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MANAGEMENT OF HAZARDOUS AND TOXIC WASTE (B3) AT MENTAL HOSPITAL X IN MEDAN CITY

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Abstract

Management of hazardous and toxic medical waste (B3) in hospitals is an important aspect in efforts to maintain environmental safety and public health. This study aims to determine the flow of B3 medical waste management at Mental Hospital X, Medan City, which includes the stages of waste sorting, storage, and transportation. This type of research is descriptive observational with a cross-sectional approach, using secondary data from the Environmental Sanitation Installation for the period January–September 2025. The results of the study indicate that the overall management of B3 medical waste is not optimal and does not meet standards. The sorting stage has not been carried out based on the type of waste, where all waste (sharp, soft, pharmaceutical) is mixed without labeling. The storage stage at the Temporary Storage Place (TPS) for B3 medical waste also does not meet design requirements, such as the building is not closed, not watertight, not equipped with hazard symbols, and emergency facilities. Although transportation has collaborated with a licensed third party (PT X), the risk remains due to the transported waste being mixed and not properly sorted. In conclusion, Mental Hospital X has critical non-conformities in the management of B3 medical waste. Therefore, fundamental improvements, especially in sorting at source and renovation of TPS, are urgent to reduce the risk of contamination and environmental impacts.

Keywords: Hazardous and Toxic Medical Waste (B3), Hospital, Waste Management, Segregation, Storage, Transportation

Introduction

Hospitals are an integral part of social and health organizations, with the function of providing comprehensive, curative, and preventive services to the community. Hospitals are crucial and must continually improve the quality of their services to facilitate access and protect patient safety. According to the World Health Organization (WHO),

A hospital is a healthcare facility that offers emergency, outpatient, and inpatient care, as well as medical and non-medical services. Hospital services not only improve public health but can also have negative impacts, one of which is the generation of hazardous and toxic waste, which requires special management. According to Ministerial Regulation No. 6 of 2021 concerning Procedures and Requirements for the Management of Hazardous and Toxic Waste (B3),

B3 waste management includes stages such as reduction, storage, collection, transportation, processing, and/or landfill. One source of hazardous and toxic waste in hospitals comes from laboratory activities, including infectious waste such as residual wound cleansing materials, hemodialysis waste, cancer therapy waste, surgical waste, pharmaceutical products, and residues from

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incineration processes. This waste can cause environmental pollution if not managed properly, so it is necessary to implement an appropriate processing strategy before the waste is disposed of or reused.

Based on monitoring results conducted by the Ministry of Environment and Forestry, hazardous waste management in healthcare facilities is still not yet optimal. These include improper collection of infectious waste, substandard temporary storage facilities, the use of incinerators that do not meet standards, such as those that emit black smoke and pollutant emissions, incomplete waste combustion, and a hazardous waste collection system (Ministry of Environment and Forestry of the Republic of Indonesia 2018).

The careless disposal and processing of hazardous medical waste with household waste can lead to soil and water contamination with chemicals, viruses, or bacteria, endangering the health of surrounding communities (Platon, Frone, Constantinescu, & Sorina, 2020). According to 2019 Ministry of Health data, there are 2,877 hospitals in Indonesia, but only 117 have permits for hazardous waste management. Of these, 111 use incinerators and 6 use autoclaves. The small number of hospitals that have obtained permits to manage B3 waste and the small number of B3 waste processing services or factories means that the amount of B3 medical waste that has not been managed properly in accordance with applicable regulations is still large (KEMENLHK, 2020).

Mental Hospital X is one of the largest Class A state hospitals and will serve as a referral center for the community, particularly in Medan City and the North Sumatra region. In addition to providing mental health services, the hospital also offers a variety of other healthcare services, such as general polyclinics, a laboratory, an emergency department (ER), and other medical support services. These various service activities generate waste, including hazardous and toxic medical waste that requires special management.

Based on the results of the initial survey, it was discovered that the hazardous and toxic medical waste management process at Mental Hospital X does not fully meet applicable waste management standards. At the sorting stage, hazardous medical waste is not properly separated by type, and most of it lacks appropriate labeling or marking. Furthermore, management of the temporary storage process at the Temporary Storage Site (TPS) for hazardous and toxic medical waste is also suboptimal. This study aims to determine the process for managing hazardous and toxic medical waste at Mental Hospital X, including the selection of hazardous medical waste, storage of hazardous medical waste, and transportation of hazardous medical waste.

Method

The research method used in this study was a descriptive observational cross-sectional study through observations of hazardous medical waste management at mental hospital X. The variables observed in this study included the sorting of hazardous medical waste, storage of hazardous medical waste, and transportation of hazardous medical waste. The data used was data from January to September 2025.

Data collection used secondary data collection methods from environmental sanitation installations. The data obtained were then analyzed descriptively and compared with the standards of Minister of Environment and Forestry Regulation No. 6 of 2021 concerning Procedures and Requirements for the Management of Hazardous and Toxic Waste (B3).

Result and Discussion

Mental Hospital X is one of the largest Class A state hospitals and will serve as a referral center for the community, particularly in Medan and North Sumatra. The hospital has a capacity of 469 beds, a land area of 38,000 m2 and a building area of 12,628 m2. It currently accommodates 300 patients and residents, and boasts a variety of adequate healthcare facilities.

The environmental sanitation facility at Mental Hospital X was established with the aim of managing environmental sanitation, including hazardous and toxic waste management, from sorting and storage to third-party transportation. The sanitation facility is staffed by two people: one facility head and one facility staff member. The environmental sanitation facility comprises several units, one of which is the hazardous and toxic medical waste unit generated from hospital service activities. The amount of medical waste generated from healthcare locations at Mental Hospital X from January to September 2025.

Table 1. Amount of Hazardous and Toxic Medical Waste from January to September 2025

Bulan	Jumlah Sampah (Kg)
Januari	22,95
Februari	6,55
Maret	23,85
April	25
Mei	24,70
Juni	8,70
Juli	23,30
Agustus	12,70
September	7,25
Rata-rata	**17,22**

Source: Data from the Environmental Sanitation Installation Report of Mental Hospital X, January-September 2025

The table above shows that the average amount of medical waste generated at Mental Hospital X is 17.22 kg/day. The hazardous and toxic medical waste generated from healthcare services is not sorted but is instead collected in a single yellow plastic container. The composition of each type of medical waste is described in Table 2 below.

Table 2. Types of Medical Waste at Mental Hospital X

Jenis Sampah Medis	Komposisi
Sampah medis tajam	Jarum suntik, spuit, ampul
Sampah medis lunak	Perban, kasa, plester
Sampah beracun (toxic)	Bahan kimia kadaluarsa
Farmasi	Obat Kadaluarsa

Source: Data from the Environmental Sanitation Installation Report of Mental Hospital X, January-September 2025

According to Minister of Environment and Forestry Regulation No. 6 of 2021 concerning Procedures and Requirements for the Management of Hazardous and Toxic Waste (B3), the management of B3 waste originating from health care facilities (fasyankes) includes reduction, storage, collection, transportation, utilization, processing, and disposal. This means that B3 waste management must encompass the entire chain from source to final disposal. A brief flowchart of the medical waste management process at Mental Hospital X shows the flowchart.

Figure 1. Hazardous Medical Waste Processing Flow at Mental Hospital X

Hazardous Waste Segregation

Hazardous medical waste at Mental Hospital X has not been sorted by waste type. Hazardous medical waste, such as syringes, ampoules, gauze, bandages, and plasters, is still mixed together in a single yellow plastic bag. Furthermore, Mental Hospital X has not labeled the medical waste. This situation indicates that the hospital's hazardous waste segregation standards are not in line with the principles stipulated in Minister of Environment and Forestry Regulation No. 6 of 2021. Research by Khatami, Mirwan, & Aulidia (2023) at Mental Hospital X, Surabaya, showed that standardized waste segregation reduces the risk of nosocomial infections and improves efficiency in waste storage and transportation. Waste separation at the source is crucial for facilitating further management.

The implementation of sorting is crucial to reduce the potential for cross-contamination between waste types and ensure safety during storage, transportation, and processing. Safety boxes prevent sharps waste from mixing with other types of waste, thus minimizing the risk of needlestick injuries and the spread of disease. Similarly, the use of yellow plastic for soft medical waste facilitates clearer waste identification. Research by Yustiani, Sugito, & Rahmawati (2021) emphasized that the availability of sorting facilities and healthcare worker compliance in sorting waste are crucial factors for successful medical waste management. Therefore, consistent supervision and routine training for healthcare workers are necessary to optimize hazardous and toxic waste sorting.

Hazardous and toxic medical waste storage

The storage of Hazardous and Toxic Materials (B3) waste is a crucial stage in the hospital waste management system as it serves as a temporary holding area before the waste is sent to a licensed processor. Based on Minister of Environment and Forestry Regulation No. 6 of 2021, B3 medical waste must be stored in a dedicated location with watertight construction, adequate ventilation, equipped with hazard symbols, and protected from weather exposure and unauthorized access. The TPS at Mental Hospital X is not in accordance with the building conditions. The TPS building is not fully enclosed and has walls that are not watertight, indicating a fundamental failure in meeting design requirements. Based on Minister of Environment and Forestry Regulation No. 6/2021, TPS must be a closed building to protect B3 waste from direct exposure to rainwater and sunlight. In addition, walls and floors must be watertight (impermeable) to prevent seepage. The TPS must be a building designed to be closed and able to protect B3 waste from direct exposure to sunlight and rainwater.

Hazardous medical waste at Mental Hospital X has not been identified as a type of waste due to the absence of symbols and labels on the hazardous medical waste containers. Each hazardous waste container must be affixed with symbols and labels indicating hazard characteristics (infectious, toxic, etc.). This indicates a non-compliance with the Minister of Environment and Forestry Regulation No. 6 of 2021. The absence of adequate emergency handling facilities such as fire extinguishers is also inconsistent with existing regulations. At Mental Hospital X, management at the storage stage in the

Temporary Storage Area (TPS) for hazardous medical waste has not been implemented optimally. Therefore, Mental Hospital X has been storing hazardous medical waste in the environmental sanitation installation room which functions as a temporary storage area for hazardous waste, thus not complying with applicable policies.

This research is in line with Abbad (2022) in his analysis at Dr. R. Sosodoro Djatikoesoemo Regional General Hospital, which also found that the TPS had problems in management procedures, such as waste storage that was not carried out separately, which indicates that suboptimal TPS increases the risk of contamination and complicates further handling procedures. Furthermore, compliance with the design of Temporary Storage Sites (TPS) for B3 Waste, especially those regulated in Ministerial Regulation of the Environment and Forestry No. 6 of 2021, is a key element in environmental risk management in healthcare facilities. The importance of this appropriate design is emphasized by Syarifah (2022), who concluded that the availability of TPS that meets regulatory criteria is vital to protecting the environment and public safety from the dangers of pollution, because TPS functions as the first line of defense before waste is further processed. Purwanti (2018) and Nurhayati, et al. (2024) also emphasized that precise building design, including ensuring that the TPS is a closed building, is an absolute necessity to optimize management, prevent direct exposure to the weather, and ultimately, reduce the dangers and negative impacts of B3 medical waste that arise.

Hazardous and Toxic Medical Waste Transportation

Hazardous and Toxic (B3) waste transportation is the final stage before the waste is processed or destroyed by a licensed management agency. At Mental Hospital X, the B3 medical waste transportation process is carried out by PT X, a third party that holds an official permit from the Ministry of Environment and Forestry (KLHK). Transportation is carried out routinely once a month using special vehicles that are sealed and labeled with hazards in accordance with Ministerial Regulation No. 6 of 2021 concerning Procedures and Requirements for B3 Waste Management.

However, inconsistencies were still found in the implementation. All types of medical waste, such as infectious waste, sharps waste, and pharmaceutical waste, were still being combined in a single yellow plastic bag without clear labeling. This situation has the potential to pose a risk of leaks, cross-contamination, and endanger transporters and the surrounding environment. Therefore, waste must be separated and labeled according to its type and characteristics before being transported by a third party to ensure the B3 waste management process is safe and in accordance with applicable regulations.

Research by Putri et al. (2022) at Dr. Soegiri Lamongan Regional General Hospital showed that collaboration with licensed third parties increased hospital compliance with medical waste management by up to 92%, particularly in transportation and manifest documentation. Similar results were also found in research by Astuti & Rahman (2021) at several hospitals in Yogyakarta, where regular waste transportation by third parties reduced the potential for waste buildup and prevented leaks of infectious materials. Both studies emphasize the importance of competent third parties, such as PT X, in maintaining a safe, transparent, and regulatory-compliant hazardous waste management chain. Therefore, strengthening coordination between hospitals and transporters needs to be continuously improved, both through periodic evaluations and contract renewals based on the results of annual environmental audits.

Implementing third-party transportation provides efficiency and safety for hospitals, considering that most healthcare facilities do not yet have independent hazardous medical waste processing facilities.

Conclusion

B3 waste management at Mental Hospital X is generally suboptimal and shows critical non-compliance with Minister of Environment and Forestry Regulation No. 6 of 2021. The process for managing hazardous and toxic medical waste at Mental Hospital X, as observed at the sorting, storage, and transportation stages, does not fully comply with standards. This is evident in the incomplete sorting stage based on waste type, where all types of B3 medical waste (sharp, soft, and pharmaceutical) are still mixed in one container without clear labeling. Significant non-compliance was also found at the storage stage, as the B3 medical waste disposal site (TPS) does not meet design requirements: the building is not fully enclosed, is not watertight, lacks symbols and labels, and is not equipped with emergency facilities. Although the transportation stage collaborates with a licensed third party (PT X), risks remain because the transported waste is still mixed in one container without proper sorting and labeling. Therefore, Mental Hospital X needs to immediately make fundamental improvements, especially in terms of separating waste at the source and improving the quality of the TPS, in order to reduce the potential for contamination, occupational safety hazards, and negative impacts on the environment.

Recommendations

Based on the research results regarding the management of Hazardous and Toxic Materials (B3) medical waste at Mental Hospital X, it is recommended that the hospital tighten waste segregation at source by providing separate standard containers (including safety boxes) and ensuring all containers are labeled according to the type of hazard, as required by Minister of Environment and Forestry Regulation No. 6 of 2021. Furthermore, renovation and physical optimization of the TPS (landfill waste disposal site) must be carried out immediately so that the TPS building is enclosed, has watertight floors and walls, and is equipped with hazard symbols and emergency facilities such as fire extinguishers. The practice of storing B3 waste in the sanitation installation room should also be discontinued and storage facilities and infrastructure improved to meet safety standards. Internal oversight and coordination with licensed third parties should also be strengthened to ensure that the entire B3 medical waste management process is safe, efficient, and in accordance with environmental regulations.

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