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Analysis of B3 Solid Medical Waste Management System in Medan Denai Community Health Center, Medan Denai District, Medan City

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ABSTRACT

Management of B3 solid medical waste is a crucial aspect in maintaining environmental quality and public health, especially in primary health care facilities such as Community Health Centers. This study aims to analyze the B3 solid medical waste management system at the Medan Denai Community Health Center UPT, Medan Denai District, Medan City. The research method used is descriptive observation with a qualitative approach, through field observation techniques, interviews, and documentation. The results of the study indicate that medical waste management has referred to applicable regulations, such as separating waste based on type, using safety boxes, and recording waste balances. However, problems were found in the form of accumulation of medical waste in Temporary Shelters (TPS) which had not been immediately transported by third parties. This condition has the potential to cause environmental pollution and the spread of disease due to exposure to infectious waste stored for a period of time exceeding the safe limit. Therefore, it is necessary to strengthen the transportation coordination system, improve TPS facilities, and increase internal supervision to ensure that waste management is effective, safe, and sustainable.

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INTRODUCTION

Puskesmas as a first-level health service facility produces various types of waste that have the potential to pollute the environment and endanger human health. Waste produced by Puskesmas in general can be classified into 3, namely liquid waste, equivalent/non-b3 waste, B3 waste. Medical waste or B3 includes infectious ones such as used bandages, cotton swabs, used syringes, and materials contaminated with the patient's blood or body fluids. This waste has the potential to transmit infectious diseases and requires special handling ranging from sorting, packaging, storage, to destruction (Hadi et al, 2020).

According to the Ministry of Health of the Republic of Indonesia, waste management in health facilities, including health centers, must follow certain standards in accordance with the Regulation of the Minister of Health No. 18 of 2020 concerning Medical Waste Management of Health Service Facilities. In the regulation, it is explained that medical waste is infectious waste, pathological waste, pharmaceutical waste, hazardous chemical waste, cytotoxic waste, and sharp waste (sharp waste). (K. K. R. Indonesia, 2020)

The provisions of hospital environmental health requirements contained in the Decree of the Minister of Health Number 1204/MENKES/SK/X/2004 concerning Hospital Environmental Health Requirements have been updated/adapted to become Regulation of the Minister of Health Number 7 of 2019 concerning Hospital Environmental Health, in the regulation it is explained that to realize a healthy environmental quality for hospitals both from the physical aspect, chemical, biological, radioactivity and social factors and protect the hospital's human resources, patients, visitors, and the community around the hospital from environmental risk factors. (Permenkes RI, 2019)

The impact of poor waste management is very detrimental to public health and can reduce the degree of public health and cause health problems such as high density of disease vectors (flies, rats, mosquitoes, cockroaches, etc.), air, soil, and water pollution, and low aesthetic value. It can also cause infectious diseases, such as diarrhea, skin diseases, dengue hemorrhagic fever (DHF), worms, and others (Nurhayati et al, 2021).

At UPT. The Medan Denai Health Center, as one of the health facilities that has undergone the process of construction and service improvement, is located in an area with a fairly high density of settlements. This requires extra attention in ensuring that its development and operational activities do not cause disturbances to the surrounding community. In addition, the management of medical waste produced by poly rooms, both from laboratory rooms, pharmaceuticals and so on, must be carried out in accordance with the provisions of laws and regulations so as not to pollute the environment or endanger public health.

Based on the results of observations that have been made, it is known that the Medan Denai Gkulu Health Center for the management of B3 solid medical waste is not in accordance with the Minister of Health Regulation No.7 of 2019, where there is an accumulation of solid medical waste before it is transported by a 3rd party. This can cause pollution and the spread of disease if B3 medical waste piled up at TPS (Temporary Disposal Reservation) is not managed properly and within a period of time that exceeds the safe limit. Medical waste such as used syringes, contaminated bandages, and leftover pharmaceutical ingredients have the potential to spread pathogenic microorganisms if left open or not stored in a compliant, sealed container.

METHOD

This type of research is observation with a descriptive approach. The research was conducted at the Medan Denai Health Center in May 2025. The main objective of this approach is to systematically describe the implementation of B3 padar medical waste management. Data was collected through three main techniques, namely direct observation using checklist sheets, interviews with environmental health workers using open-ended question guides, and documentation as supporting evidence. Data analysis is carried out in a qualitative descriptive manner through the process of data reduction, presentation of narratives, and drawing conclusions based on patterns and relationships from findings in the field.

RESULTS AND DISCUSSION

Based on the results of observations conducted at the Medan Denai Health Center UPT, it was found that the solid medical waste management system for Hazardous and Toxic Materials (B3) in general has referred to applicable laws and regulations, such as Permenkes No. 18 of 2020 and Permenkes No. 7 of 2019. Waste collection, recording, and storage procedures have been carried out according to standards with the use of safety boxes, separation of waste based on bag color, and recording in the monthly waste balance. However, problems were found in the temporary storage stage, namely the accumulation of solid medical waste B3 in the Temporary Shelter (TPS) which exceeded the ideal frequency before being transported by a third party.

The management of medical waste in health care facilities studied shows a structured work system starting from waste collection using safety boxes in each poly. Based on the information gathered, collection activities are carried out every day between 14.00 and 16.00 by cleaners. One of the officers said:

> *"We take it from the General Police, KIA, Children, and the Elderly. Usually two o'clock a little past two have started to go around. Sometimes the KIA poly is the slowest to collect, but we still wait for everything to be recorded."*

This time discipline shows a low understanding of the importance of timely management of infectious waste. In accordance with the Minister of Health Regulation No. 18 of 2020 , medical waste must be collected within a time not exceeding 1 x 24 hours to prevent biological decomposition which can increase the risk of infection. Nevertheless, there are operational obstacles that arise. In another interview, the cleaning service officer said:

> *"Sometimes the safety box is too full that it is difficult to close. Then we have to report it first before transporting, afraid that the contents will spill."*

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This shows the need for control at the level of the initial user (medical personnel), not just at the collection officer. A study by Kartika et al. (2021) states that direct supervision and rotation of collection officers can help improve compliance with SOPs for storing sharp waste. This accumulation of waste can have various negative impacts on the environment and public health. B3 waste such as used syringes, bandages contaminated with blood or body fluids, and pharmaceutical waste are types of waste that are infectious. If not immediately managed or stored for too long, the waste can become a medium for the growth of pathogenic microorganisms, which can pose a risk of spreading disease, both to health workers, patients, and the surrounding community.

Once the TPS is full or the shelf life is close to the 90-day limit, the facility will allow the disposal of waste to a third party. However, transportation is not always at the desired time. A staff member said:

"We can only ask to be transported once every two months. If there is a lot of sudden waste, you have to wait until the schedule. They also have a lot of other places to visit."

The dependence on limited number of waste transport service providers makes many facilities have no interruptions in emptying the TPS. This is in accordance with the research of Rahmadani et al. (2021), which suggested a consortium between health facilities to synchronize joint transportation to be more efficient.

The storage of medical waste for a period of up to three months is still within the legally allowed limit, which is a maximum of 90 days, but this condition must still be reviewed in terms of the risk of biological exposure and potential contamination. This phenomenon reflects the importance of a more responsive and adaptive system to the generation of medical waste that occurs dynamically in the field. Health service facilities such as health centers should have a waste management system that is not only in accordance with regulations, but also flexible and effective operationally. In this case, the waste transport service provider must have a cooperation agreement that allows the collection schedule to be carried out more frequently, or at least in accordance with the collection capacity and daily generation volume.

The waste that has been collected is weighed regularly and included in the waste balance that is compiled per month. One of the administrative staff stated:

"After being weighed, the data is immediately entered into excel. At the end of each month, we send it to the Health Office, according to their request."

This recording is not only for routine reports, but also as a tool for monitoring and evaluating the occurrence of waste produced. According to the Minister of Environment Regulation No. P.59/Menlhk/Setjen/Kum.1/10/2016 concerning B3 waste management documents, recording must be carried out to verify the suitability between the amount of waste and the capacity of the polling station, and for environmental audits. However, in practice, the limitations of technology and administrative personnel make the recording system still carried out semi-manually. One of the speakers said:

"If there is a computer problem, yes, we record it on paper first. But I'm afraid that data is lost when it moves to a computer."

In this case, cloud-based digitization systems such as SIMLIMBAH or applications based on the Ministry of Health are highly recommended (Widyasari & Firmansyah, 2022).

Once collected, the medical waste is moved to the Temporary Shelter (TPS) located in the back area of the facility. Transfers are carried out at 17.00 every day. One of Kesling's staff explained:

"Our polling stations are actually enough, but if transportation is late or waste from poly is large, it can be full in two months. We also once covered it with additional plastic because it smelled strong."

TPS that are too full or not equipped with ventilation systems can risk causing air pollution and becoming a breeding ground for disease vectors. Based on the Minister of Environment and Forestry Regulation No. 56 of 2015, B3 waste landfills must meet the standards: airtight floors, ventilation, leak-proof systems, and be given clear B3 danger signs. Previous researchers found that 78% of first-level health facilities in Indonesia still do not have medical waste TPS that meet technical specifications. This can lead to law enforcement and the environment if not corrected immediately. Nurul & Rachman (2023).

TPS that do not meet technical standards, such as the absence of ventilation, and are not equipped with temperature and humidity control facilities, will accelerate waste decay and increase the intensity of unpleasant odors. This situation not only reduces comfort, but also attracts disease vectors such as flies, mosquitoes, and rodents. The vector can carry infectious agents from waste to the external environment, including to the homes of local residents or into the health service room itself. This risk is very high, especially in densely populated areas such as the location of the Medan Denai Health Center in dense residential areas. The impact of pollution is not only limited to the spread of disease, but can also contaminate the surrounding soil and water in the event of leakage or spillage of waste from non-standard containers.

The medicines taken are not managed by the environmental team, but by the pharmaceutical department. One of the pharmacy attendants explained:

"If there is an expired drug, we immediately data it, store it, and then send it to the Office. Usually we wait until the amount is enough to be transported to a third party."

This procedure is in accordance with the Technical Guidelines for Pharmaceutical Waste Management from the Ministry of Health. However, most facilities do not yet have documentation of digital systems for pharmaceutical waste disposal, as stated in a study by Isnawati et al. (2022), which suggested the use of digital pharmaceutical barcode and logbook systems. Infectious liquids that seep into the soil have the potential to contaminate groundwater, which can enter the community's clean water system. Situations like this become very dangerous if there is no adequate monitoring or mitigation system. Thus, obstacles in the schedule of waste transportation by third parties are not only administrative problems, but can turn into serious environmental and health problems if not addressed immediately.

It is important to know that the medical waste transportation system at the Puskesmas is highly dependent on cooperation with a third party, namely PT. Sumatra Lestari Indah which already has an official permit from the Health Office. When the volume of waste has reached the capacity of the TPS, then an official request for transportation is made. However, in practice, this process often cannot be done immediately due to the constraints of inflexible transportation schedules. The mismatch between the volume of waste produced and the available transportation capacity is the main cause of the accumulation of B3 medical waste.

In addition, the health center also needs to ensure that the polling station has adequate infrastructure and meets technical standards, such as being equipped with watertight floors, having good ventilation, being tightly closed, and given clear B3 waste warning signs. Strengthening the capacity of cleaners and environmental health teams in conducting routine monitoring of the condition of the polling station is also a key factor in preventing pollution and exposure to hazardous waste.

Thus, although administratively and procedurally the management of medical waste at the Medan Denai Health Center has shown systematic efforts, the accumulation of B3 waste at the TPS is a weak point in the system that can have a major impact on public health and the environment. Therefore, there is a need for evaluation and improvement of internal policies as well as increased cooperation with external partners so that waste management runs more effectively, efficiently, and safely from potential pollution and disease transmission. This approach is expected to be able to realize medical waste management that is not only compliant with regulations, but also able to ensure sustainable public health protection.

CONCLUSION

The management of solid medical waste B3 at the Medan Denai Health Center has generally been carried out based on applicable guidelines and regulations, such as waste separation using colored bags, the use of safety boxes for sharp waste, periodic recording of waste generation, and storage in Temporary Shelters (TPS). However, the observation results show that there is a buildup of solid medical waste B3 at the polling station that has not been immediately transported by a third party. This buildup causes potential environmental pollution, such as bad odors, the development of disease vectors, and the risk of spreading infections due to infectious waste stored for a long time. This condition shows weaknesses in the operational system for transporting waste and lack of monitoring of TPS capacity.

Suggestion

To reduce the risk of pollution and disease transmission, it is recommended that the Health Center improve coordination with third parties in terms of waste transportation, so that waste can be transported more regularly and does not accumulate beyond the capacity of the TPS. In addition, TPS facilities need to be improved to meet technical standards, such as having adequate ventilation, tight covers, watertight floors, and clear B3 waste warning signs. Puskesmas also need to strengthen internal supervision through periodic evaluations and increase training for cleaners and environmental health teams so that waste management is carried out more disciplined and in accordance with procedures. With these steps, it is hoped that B3 medical waste management can run more effectively, safely, and not endanger public health and the surrounding environment.

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