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NURSES PRACTICES IN SEGREGATING SOLID HAZARDOUS MEDICAL WASTE

Perilaku Perawat dalam Pemilahan Limbah B3 Medis Padat

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ABSTRAK

Limbah B3 medis padat dari rumah sakit berpotensi membahayakan kesehatan dan lingkungan jika tidak dikelola dengan baik. Penelitian ini bertujuan mengetahui perilaku perawat dalam pemilahan limbah B3 medis padat. Sampel berjumlah 136 diambil dengan teknik proportional sampling, dan data dianalisis menggunakan multiple logistic regression model prediksi dengan tujuan untuk mendapatkan model yang paling baik (fit) yang dapat menggambarkan hubungan variabel independen dan dependen. Hasil penelitian menunjukkan ada hubungan antara sarana dan fasilitas (p=0,003), peran kepala ruangan (p=0,015), ketersediaan informasi (p=0,032), sikap (p=0,045) dan supervisi (p=0,046) dengan perilaku perawat dalam pemilahan limbah B3 medis padat. Variabel paling dominan adalah sarana dan fasilitas (POR=3,463). Manajemen rumah sakit disarankan untuk melengkapi setiap ruang rawat inap dengan fasilitas pemilahan limbah yang sesuai standar (kantong plastik berwarna, safety box), Menarik wadah limbah non-standar dan menggantinya dengan yang sesuai regulasi limbah B3 medis, menyediakan buku saku dan pelatihan rutin tentang limbah B3 medis, serta meningkatkan sosialisasi dan monitoring SOP pemilahan limbah kepada perawat secara berkala. Manajemen limbah B3 padat yang baik di rumah sakit mencegah penularan penyakit, melindungi tenaga kesehatan, menjaga lingkungan, memastikan kepatuhan regulasi, meningkatkan efisiensi, dan membangun kepercayaan masyarakat.

Kata kunci: *Limbah B3 medis padat, perilaku perawat, RSUD Dumai*

ABSTRACT

Solid medical hazardous waste (B3) from hospitals has the potential to harm health and the environment if not properly managed. This study aimed to examine nurses' behavior in segregating solid medical B3 waste. A sample of 136 respondents was selected using proportional sampling, and the data were analyzed using a multiple logistic regression predictive model to obtain the best-fitting model that describes the relationship between independent and dependent variables. The results showed significant associations between facilities and infrastructure (p=0.003), the role of the head nurse (p=0.015), information availability (p=0.032), attitude (p=0.045), and supervision (p=0.046) with nurses' behavior in segregating solid medical B3 waste. The most dominant variable was facilities and infrastructure (POR=3.463). Hospital management is advised to equip each inpatient room with standard-compliant waste segregation facilities (color-coded plastic bags, safety boxes), replace non-standard waste containers with ones compliant with B3 medical waste regulations, provide pocket guides and regular training on medical B3 waste, and enhance the routine dissemination and monitoring of waste segregation SOPs among nurses. Additionally, hospital management should establish a policy of sanctions for non-compliant nurses and provide rewards for those who comply, to increase adherence and support sustainable solid B3 waste management.

Keywords: Solid hazardous and toxic medical waste, behavior nurses, RSUD Dumai

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INTRODUCTION

Medical waste management is regulated in Minister of Health Regulation Number 7 of 2019 concerning Hospital Environmental Health, which includes the sorting, collection, transportation, storage, destruction, and disposal of Hazardous and Toxic Materials (B3) waste. For liquid waste, the process includes distribution, processing, and disposal[1]. The WHO (2022) stated that only 58% of 24 countries have medical waste disposal systems that meet standards. Of the total global medical waste, 85% is non-hazardous, and 15% is classified as hazardous. The WHO (2023) highlighted that of the 16 billion injections administered annually, not all are disposed of safely[2]. In Indonesia, medical waste management according to standards increased from 26.7% in 2021 to 38.9% in 2022, with Riau Province reaching 40.2% (Ministry of Health, 2022) [3].

B3 waste that is not managed properly has a major impact on public health and the environment, especially due to the risk of infection from body fluids and sharp objects.[4]. Minister of Health Regulation No. 2 of 2023 stipulates that all healthcare facilities are required to manage waste in accordance with regulations. Nurses are the profession with the highest risk of exposure to infectious medical waste; the WHO notes that more than 35 million healthcare workers are at risk of injury from contaminated sharp objects, with nurses being the largest group[5].

Solid hazardous waste, such as used syringes, bandages, and gloves, is toxic and dangerous, potentially causing HIV, hepatitis, heavy metal poisoning, and cancer. Unmanaged waste also pollutes soil, water, and air. The lack of waste processing infrastructure and the practice of exporting waste from developed to developing countries exacerbate this situation. Asia reportedly produces more than 400 million tons of hazardous waste annually, highlighting the importance of strengthening waste management systems, enforcing regulations, and educating across sectors[6].

Nurses in inpatient wards play a crucial role in medical waste sorting due to their direct involvement in nursing procedures such as injections, IV insertions, and wound care. They are the first to come into contact with medical waste[7]. In addition, nurses must ensure that waste sorting is carried out according to SOP until it is transported to the incinerator by special officers[8]. Green and Kreuter's Precede Model explains that waste sorting behavior is influenced by three main factors: predisposition (knowledge, attitudes, values), support (availability of facilities, training), and drivers (managerial and policy support).[9].[10]emphasized that predisposing factors such as knowledge and attitudes can influence nurses' readiness to carry out sorting[11], stated that hospital policies and superior support influence nurses' behavior. Clear SOPs are also needed to ensure effective waste management added that funds, training, and facilities also influence the success of waste management implementation [12],[13].

Rangkuti et al. (2023) [14] reported that RSU Sundari Medan generates an average of 762 kg of medical waste annually, with inpatient wards identified as the largest contributors. The study revealed that waste segregation practices did not fully comply with standard operating procedures (SOPs), and were influenced by factors such as nurses' knowledge, attitudes, length of service, and the availability of facilities. Similarly, Huda et al. (2020) in a study conducted at Haji General Hospital, Medan, recorded an average medical waste generation of 1,165 kg per month, with Class III inpatient wards contributing the highest volume. Their findings demonstrated significant associations between nurses' waste segregation behavior and knowledge ($p = 0.019$), attitude ($p = 0.035$), facilities ($p = 0.038$), information availability ($p = 0.033$), and policy support ($p = 0.011$) [9].

Dumai City has five large hospitals, one of which is RSUD Kota Dumai, a government-owned type B hospital that serves as a primary referral hospital. This hospital recorded a BOR of 83.23% in 2023, still within the ideal limit (60-85%), but had a BTO value of 71 times/year, exceeding the efficiency limit (40-50 times/year). The high BOR has a direct

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impact on the increase in medical waste generated in inpatient wards. Observations at RSUD Kota Dumai indicate that medical and non-medical waste is still mixed in one container, without sorting. Some nurses, especially contract nurses who have not received training, do not understand the types of waste and the color of the plastic waste according to SOP. They also assume that because the waste will be incinerated, sorting is not important. There were 17 cases of needlestick injuries recorded between 2020 and January 2024, including one involving a nurse who was pricked by a needle used by a Hepatitis B patient[15].

Based on an interview with the Head of the PPIRS Committee RSUD Kota Dumai does have a waste management SOP, but outreach and training activities are not sustainable. Sanctions are also ineffective. A handbook on medical waste sorting is not yet available, and PPI training has not reached all nurses. Of the 100 nurses trained in 2023, only 74 participated in PPI training, which included waste sorting. Observations also showed that solid hazardous waste sorting did not comply with SOPs, with infectious and non-infectious waste being mixed.

The online media report Selidik Kasus (September 24, 2020) revealed alleged inconsistencies in the management of infectious hazardous waste at RSUD Kota Dumai, in the form of mixing infectious waste with non-infectious waste that has the potential to pose a risk of contamination to the community. This condition emphasizes the importance of research to examine individual and organizational factors, such as knowledge, attitudes, training, and managerial support, that influence nurses' behavior in sorting solid medical hazardous waste. The results of this study are expected to serve as a scientific reference in efforts to improve the medical waste management system in hospitals, particularly at Dumai City Hospital. This study aimed to analyze nurses' behavior in sorting solid medical hazardous waste.

METHODS

This study was an observational, analytical, quantitative study with a cross-sectional design conducted in the Inpatient Ward of RSUD Kota Dumai from January to May 2024. The study population was all 210 nurses, with a sample of 136 respondents selected using proportional sampling based on the inclusion criteria of active nurses and the exclusion of nurses who were sick, on leave, or on study assignments. The independent variables in this study include knowledge, attitudes, length of service, training, availability of information, facilities and equipment, supervision, the role of the ward head, and policy support. The dependent variable was the behavior of nurses in sorting solid medical hazardous waste.

In this study, the researcher only used one data collection technique, namely a closed-ended questionnaire that was directly answered or filled out by the respondents. The research instrument used a closed questionnaire. The variables of knowledge, length of service, training, and facilities were measured using the Guttman scale with answer choices of true–false or present–absent. The behavioral variable consisted of 9 statements with answers of yes = 1 and no = 0. Meanwhile, the variables of attitude, availability of information, supervision, the role of the head of the room, and policy support were measured using a Likert scale (SS = 4, S = 3, TS = 2, STS = 1). The validity test was conducted on 20 nurses at Mandau Siak Regional Hospital, as an accredited type B comparison hospital, and the reliability test showed a Cronbach's alpha value of 0.944, so the instrument was declared reliable.

Data analysis was conducted multivariately using the Multiple Logistic Regression prediction model to obtain the best model describing the relationship between the independent and dependent variables. This research has undergone an ethical review by the Ethics Commission of Universitas Hang Tuah, Pekanbaru, and was declared appropriate with letter number 029/KEPK/UHTP/IV/2024.

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RESULT

Bivariate analysis

Table 1. Nurses' Behavior in Solid Medical Hazardous Waste (B3) Segregation

Variables	Behavior				Total		*P-value*	
	Poor		Good					
	n	%	n	%	n	%		
Knowledge								
Low	25	54.3	21	45.7	46	100	0.362	1,488
High	40	44.4	50	55.6	90	100		(0.729-3.038)
Attitude								
Negative	20	43.5	26	56.5	46	100	0.590	0.769
Positive	45	50	45	50	90	100		(0.376-1.572)
Length of Work								
Short	31	47	35	53	66	100	0.988	0.938
Long	34	48.6	36	51.4	70	100		(0.478-1.839)
Information Availability								
Inadequate	33	64.7	18	35.3	51	100	0.004	3,036
Adequare	32	37.6	53	62.4	65	100		(1,474-6,255)
Training								
Never	36	48	39	52	75	100	1,000	1,019
Ever	29	47.5	32	52.5	61	100		(0.518-2.004)
Facilities and Amenities								
Incomplete	49	65.3	26	34.7	75	100	0,000	5,300
Complete	16	26.2	45	73.8	61	100		(2,522-11,139)
Supervision								
Low	33	63.5	19	36.5	52	100	0.007	2,822
High	32	38.1	52	61.9	84	100		(1,379-5,775)
Head Nurse's Role								
Poor	39	62.9	23	37.1	62	100	0.002	3,130
Good	26	35.1	48	64.9	74	100		(1,551-6,319)
Policy Support								
Unsupportive	36	64.3	20	35.7	56	100	0.002	3,166
Supportive	29	36.3	51	63.8	80	100		(1,554-6,450)

Table 1 shows that information availability, facilities and infrastructure, supervision, head nurse's role, and policy support were significantly associated with nurses' behavior in solid medical hazardous waste segregation ($p < 0.05$). The strongest association was observed for adequate facilities and infrastructure, which increased the likelihood of good waste segregation behavior by more than five times (OR = 5.300). In contrast, knowledge, attitude, length of work, and training were not significantly associated with waste segregation behavior ($p > 0.05$), indicating that organizational and system-level factors play a more critical role than individual characteristics in influencing nurses' compliance.

Multivariate analysis

Table 2. Nurse Behavior in Solid Medical B3 Waste Sorting

Independent Variables	*p-value*	BY	(95%CI)
Facilities and Amenities	0,003	3,463	(1,523-7,873)
Head Nurse's Role	0,015	2,795	(1,223-6,385)
Information Availability	0,032	2,732	(1,093-6,828)
Attitude	0,045	0,384	(0, 150-0,979)
Supervision	0,046	2,364	(1,015-5,505)
Policy Support	0,053	2,626	(0,989-5,191)
Omnibus Tests	0,000	*Nagelkerke R Square* = 0,373	

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Based on the analysis in Table 2, the variables significantly related to nurses' behavior in sorting solid medical hazardous waste in the inpatient ward of RSUD Kota Dumai are facilities (p=0.003), the role of the ward head (p=0.015), the availability of information (p=0.032), attitude (p=0.045), and supervision (p=0.046). Facilities are the most dominant factor, where wards with complete facilities are 3.463 times more likely to support good sorting behavior. Policy support is not significantly related (p=0.053) and acts as a confounding variable for facilities. The multivariate model is declared feasible (Omnibus p=0.000) and can explain 37.3% of the variation in nurses' behavior, while the remaining 62.7% is influenced by other variables not studied.

DISCUSSION

The Relationship between Facilities and Nurse Behavior in the Separation of Hazardous and Toxic Materials (B3 Waste) of Solid Medical in the Inpatient Room of the RSUD Kota Dumai in 2024

Smith et al (2020)[16] explained that supportive policies, including clear procedures and consistent rules regarding the use of solid hazardous waste sorting facilities, can influence nurses' behavior in sorting solid medical hazardous waste. Permana and Haediana (2024)[17] found that clear procedures provide specific guidelines that make it easier for nurses to understand the use of facilities and equipment, while consistent rules ensure that every nurse uses B3 waste sorting facilities and equipment according to hospital standards.

The results of this study are in line with Rangkuti et al (2023)[14] that there was a relationship between the availability of facilities and behavior in sorting medical waste, with a p-value = 0.001. The regression coefficient for the knowledge variable shows a positive impact, namely the higher the level of knowledge, the better the nurse's behavior tends to be in selecting medical waste [14].

The results of this study are in line with research by Huda et al (2020)[9] namely, there was a relationship between the availability of medical waste sorting facilities and the behavior of nurses in sorting infectious and non-infectious medical waste, with a p-value = 0.004. Results of Rossalina et al (2022)[18]also found there is relationship between infrastructure with nurses' behavior in sorting and containing infectious and sharp medical waste at Sint Carolus Hospital, Jakarta, with a p-value = 0.000. Most respondents (90%) stated that infectious and non-infectious waste containers with yellow bags were available in every room. However, 76% considered that safety boxes were not evenly available, and 74% stated that waste sorting SOPs had not been installed or socialized properly. These findings indicate that although the main facilities are available, accompanying support such as SOPs, training, monitoring, and distribution of facilities is still not optimal, so that nurses are more familiar with physical facilities than understanding standard waste sorting procedures.

The Relationship between the Role of the Head of the Room and the Behavior of Nurses in the Sorting of Hazardous and Toxic Waste (B3 Waste) of Solid Medical

The head of the room has a central role in creating an effective and efficient work environment. They are responsible for ensuring that all nursing staff understand and adhere to established standard operating procedures, including in the case of solid medical B3 waste sorting. The role of an effective head of the room not only provides supervision but also guides and supports the nurse, which in turn increases the motivation and responsibility of the nurse in carrying out their duties correctly [19].

Consistent support and guidance from the head of the room also increases nurses' awareness of the importance of proper medical waste management and its impact on patient safety and the environment. According to Azami-Aghdash et al (2023) [20], Good supervision and adequate provision of resources help nurses to work according to established standards, reduce the likelihood of errors, and improve compliance with

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procedures. The results of this study are in line with the research of Syafrina et al (2022) [21], at the Aceh Government Hospital that there was a relationship between the role of the head of the room and the job satisfaction of nurses (p-value=0.000).

The results of the analysis showed that 92% of respondents considered that the head of the room did not provide adequate support in the implementation of the sorting and collection of solid medical B3 waste, and 74% of respondents also considered that the encouragement and motivation of the head of the room was still low. To improve the role of supervision, hospitals need to implement strategic policies such as structured leadership training to improve communication competencies, conflict management, and staff coaching. In addition, it is important to implement a periodic evaluation mechanism based on key performance indicators (KPIs) so that the effectiveness of supervision can be assessed objectively and used as a basis for providing feedback, setting targets, and sustainable development.

The Relationship between Information Availability and Nurse Behavior in the Sorting of Hazardous and Toxic Waste (B3 Waste) of Solid Medical Waste

Sartika et al (2022) [22] state that when individuals have access to relevant information, they are more likely to understand the situation better, make more informed decisions, and adopt behaviors that suit their needs or goals. In these cases, the lack of availability of information results in nurses not having an adequate understanding of the importance of solid medical B3 waste sorting, which ultimately affects their behavior.

A lack of information can reduce nurses' self-efficacy, defined as their belief in their ability to properly sort B3 waste. According to Robbins and Judge's (2018) social learning theory, low self-efficacy can negatively affect performance in specific tasks. When adequate information is lacking, nurses may feel less confident in carrying out waste-sorting procedures, which in turn may reduce their adherence to these procedures[23].

Inadequate information can result in a limited understanding of the procedures and operational standards to be followed. Research by Udoudom et al (2024) shows that unclear or less detailed guidelines can lead to confusion and non-compliance among medical personnel. In situations where information is limited, nurses may not understand the importance of each step in the B3 waste sorting procedure, which can lead to behavior that does not meet the expected standards [24].

Lack of information can also reduce nurses' understanding of the negative impacts of improper B3 waste management. WHO (2017) [25] indicates that an inadequate understanding of the risks and consequences of incorrect waste management can reduce motivation to adhere to correct procedures. If nurses are not fully aware of the health and environmental risks associated with B3 waste, they may be less careful in sorting such waste.

This study is in line with the research of Rangkuti et al (2023) [14] in nurses in the Inpatient Room of Sundari General Hospital Medan, which showed a significant influence between the availability of information and nurses' behavior in choosing medical waste (p=0.032). The results of this study are also in line with the research of Huda et al (2020)[9]In nurses in the Class 3 Inpatient Ward of Haji Medan General Hospital, it was found that there was a relationship between the availability of information and the behavior of nurses in sorting infectious and non-infectious medical waste, with a p-value = 0.033. The results of this study were also the same as the study by Istiqomah et al (2023).[26]In nurses in the Inpatient Ward of Dr. H. Soemarno Sosroatmodjo Kuala Kapuas Regional Hospital, it was found that the availability of information influenced nurses' behavior in sorting medical waste with a p-value = 0.032.

Based on the researcher's analysis, 75% of respondents had a high score on statement number 1, which stated that in each treatment room there is a poster or information chart separating infectious medical waste from non-infectious waste.

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However, 56% of respondents showed a low score on statement number 4, i.e., I have easy access to information related to sorting medical B3 waste in hospitals.

The Relationship between Attitude and Nurse Behavior in the Sorting of Hazardous and Toxic Waste (B3 Waste) of Solid Medical Waste

According to Tumurang (2018)[27], Attitude is how a person responds to something, although this response is not always immediately apparent. Attitude is more about a person's readiness to act than the actual action. Oktavilantika et al. (2023) added that attitude reflects an individual's readiness to act based on how they evaluate something. Therefore, attitude influences how a person acts in a given situation, even though the action may not be immediately apparent.

The results of this study are in line with research by Ngurah et al (2020) [28] on nurses in the Inpatient Ward of Mangusada Regional Hospital, Badung Regency, Bali. It is known that there is a relationship between attitudes and the behavior of nurses in processing medical waste at Mangusada Regional Hospital, Badung Regency, Baliwith p-value = 0.000. The results of this study are also in line with the research of Isnaeni and Gustiana (2023)[29] to nurses in the Treatment Room of Rokan Hulu Regional Hospital is, there is a relationship between attitudes and the behavior of nurses in medical waste sorting, with a p-value of 0.001. Research results by Akmal et al (2023)[30] to the nurse in the Treatment Room RSIA Aceh that there is a relationship between attitudes and nurses' behavior in sorting medical waste. P-value = 0.000.

Based on the researcher's analysis, 72% of respondents scored high on attitude statement number 12, which states that waste containers should always be covered and placed out of reach of patients or food preparation areas. However, 63.2% of respondents scored low on attitude statement number 5, which states that waste sorting should be carried out by ward nurses. Nurses may agree that waste containers should always be covered and placed out of reach of patients or food preparation areas because this is a clear infection prevention measure and directly related to patient safety and the cleanliness of the hospital environment. They understand that maintaining cleanliness and preventing the spread of contamination is an important part of safe care practices.

The Relationship between Supervision and Nurse Behavior in the Sorting of Hazardous and Toxic Waste (B3 Waste) of Solid Medical Waste

Franisha et al (2022)[31] found that direct supervision by the ward head allows for active oversight of the waste sorting process carried out by nurses. This oversight allows the ward head to provide direct feedback, correct substandard practices, and ensure that nurses carry out their duties responsibly. Research by Suyuti et al. (2022)[32] also showed that effective supervision led to increased motivation of nurses to comply with waste sorting procedures. In line with motivation theory in the health context[33].

Letho et al (2021)[34]also explained that supervision helps develop nurses' skills related to the sorting of solid medical hazardous waste. Ward heads can identify the need for additional training and provide the necessary guidance to improve nurses' competency in managing medical waste safely and efficiently. Furthermore, consistent supervision also enforces applicable standard operating procedures (SOPs), ensuring nurses' compliance with waste management regulations aimed at maintaining the safety of patients, staff, and the surrounding environment.

The results of this study are in line with the research results of Mureski et al (2021)[33] considered the ward head's supervision to be in accordance with the principles (53.1%). There was a significant relationship between ward head supervision and medical waste sorting by nurses in inpatient wards, with a p-value of 0.00. Meanwhile, the results of research by Letho et al. (2021)[34]also stated that there was a relationship between the supervision of the head of the room and the management of medical waste by nurses in the inpatient room with a p-value = 0.000.Pasaribu's research results (2022)[35]also

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stated that there was a relationship between room supervision and nurses' compliance in disposing of medical waste at Padang Lawas Regional Hospital.

Based on the analysis, 92% of respondents assessed that ward heads provide serious oversight of solid medical waste sorting, but 82% assessed that this supervision was ineffective in improving nurse compliance. This may be due to nurses not having received adequate training and therefore not fully understanding the protocol. Furthermore, some nurses considered sorting unnecessary, believing that sanitation staff would re-sort the waste.

Relationship between Knowledge and Nurse Behavior in the Separation of Hazardous and Toxic Waste (B3 Waste) of Solid Medical

This high level of knowledge does not automatically guarantee appropriate behavior. Other factors, such as the availability of adequate facilities and infrastructure, strict policies and supervision, as well as ongoing training and internal motivation from nurses themselves, also influence their behavior in sorting solid medical hazardous waste. This is in line with previous research showing that structural and organizational factors also play a significant role in influencing nurses' behavior in waste management practices[36], [37].

Sanana and Mwanza (2024)[38]stated that hospital policies and the availability of adequate facilities often determine behavior more than individual knowledge. If policies are not supportive or without adequate infrastructure support, waste sorting behavior can remain poor even if nurses have high levels of knowledge. Furthermore, Yakubu et al. (2023)[39]stated that high workloads and stressful conditions can also cause nurses not to prioritize proper waste sorting.

The results of this study are in line with the study of Huda et al (2020)[9] at Haji General Hospital in Medan, 52.2% of nurses had good knowledge of medical waste sorting. Research by Darus et al (2021)[40], a study at Medan Hospital, also showed no significant relationship between nurses' knowledge and behavior in sorting medical B3 waste (p-value = 0.227). Similarly, a study by Dewi et al (2024)[41]in a hospital in Purwekerto showed that although nurses had good knowledge, there was no significant relationship between knowledge and behavior in disposing of medical waste (p-value = 0.321).

Based on the researcher's analysis, 91% of respondents answered question number 1 correctly regarding the meaning of medical waste is waste that comes from medical service units in hospitals. Although the majority of respondents showed good knowledge, there were still 68% of nurses who answered question number 4 incorrectly regarding the correct stages of infectious waste management, namely sorting, collection, temporary storage, transportation, and destruction. A high level of knowledge does not necessarily guarantee appropriate behavior, because behavior in sorting solid medical B3 waste is also influenced by various other factors, such as the availability of facilities and infrastructure, institutional policies, supervision, ongoing training, and the nurse's own internal motivation.

The Relationship between Working Time and Nurse Behavior in the Sorting of Hazardous and Toxic Materials (B3 Waste) Solid Medical Waste

Seniwati et al (2022)[19]stated that long work experience for nurses is often considered a valuable asset because they have faced various practical situations in patient care. However, research by Tilahun et al (2023)[42] studies have shown that work experience alone does not guarantee a thorough understanding of proper medical waste management procedures; comprehensive knowledge and conceptual understanding are more influenced by systematic and structured formal training. This is essential for nurses to understand the safety and environmental implications of each action they take.

Furthermore, clear and consistent policies for implementing medical waste management in hospitals are also key to shaping nurse behavior. Inconsistent or

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ambiguous policies can lead to ambiguity in daily practice, impacting the ability of nurses, both experienced and new, to adhere to expected standards[38]. The results of this study are in line with the research of Leonard et al (2022)[43] in Zambian hospitals; it was found that there was no relationship between length of service and waste management health practices among healthcare workers in Zambian hospitals (p-value = 0.273). The results of this study are also in line with the research of Rangkuti et al. (2023) on nurses in the Inpatient Ward of Sundari General Hospital, Medan, which found no relationship between the availability of facilities and behavior in sorting medical waste, with a p-value = 0.099.

The analysis showed that respondents had an average work experience of 8.5 years (1–26 years), but there was no correlation between length of service and waste sorting practices. Nurses with more recent work experience generally completed professional nursing education, thus possessing a better understanding of waste management procedures. Meanwhile, some nurses with longer work experience who still hold a Diploma 3 degree may not have optimally updated their knowledge, so work experience does not always correlate with the implementation of waste sorting practices.

The Relationship of Training with Nurse Behavior in the Sorting of Hazardous and Toxic Materials (B3 Waste) of Solid Medical Waste

Robbins and Judge (2018)[23] explain that training that does not provide sufficient or relevant information may not be effective in changing nurses' daily practices regarding the sorting of solid medical hazardous waste. In addition, Khansa et al (2024)[44] state that individual awareness and motivation to adopt the practices taught in training are also important. Without sufficient understanding of the importance of B3 waste sorting and strong motivation to implement it, training may not be able to influence nurses' behavior.

Izzati and Mulyana (2019)[45]Organizational culture can also play a role in the acceptance and implementation of training. If the culture in the hospital does not support the practices taught in training, nurses may find it difficult to change their behaviors even after receiving adequate training. Other contextual factors, such as high workload, insufficient management support, and resource availability, can also be barriers to implementing new practices learned from training.

The results of this study are in line with the research of Hasiu et al (2024)[46] at the North Buton Regency General Hospital, there was no relationship between receiving training and health workers' actions in medical waste management, with a p-value of 0.563. The results of this study are also consistent with the research of Mitiku et al. (2022).[47]that there is no effect of training on waste management practices in metropolitan city hospitals in the Amhara Region of Ethiopia.

The Relationship of Policy Support with Nurse Behavior in the Sorting of Hazardous and Toxic Waste (B3 Solid Medical Waste)

Jannah et al (2023)[48]In the hospital context, various provisions, including written regulations or Standard Operating Procedures (SOPs) on clinical waste management, sanctions and rewards related to the implementation of solid medical waste disposal procedures, and nurses' understanding of these policies, will influence their actions in disposing of solid medical waste. Saputri et al (2020)[49] stated that providing clear and communicated rules to nurses can foster greater compliance. This suggests that well-socialized policies have the potential to change nurses' behavior toward greater compliance with medical waste management procedures, ultimately improving hospital safety and environmental sustainability.

The results of this study are not in line with the research of Rangkuti et al (2023)[14], which indicates a significant influence between policy and nurses' behavior in sorting medical waste (p=0.018). The regression coefficient for the policy variable indicates a strong positive impact, where increased policy implementation will impact improved nurses' behavior in sorting medical waste. This study also disagrees with the research

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of Huda et al. (2020)[9], which shows a relationship between policy and nurse behavior in sorting infectious and non-infectious medical waste, with a p-value of 0.011.

Based on the analysis, policy support does not automatically translate to implementation in the field because socialization and monitoring for nurses have not been optimal. Although 88% of respondents assessed the solid medical hazardous waste sorting policy as supporting good practice, 75% scored low on the management assessment aspect, reflecting a lack of recognition, oversight, and feedback from the hospital. This condition can reduce nurse motivation due to perceived unfairness in policy implementation, in line with behavioral theory that emphasizes the role of positive reinforcement in shaping work compliance. Furthermore, waste sorting behavior is influenced by other external factors, such as high workload, intrinsic motivation, and work culture. Excessive workload can lead nurses to neglect procedures perceived as time-consuming, while professional commitment and a sense of responsibility can increase compliance even without direct supervision. An organizational culture that does not support continuous evaluation and improvement, including a lack of leadership role models or peer support, can also hinder consistent implementation of waste sorting policies.

CONCLUSION

This study concluded that nurses' behavior in segregating solid medical hazardous waste (B3) is significantly influenced by attitude, availability of information, facilities and infrastructure, supervision, and the role of the head nurse, with facilities and infrastructure being the most influential factor. Knowledge, length of work, training, and policy support were not significantly associated with segregation behavior, with policy support acting as a confounding variable. The multivariate model explained 37.3% of behavioral variation, indicating the presence of other influencing factors. Strengthening waste segregation practices requires improving facilities, reinforcing supervision, enhancing information dissemination, and optimizing the leadership role of head nurses to ensure sustained compliance.

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