

ANALYSIS OF HAZARDOUS AND TOXIC SOLID MEDICAL WASTE MANAGEMENT IN PURWOREJO HOSPITAL

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ABSTRACT

Hospitals and health care facilities generate increasing amounts of solid medical waste each year. Improper treatment of this waste poses a potential risk for disease transmission. The Ministry of Health Regulation No. 7 of 2019 classifies hospital waste as hazardous and toxic medical waste and regulates its management procedures accordingly. This study aims to analyze the management of hazardous and toxic solid medical waste at Purworejo Hospital, focusing on the stages of reduction, segregation, storage, transportation, and the use of personal protective equipment (PPE). This research employed a descriptive qualitative approach with a cross-sectional design. Data were collected through observations, interviews, and document reviews. The interviews involved both key informants and triangulation informants. The results revealed that the management of hazardous and toxic solid medical waste at Purworejo Hospital achieved a compliance rate of 74.58% categorized as "appropriate" and 25.442% categorized as "not yet appropriate." This compliance rate remains below the required standard as stipulated in the Ministry of Health Regulation No. 7 of 2019. Non-compliance was identified in several aspects, including the absence of a designated pathway and special trolley for waste transportation, the lack of hepatitis and tetanus immunization for staff, and inconsistencies in the use of PPE.

Keywords: *Analysis, Medical Waste, Management, Hazardous and Toxic Materials*

INTRODUCTION

Solid medical waste management in hospitals is important because the waste produced has the potential to contain hazardous and toxic materials. Hazardous and toxic solid waste in Purworejo Hospital comes from outpatient, inpatient, Emergency Room (IGD), laboratory units, and pharmaceutical installations. Based on initial observations, the rate of hazardous

solid waste generated was 18.32 kg/day with the largest percentage of infectious waste (88.72%). Waste generated by health facilities such as hospitals, 10 - 25% is categorized as hazardous and can have an impact on health. Hazardous and toxic waste in hospitals has a high risk if not managed properly. Risks that can arise are the emergence of disease and environmental pollution. Hospital medical

waste is categorized as hazardous and toxic solid waste which has infectious and toxic characteristics. In addition to medical waste, waste classified as hazardous and toxic solid waste in hospitals are expired chemical products, expired pharmaceuticals, laboratory equipment contaminated with hazardous and toxic solid, medical equipment containing heavy metals, pharmaceutical product packaging and WWTP sludge.¹

Solid Medical Waste is generated from activities originating from treatment rooms such as dental clinics, general polyclinics, laboratories and pharmacies, various types of medical waste generated from health service activities can endanger and cause health problems, especially during collection, sorting, storage, storage, transportation and destruction and final disposal.² Hazardous and toxic solid waste in hospitals generally comes from medical and non-medical activities such as wound cleaning, patient treatment, cancer therapy processes and incineration process residues. Based on research at Purworejo Hospital, hazardous and toxic solid medical waste comes from outpatient and inpatient services, radiology, laboratory, and pharmaceutical installations. Hazardous and toxic solid waste before disposal must be processed and further managed first so as not to cause pollution. Hospital hazardous waste must be handled starting from the stages of sorting, packaging, collection, storage, processing, to transportation in accordance with the provisions. Indonesia has experienced an increase in the development of the number of hospitals, this is found in the Indonesian health data profile, the number of hospitals in Indonesia reached 2,877 in 2019, this number increased from 2015 which

amounted to 2,488 hospitals throughout Indonesia.³

In 2019, the waste generated from Health Service Facilities, especially hospitals and health centers, amounted to 296.86 tons / day, on the other hand, data from Medical Waste e-monv in December 2019 by the Directorate of Environmental Health of the Ministry of Health, only about 42% of hospitals whose medical waste management meets the standards, meaning that the remaining 58% of hospitals have not met the standards in medical waste management.⁴ Given the high rate of increase in medical waste, the potential for hospitals to spread nosocomial infections will also be higher. Nosocomial infections or Healthcare Associated Infections (HAIs) are infections that are closely related to medical service activities. Nosocomial infections are a measure of the quality of service in a health facility. Health workers, people who receive health services, people who are just visiting have the same or higher risk of exposure to infection in health services, about 20% of nosocomial infections are caused by visits to hospitals and also care.⁵ The government has stipulated the procedures and technical requirements for handling hazardous and toxic solid waste from health care facilities through Minister of Health Regulation No. 7 Year 2019 on Hospital Environmental Health, and hospitals are required to carry out hazardous and toxic solid waste handling consisting of the reduction and sorting stage, storage stage, transportation stage, processing stage, burial stage, and/or landfill stage.⁶

In the initial observation, the management of medical waste at Purworejo Hospital was still not in accordance with the regulations set by the Government. At the

transportation stage, there was still an emphasis on hazardous and toxic waste plastics. Then in the storage process, medical waste plastics are seen only placed on the floor without being neatly arranged, with the condition of the floor where the temporary storage of medical waste looks dirty. The purpose of this study is to analyze the sources and types of waste, the collection stage, the weight of medical waste generated, the reduction stage, the sorting stage, the transportation stage to the hazardous and toxic solid waste temporary storage place, the hazardous and toxic solid waste temporary storage stage, the transportation stage by the 3rd party, the destruction stage, and find out the Personal Protective Equipment used by Officers. With proper hazardous waste management, the harmful impact on health can be reduced and the chain of disease spread due to hazardous waste generated can be stopped.

METHODS

This research was descriptive research with a qualitative approach. In this study, the subjects or informants were selected using a purposive sampling technique by considering and choosing individuals who were relevant to the research objectives and had a better understanding of the required information. The subjects or informants in this study included the Head of Environmental Sanitation Installation, Head of Cleaning Service, Head of Outpatient Department, Head of Inpatient Department, Head of Pharmacy Installation, Head of Emergency Department, and Head of Laboratory. To increase the validity of the research results and obtain more reliable data, the researchers selected additional subjects as triangulation informants, which included

the Sanitation Installation Officer, Cleaning Service Officer, and Hospital Infection Prevention and Control Officer.

This study used both primary and secondary data obtained through observations, interviews, and the review of related documents. Primary data were obtained through observations and interviews. The observations were conducted at Purworejo Hospital using a solid medical waste management checklist based on the guidelines of the Minister of Health Regulation No. 7 of 2019. Meanwhile, secondary data were obtained through document reviews related to the management of hazardous and toxic solid medical waste, including standard operating procedures for waste handling, data on the amount of waste generated, licensing documents, and cooperation documents with hazardous and toxic waste management service providers. Data analysis and verification were carried out by triangulating data sources and collection methods or techniques, namely by comparing the responses from the main informant interviews with those from the triangulation informants. The results of the interview checks were then compared with the observation data and further compared with the findings from the document review.

RESULT AND DISCUSSION

The analysis in this study was carried out by calculating the effectiveness value of handling hazardous and toxic solid medical waste at Purworejo Hospital, the effectiveness value is obtained from the percentage of the level of conformity with the requirements contained in the Minister of Health Regulation Number 7 of 2019 concerning Hospital Environmental Health.

The results of the analysis can be seen in table 1 below :

Table 1. Analysis of the Effectiveness of Solid Medical Waste Handling of Hazardous and Toxic Materials at Purworejo Hospital

Management Stage	Number of Requirement	Requirements accordingly	Persentation (%)
Reduction and Segregation	10	6	60,00
Storage Stage	17	12	70,05
Transport Stage	20	17	85,00
PPE Usage	6	5	83,3
Total	53	40	74,58

Based on table 1. obtained the results of the analysis of the effectiveness of handling hazardous and toxic solid medical waste in Purworejo Hospital with a total percentage of 74.58% for the appropriate category and the remaining 25.42% for the category not yet appropriate.

The type of hazardous and toxic solid medical waste generated by Purworejo Hospital comes from several types of waste, namely infectious waste, chemical waste, sharps waste, and pharmaceutical waste. The main health facility waste is medical waste or clinical waste. The source of medical waste comes from medical service units, hospitalization, polyclinics and supporting units, namely laboratories, and pharmaceuticals. This medical waste is in the form of body tissue, blood, expired medicines, masks, gloves. The following types of medical waste are generated:

1. Infectious Waste

This waste has the potential to transmit disease. This waste is generated from medical service activities originating from treatment rooms, polyclinics, emergency rooms, laboratories. This medical waste can be in the form of

infusion hoses, masks, gloves, cotton, tissue, scar gauze, blood bags, body tissues, urine bags and others.

2. Sharps and needles waste

Waste that is physically sharp and can cause cuts or injuries such as ampoules, syringes, glass infusion bottles, scissors. These items may be contaminated with blood, body fluids.

3. Pharmaceutical waste (drugs)

Pharmaceutical products, drugs and chemicals that are expired, damaged, or contaminated or must be destroyed which are hazardous to health.

4. Chemical Waste

This waste is generated from the use of chemicals in medical procedures, laboratories, sterilization processes.

5. Container waste under pressure

Waste in the form of tubes containing gases and aerosols that are not used for medical purposes such as air fresheners and insect repellents. This waste can explode if damaged.⁷

Informant A:

"There are many types of hazardous and toxic solid medical waste ma'am,

usually there are masks, handscones, ampoules, transfusion sets, NGT (Nasogastric Tube), infusion plates, glass vials."

Informant B:

"Types of solid medical waste in the outpatient clinic are syringes, remaining teeth extracted, remaining fluids, eye poly usually sponges, remaining ointments, vials, tissue from surgical poly, scalpels from surgical poly and dental poly."

Sharps waste is generated in almost every room except rehabmedik and pharmaceutical installation. Waste in the form of expired and damaged medicines is generated by the pharmaceutical installation. Solid medical waste with infectious characteristics is found in rooms that provide action and treatment to patients including outpatient installations, central surgical installations, inpatient installations, emergency installations, hemodialysis, laboratories, and ICU. Central surgical installations, laboratories, and outpatient installations produce solid medical waste in the form of tissues and organs with pathological characteristics. Radiology does not produce radioactive waste because it already uses more modern computerized digital tools in the film washing process.

Based on the results of observations and interviews, the facilities contained in the hazardous and toxic solid medical waste Temporary Storage Place mostly do not meet the requirements. Temporary Storage Place is not equipped with a fire extinguisher, which is an important tool that must be present in hazardous and toxic solid Temporary Storage Place because there is a lot of hazardous and toxic solid waste with flammable characteristics. The function of a fire extinguisher is to extinguish fires when the fire is still small

and serves to prevent or overcome fires so as not to cause casualties and greater losses.⁸ The next facility is a PPE box consisting of masks and gloves, as a backup when the PPE worn by officers is damaged or not functioning properly. There are also scales to weigh the weight of waste bags before storage. Temporary Storage Place hazardous and toxic solid is equipped with spare medical waste plastic as a backup if the plastic is torn or leaking. And Temporary Storage Place hazardous and toxic solid is also equipped with a first aid kit, but not yet equipped with adequate types of drugs. The function of the first aid kit is quite important, namely for first aid measures and preventing injuries from becoming more severe.^{9,10}

The Temporary Storage Place looks less organized because there are waste bags that are left open and placed on the floor. The impact of temporary shelters that do not meet the requirements is that the Temporary Storage Place room looks dirty, dirty and shabby. This can be a place for disease vectors that are harmful to human health, cause work accidents for workers due to the scattering of sharp objects such as syringes.¹¹ The walls and floor of the temporary storage area tend to look dirty because cleaning is not done every day and is only done once a week. Because if cleaning and disinfection are not carried out, it will be very dangerous and can be a source of disease and the development of vectors.¹² The Temporary Storage Place building looks poorly maintained because there are several large holes that can be accessed by insects, birds, and other animals. PPE provided by the hospital at the storage stage is quite complete, but the low awareness of officers makes the use of PPE not optimal and in accordance with applicable requirements. Proper use of PPE

can prevent infection and transmission of occupational diseases and can reduce the potential for occupational accidents.^{13,14}

Based on observations of medical waste plastic that will be tied up, it meets the criteria, namely that the waste is no more than $\frac{3}{4}$ of the volume of waste plastic.¹⁵ Purworejo Hospital does not have a special route for the transportation of hazardous and toxic solid medical waste to the Temporary Storage Place. This should be avoided because the dust particles contained in the waste can cause air pollution that can spread germs and contaminate medical equipment and food.¹⁶ In the transportation stage, it was also found that the process was not appropriate, namely by combining small-sized waste plastics into large-sized plastics without being tied first, increasing the potential for waste to be scattered and spilled. Scattered waste such as used bandages can leave bacteria that cause nosocomial infections on the floor, and increase the potential for needle sticks or work accidents for hospital staff and visitors.^{17,18}

The low awareness of officers makes the use of PPE not optimal and in accordance with applicable requirements. There are some officers who use short-sleeved uniforms, so that the arms are not covered. Waste is included in the class of hazardous chemicals that can enter the body through various ways, one of which is absorption through the skin.¹⁹ The hospital has not provided hepatitis B and tetanus immunization. Immunization for recommended medical waste management officers includes hepatitis B and tetanus immunization.²⁰ The provision of immunization is considered important because waste management officers are

REFERENCES

people who come into direct contact with waste, therefore it is necessary to provide immunization as an anti-immune to waste management officers in order to avoid disease.²¹

CONCLUSION

This study aimed to analyze the management of hazardous and toxic solid medical waste at Purworejo Hospital. The findings showed that the waste management process, which includes the stages of reduction, segregation, transportation, and storage, has been implemented fairly well but remains suboptimal. The overall compliance rate reached 74.58% in the appropriate category and 25.42% in the not yet appropriate category. These results indicate that the hospital's waste management practices have not fully met the technical requirements stipulated in the Ministry of Health Regulation No. 7 of 2019 concerning Hospital Environmental Health.

To improve compliance, the hospital is recommended to provide a designated route and trolley for waste transportation, as well as hepatitis immunization for cleaning staff involved in waste handling to reduce the risk of infection. Strengthening infrastructure and ensuring proper use of personal protective equipment are also necessary to optimize hazardous and toxic solid medical waste management.

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1. Hanako A, Trihadiningrum Y. Study on the Management of Hazardous Solid Waste at Hospital X in Surabaya. *J Tek ITS*; 9. Epub Ahead of Print 2021. DOI: 10.12962/J23373539.V9i2.55026.
2. Faidah DA, Tuzzahro NF. Overview of Solid Medical Waste Management at Pagedongan. *Jurnal Medsains* 2024; 10: 87–94. DOI: <https://doi.org/10.31004/jn.v1i2.114>.
3. Ministry of Health of the Republic of Indonesia. *Indonesia Health Profile 2019*. Jakarta, 2019.
4. Minister of Health of the Republic of Indonesia. Regulation of the Minister of Health of the Republic of Indonesia Number 18 of 2020 concerning the Management of Medical Waste in Regional Health Care Facilities. Indonesia, 2020.
5. Nurseha D (Poltekkes MJK). Development of Nosocomial Infection Prevention Measures by Nurses in Hospitals Based on the Health Belief Model. *J Ners* 2013; 8: 64–71. DOI : 10.20473/jn.v8i1.3879
6. Ministry of Health of the Republic of Indonesia. Regulation of the Minister of Health of the Republic of Indonesia Number 7 of 2019 concerning Hospital Environmental Health. Indonesia, 2019.
7. Hasianny S, Naibaho RTE, Lisafitri Y, et al. Toxic and Hazardous (B3) Solid Waste Management at Abdul Moeloek General Hospital: An Implementation Assessment in 2022 and Recommendations. *Indones J Environ Manag Sustain* 2023; 7: 32–37. doi.org/10.26554/ijems.2023.7.1.32-37.
8. Hambyah RF. Evaluation of Fire Alarm System Installation in the Emergency Response System of the Surgical Building at Dr. Soetomo General Hospital, Surabaya. *Indonesian Journal of Occupational Safety and Health* 2016; 5: 41–50. DOI : 10.20473/ijosh.v5i1.2016.41-50.
9. Afifah LN, Syafiuddin A, Arie P. Availability of First Aid Kits in PT X Company Based on Law No. 1 of 1970. *Insologi Journal of Science and Technology* 2023; 2: 657–663. DOI: 10.55123/insologi.v2i4.2062
10. Manalu SP, Husin A, Suryati I, et al. Toxic Waste (B3) in Enhancing the Performance of North Sumatra Hospital. *Simetrikal* 2024; 1- 29. DOI: <https://doi.org/10.32734/jet.v3i1.13485>
11. Amelia AR, Ismayanti A, Rusydi AR. Management of Solid Medical Waste at Mamuju Regional General Hospital, West Sulawesi Province Article History: Accepted December 20, 2019 Address: Available Online January 25, 2020 Email: Phone: Environment, Where There Are Many Viruses, Bacteria, and Other Pathogens. *J Health* 2020; 3: 73–85. <https://doi.org/10.33096/woh.v3i3.542>.
12. Tri Wulandari, Rochmawati M. Student Journal and Health Research Analysis of Solid Medical Waste Management at Community Health Centers in Pontianak City. *J Mhs Dan Penelit Kesehatan* 2019; 6: 71–78. DOI: <http://dx.doi.org/10.29406/jjumv6i2>.
13. Minister of Health of the Republic of Indonesia. Regulation of the Minister of Health of the Republic of Indonesia Number 66 of 2016 on Occupational Safety and Health in Hospitals. Indonesia, 2016.
14. Mulya W, 2 Iz, 3 Kr, et al. Analysis of Solid Medical Waste Management at Dr. Kanujoso Djatiwibowo Hospital in Balikpapan. Identification of Occupational Safety,

- Health, and Environmental Protection 2022; 8: 532–538. <https://doi.org/10.36277/identifikasi.v8i1.222>
15. Arumdani IS. Management of Medical, Non-Medical, and Sharp Waste at Rembang Intan Hospital. *Journal of Health Research Suara Forikes* 2024; 15: 678–682. DOI: <http://dx.doi.org/10.33846/sf154>.
 16. Puji LKR, Listiana I, Kasumawati F, et al. Factors Associated with Nurses' Compliance in the Disposal of Solid Medical Waste at the Tangerang District General Hospital in 2023. *Edu Dharma Journal of Research and Community Service* 2024; 8: 53. DOI: 10.52031/edj.v8i1.728
 17. Amanullah A. Medical Waste Management in Tertiary Hospitals in Bangladesh: An Empirical Inquiry. *ASA Univ Rev* 2016; 5: 2. <http://dx.doi.org/10.3329/jesnr.v6i1>.
 18. Kusuma Adi B, Joko T, Setiani O. Analysis of Hazardous Medical Waste in Dr. Soehadi Prijonegoro Hospital Using a Life Cycle Assessment Approach. *Sanitation Journal of Environmental Health* 2023; 16: 9–19. DOI: 10.29238/sanitasi.v16i1.1675.
 19. Satrianegara MF. Policy Management Analysis Approach in Hospital Waste Management | Satrianegara | *HIGIENE: Journal of Environmental Health*. *Higiene* 2016; 2: 62–66. <https://doi.org/10.24252/higiene.v2i2.1810>.
 20. Setyaningtyas E, Hartono B. Analysis of Hazardous and Toxic (B3) Management at the Sirnajaya Community Health Center. *Int J Sci Soc* 2024; 6: 659–664. DOI :10.54783/ijsoc.v6i2.1191
 21. Erma K. Factors Associated with Nosocomial Infections in Solid Medical Waste Managers (Cleaning Service) at Bangkinang Regional General Hospital in 2016. *Ners Univ Pahlawan Tuanku Tambusai* 2017; 1: 20–32. <https://doi.org/10.31004/jn.v1i2.114>.