that the management of solid medical waste in the work area of the Balai Jaya Health Center has internal conditions that are in the medium category. This is indicated by the total score that is still below the ideal average value (2.5). This condition illustrates that the internal capabilities of the organization still need to be strengthened so that they can run in balance with the dynamics and demands of the existing external environment.

The determination of the quadrant position in the SWOT analysis is carried out through the combination of the results of internal factor analysis (IFAS) and external factors (EFAS). This stage aims to find out the strategic position of solid medical waste management in the work area of the Balai Jaya Health Center so that the most suitable alternative strategy to be implemented can be determined. According to (Kakyarmabin et al. 2022) The internal axis coordinate value is derived from the difference between the total strength score (*strengths*) and total weakness score (*weaknesses*) and the external axis coordinate value is derived from the difference between the total chance score (*opportunities*) and total threat score (*threats*). After obtaining the results of the IFAS and EFAS calculations, calculations are carried out to determine the ranking and

alternative strategies of each IFAS and EFAS matrix. The results of the calculation can be seen in the following table

Table 1. IFAS and EFAS Final Scores

IFAS		EFAS	
Category	Total Score	Category	Total Score
Strength (S)	1,44	Odds (O)	2,01
Disadvantages (W)	0,99	Threat (T)	1,00
Total (S-W)	0,45	Total (O-T)	1,01

Source: Primary data processed by researcher based on IFAS and EFAS analysis (2026)

Based on the results of the SWOT analysis, the total IFAS value of 0.45 was obtained which came from the difference between strengths (Strengths) of 1.44 and weaknesses (Weaknesses) of 0.99. Meanwhile, the total EFAS score of 1.01 was obtained from the difference between Opportunities (Opportunities) of 2.01 and Threats (Threats) of 1.00. The results of the SWOT coordinates are at point (0.45; 1.01) so that the organization's position is in Quadrant I (+,+), which is a progressive position or aggressive strategy. This position shows that the organization has more dominant internal strengths than weaknesses and external opportunities that are greater than threats.

Institutional Theory explains in the way Martin & Herold, (2018) that organizations tend to adapt the practices and policies carried out to the demands of the institutional environment, both in the form of government regulations, professional standards, and applicable social norms. In the context of this study, the existence of Permenkes Number 18 of 2020, Ministerial Regulation Number 56 of 2025, guidance from the Health Office, and requirements for cooperation with licensed waste processors are forms of regulatory pressure that affect medical waste management practices. Therefore, the opportunities identified in the SWOT analysis can be understood as a form of institutional environmental support that encourages healthcare facilities to adjust medical waste management practices in accordance with applicable regulations. These findings suggest that medical waste management is not only influenced by internal organizational factors, but also by the institutional environment in which the organization operates.

In addition, Stakeholder Theory explains that the success of an organization is influenced by its ability to manage relationships with parties that influence or be influenced by organizational activities (Awa et al. 2024). In this study, medical waste management involves various stakeholders, including health workers, cleaners, health service facility managers, Health Offices, Environmental Agencies, third parties transporting and processing medical waste, and communities potentially affected by medical waste. From the perspective of this theory, medical waste management is the result of the interaction of various stakeholders who have different roles and responsibilities in ensuring that medical waste is managed in accordance with applicable regulations. Therefore, the strategy produced through the SWOT analysis in this study can be understood as an effort to accommodate the various interests of stakeholders involved in the medical waste management system.

4. Solid Medical Waste Management Strategy in Health Facilities in the Balai Jaya Health Center Working Area

Based on the results of the IFAS and EFAS analysis, a SWOT matrix was prepared to determine alternative strategies for managing solid medical waste in health service facilities in the Balai Jaya Health Center work area. The SWOT matrix is used to combine internal and external factors so that SO (Strength–Opportunity), WO (Weakness–Opportunity), ST (Strength–Threat), and WT (Weakness–Threat) strategies are obtained which can be used as a basis for improving the effectiveness of solid medical waste management optimally, safely, and in accordance with applicable regulations.

One of the important findings obtained from this study is the tendency that human factors are more dominant as a force than organizational system factors in the management of solid medical waste in health service facilities in the Balai Jaya Health Center work area. This can be seen from the high scores in the aspects of health workers' knowledge about medical waste and B3 waste, attitudes and perceptions of the importance of medical waste management, the use of personal protective equipment, and concern for occupational health and safety. The findings show that in general, there has been an awareness of individuals regarding the importance of safe and regulated medical waste management.

However, the results of the study also show that several factors related to organizational governance are still identified as weaknesses, including management commitment, quality of SOPs, compliance with SOPs, competence of waste management human resources, recording and reporting systems, internal supervision systems, and incentive and sanction systems. This condition shows that there is a gap between the capacity of individuals and the capacity of organizational systems in the management of solid medical waste. These findings indicate that the main challenge of medical waste management in the research area lies not solely in the lack of understanding of medical waste, but in the aspect of strengthening environmental management systems that govern how this knowledge is translated into sustainable control procedures, monitoring, documentation, and mechanisms. In other words, the main problems identified in this study lead more to the governance issue than to the aspect of individual knowledge.

These findings provide a scientific contribution that the existence of health workers who have good knowledge and environmental awareness has not automatically resulted in a strong medical waste management system if it is not supported by adequate organizational mechanisms. Therefore, solid medical waste management needs to be understood as a system that requires integration between individual capacity, organizational commitment, and institutional control mechanisms in order to run consistently and sustainably.

Another finding that emerged from this study is the dominance of the influence of institutional factors in shaping the direction of medical waste management strategies. This can be seen from the magnitude of the value of opportunities compared to threats in the EFAS analysis which places organizations in Quadrant I. The findings show that the external environment, especially regulatory and policy support, is a strategic capital that can be used by healthcare facilities in strengthening the medical waste management system. Thus, the resulting strategy is not only oriented towards the internal improvement

of the organization, but also makes use of the institutional support available to strengthen the governance of medical waste management in a sustainable manner.

Based on the results of the SWOT analysis, the strategy for managing solid medical waste in health service facilities in the Balai Jaya Health Center work area was prepared through a combination of internal and external factors that affect the implementation of medical waste management. The results of the analysis show that the organization's position is in Quadrant I (+,+), which means that the organization has considerable internal strength and supporting external opportunities. This condition shows that the most appropriate strategy to be implemented is an aggressive strategy (growth oriented strategy), which is a strategy that is oriented towards the development and improvement of the optimal medical waste management system.

The SO (Strength–Opportunity) strategy is directed at utilizing all internal strengths to maximize available external opportunities. Health workers' knowledge of medical waste and B3 waste is the main capital in improving the quality of medical waste management starting from the process of sorting, containerization, temporary storage, to transportation of medical waste according to environmental health standards. The attitude and perception of health workers that are good enough to the importance of medical waste management is also a supporting factor in building a work culture that cares about environmental health and occupational safety. In addition, the availability of infrastructure facilities and the use of personal protective equipment (PPE) can be used to support the fulfillment of accreditation standards for health service facilities and reduce the risk of environmental pollution and work accidents. The support of government regulations, the national accreditation system, and the existence of licensed third parties in B3 waste management are strategic opportunities that must be used to strengthen a more effective, safe, and sustainable medical waste management system.

The WO (Weakness–Opportunity) strategy is focused on efforts to improve various internal weaknesses by taking advantage of available opportunities. Low management commitment, lack of optimal quality of SOPs, and weak compliance of health workers with medical waste management procedures show that the medical waste management system still needs comprehensive strengthening. Therefore, government support through training, coaching, and supervision must be utilized to improve the competence of human resources for medical waste management. In addition, the policy of procurement of goods and services as well as local government support needs to be used to increase the availability of medical waste management facilities and infrastructure that meet standards. The development of a national standard-based medical waste recording and reporting system is also an important step to increase the effectiveness of monitoring, evaluation, and supervision of medical waste management. With a better administrative system, the medical waste control process can be carried out in a more measurable and accountable manner.

The ST (Strength–Threat) strategy is directed at the use of internal forces to overcome various external threats that can hinder the management of medical waste. The risk of environmental pollution, disease transmission, high costs of medical waste management, and increasing public demands on environmental health issues are threats that must be seriously anticipated. Health workers' knowledge of medical waste and the

application of occupational health and safety (K3) principles must be optimized to minimize the risk of mismanagement of medical waste. The consistent use of PPE and the use of available infrastructure facilities are also very important in protecting officers from the risk of work accidents and exposure to infectious waste. In addition, the available medical waste management budget must be utilized effectively and efficiently to address the high cost of transportation services and the destruction of medical waste by licensed third parties. Compliance with medical waste management regulations also needs to be strengthened so that health service facilities are able to face external supervision from relevant agencies and community demands regarding the environmental impact of medical waste.

The WT (Weakness–Threat) strategy is a defensive strategy that aims to minimize internal weaknesses while avoiding external threats. Low management commitment, weak internal supervision system, limited human resource competence, and suboptimal recording and reporting systems can increase the risk of violations in medical waste management. Therefore, it is necessary to strengthen the monitoring, evaluation, and internal audit system on a regular basis to ensure that the entire medical waste management process runs in accordance with the applicable standard operating procedures. Improving the competence of health workers and waste management officers through periodic training is also an important step in improving the compliance and skills of officers in handling medical waste safely. In addition, the preparation of a clear incentive and sanction system needs to be implemented to increase officer discipline towards the implementation of SOPs for medical waste management. Improving the medical waste recording and reporting system is also an important aspect to support the process of proper supervision, control, and decision-making in an effort to prevent environmental pollution and health impacts due to suboptimal management of medical waste.

Based on the results of the SWOT analysis, the management of solid medical waste in health service facilities in the Balai Jaya Health Center work area is in the position of Quadrant I (Strength–Opportunity) with coordinates (0.45; 1.01). This position shows that the organization has more dominant internal strengths than weaknesses and external opportunities that are greater than threats. This condition indicates that the most appropriate strategy to implement is an aggressive strategy through the Strength–Opportunity (SO) approach, which is a strategy that utilizes internal forces to optimize external opportunities in order to increase the effectiveness of solid medical waste management. Through the SO strategy, this research produced a **"Strategy for Strengthening the Solid Medical Waste Management System"** as a priority strategy in the management of solid medical waste in health service facilities in the Balai Jaya Health Center work area. This strategy is an effort to strengthen the overall medical waste management system by utilizing the internal strengths of the organization in the form of knowledge of health workers about medical waste and B3 waste, positive attitudes and perceptions of health workers on the importance of medical waste management, the availability of supporting facilities and infrastructure, and the use of personal protective equipment (PPE). These strengths are then optimized to take advantage of available external opportunities in the form of government regulatory support, health service

facility accreditation systems, coaching and supervision from related agencies, as well as cooperation with licensed third parties in the transportation and treatment of medical waste.

CONCLUSION

Solid medical waste management at the Balai Jaya Community Health Center (Puskesmas) health care facility encompasses all stages, from waste segregation to final treatment. However, its implementation remains suboptimal due to challenges related to standard operating procedures (SOPs), management commitment, staff competency, and reliance on third-party services. Key internal factors supporting medical waste management include the positive attitudes of health care workers and the availability of supporting facilities. Conversely, major weaknesses include limited management commitment, suboptimal SOP implementation, and inadequate human resources. Externally, the primary opportunities are government regulatory support and collaboration with licensed waste management providers, while the main threats include high management costs and the potential risk of environmental pollution. The recommended strategy is to strengthen the solid medical waste management system (Sistem Pengelolaan Limbah Medis Padat [PSPLMP]) through improved organizational governance, human resource development, facility optimization, strengthened partnerships, and environmental risk management.

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