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FACTORS INFLUENCING NURSES BEHAVIOR IN INFECTIOUS WASTE MANAGEMENT AT HASANUDDIN UNIVERSITY TEACHING HOSPITAL

FAKTOR-FAKTOR YANG MEMENGARUHI PERILAKU PERAWAT DALAM PENGELOLAAN LIMBAH INFEKSIUS DI RUMAH SAKIT PENDIDIKAN UNIVERSITAS HASANUDDIN

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Abstract

Background: Hospitals produce infectious waste containing harmful pathogens that pose significant health risks to medical personnel, patients, and the surrounding environment. Therefore, proper infectious waste management is essential to prevent the transmission of diseases. The implementation of effective waste management requires nurses to demonstrate appropriate behavior to ensure that the risk of disease transmission can be minimized. At the Hasanuddin University Teaching Hospital, the volume of infectious waste has fluctuated from 26.297 tons in 2022 to 45.573 tons in 2023, before decreasing to 39.046 tons in 2024. These data reflect the dynamics of waste management and underscore the need to analyze the factors that influence nurses' behavior as the primary actors in the management of infectious waste. Objective: To determine the factors that influence nurses' behavior in the management of infectious waste at the Unhas Teaching Hospital. Method: Quantitative research with a Cross Sectional Study approach. Data analysis used the chi-square test and logistic regression using the SPSS application. The total population consisted of 230 nurses, with a sample of 146 nurses determined using the Slovin formula. Results and Conclusion: The results of the chi-square test showed that two independent variables had a significant influence (p-value < 0.05), namely the supporting factor (p = 0.030) and the driving factor (p = 0.003). Meanwhile, one independent variable, the predisposing factor, had no influence (Fisher's exact = 0.060). The results of the logistic regression test showed that, simultaneously, the three factors had an influence on waste management (p = 0.010). However, partially, only the driving factor was a significant predictor (p = 0.016) with an Odds Ratio of 3.48. Suggestion: It is expected that this can serve as a reference for hospitals to improve training, the provision of facilities and infrastructure, as well as to strengthen policies in the management of infectious waste.

Keywords : Management, Infectious Waste, Behavior, Hospital, Environmental Health.

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Abstrak

Latar Belakang: Rumah sakit menghasilkan limbah infeksius yang mengandung patogen berbahaya, yang menimbulkan risiko kesehatan signifikan bagi tenaga medis, pasien, dan lingkungan sekitar. Oleh karena itu, pengelolaan limbah infeksius yang tepat sangat penting untuk mencegah penularan penyakit. Penerapan pengelolaan limbah yang efektif menuntut perawat untuk menunjukkan perilaku yang sesuai guna memastikan risiko penularan penyakit dapat diminimalkan. Di Rumah Sakit Pendidikan Universitas Hasanuddin, volume limbah infeksius mengalami fluktuasi, yakni 26,297 ton pada tahun 2022 menjadi 45,573 ton pada tahun 2023, kemudian menurun menjadi 39,046 ton pada tahun 2024. Data ini mencerminkan dinamika pengelolaan limbah dan menegaskan perlunya menganalisis faktor-faktor yang memengaruhi perilaku perawat sebagai aktor utama dalam pengelolaan limbah infeksius. Tujuan: Untuk mengetahui faktor-faktor yang memengaruhi perilaku perawat dalam pengelolaan limbah infeksius di Rumah Sakit Pendidikan Unhas. Metode: Penelitian kuantitatif dengan pendekatan Cross-Sectional Study. Analisis data menggunakan uji chi-square dan regresi logistik dengan aplikasi SPSS. Populasi penelitian berjumlah 230 perawat, dengan sampel sebanyak 146 perawat yang ditentukan menggunakan rumus Slovin. Hasil dan Kesimpulan: Hasil uji chi-square menunjukkan bahwa dua variabel independen memiliki pengaruh signifikan (nilai $p < 0,05$), yaitu faktor pendukung ($p = 0,030$) dan faktor pendorong ($p = 0,003$). Sementara itu, satu variabel independen, yaitu faktor predisposisi, tidak menunjukkan pengaruh (Fisher's exact = 0,060). Hasil uji regresi logistik menunjukkan bahwa secara simultan, ketiga faktor tersebut berpengaruh terhadap pengelolaan limbah ($p = 0,010$). Namun, secara parsial, hanya faktor pendorong yang menjadi prediktor signifikan ($p = 0,016$) dengan Odds Ratio sebesar 3,48. Saran: Hasil penelitian ini diharapkan dapat menjadi acuan bagi pihak rumah sakit untuk meningkatkan pelatihan, penyediaan sarana dan prasarana, serta memperkuat kebijakan dalam pengelolaan limbah infeksius.

Kata Kunci : Pengelolaan, Limbah Infeksius, Perilaku, Rumah Sakit, Kesehatan Lingkungan.

1. INTRODUCTION

Law Number 17 of 2023 concerning Health affirms that environmental health efforts are aimed at achieving an environment that is healthy in physical, chemical, biological, and social terms, thereby enabling everyone to attain the highest possible level of health. Environmental health activities are carried out through measures of sanitation, safety, and control designed to meet environmental health quality standards and health requirements for environmental media. Environmental health measures are implemented in residential areas, workplaces, recreational areas, as well as public places and facilities. Similarly, the management of infectious waste originating from healthcare facilities must comply with technical requirements or be conducted in collaboration with other parties, in accordance with the provisions of applicable laws and regulations.

A hospital is a healthcare facility that provides comprehensive health services to individuals—encompassing promotive, preventive, curative, rehabilitative, and/or palliative efforts—through inpatient care, outpatient care, and emergency services, in accordance with Law Number 17 of 2023. Hospitals are healthcare facilities that deliver services within the scope of public health science. This includes disease prevention efforts—ranging from early diagnosis and appropriate treatment to intensive care and the rehabilitation of the sick—aimed at achieving optimal recovery.

According to the Decree of the Minister of Health of the Republic of Indonesia Number 7 of 2019 concerning Hospital Environmental Health, hospitals serve as healthcare facilities and gathering places for both the sick and the healthy, thereby becoming potential sites for disease transmission. Hospital activities generate various by-products in the form of solid, liquid, and gaseous waste containing pathogenic microorganisms and hazardous chemical substances (Pradnyana & Bulda Mahayana 2020). Consequently, hospital waste management is essential as part of maintaining a

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healthy hospital environment, aiming to protect against hazards originating from the facility (Ramadayanti et al. 2024). Hospitals generate significant quantities of waste daily—often toxic in nature—comprising both medical and non-medical waste, particularly solid waste (Heriwati et al., 2023).

According to Minister of Health Regulation No. 18 of 2020, medical waste consists of residual materials generated from healthcare service activities. To prevent the potential spread of infection to the public and personnel within healthcare facilities, this waste requires proper management. Types of medical waste include infectious materials, used medical equipment, and expired medications. The volume of such waste continues to rise alongside the growing number of healthcare facilities, including hospitals, community health centers, clinics, and laboratories. Consequently, its management must be carried out meticulously, as it falls under the category of hazardous and infectious materials (Rangkuti et al., 2023). Medical waste generated by hospitals is infectious and hazardous; therefore, it must be handled in accordance with standard procedures to avoid adverse impacts on health and the environment (Huda et al., 2020).

Infectious waste is a type of waste containing pathogenic organisms—typically not found in the environment—present in sufficient quantities and levels of virulence to cause infection in susceptible individuals (Ferawati et al., 2022). This waste can harbor various microorganisms that cause infectious diseases—such as tetanus, wound infections, cholera, diarrhea, HIV, hepatitis B (HBV), hepatitis C (HCV), and tuberculosis—particularly if not handled correctly (Asriningrum, 2018). Consequently, the management of infectious waste in hospitals is critical, given the potential health risks it poses not only to patients but also to the entire hospital workforce (Asriningrum, 2018).

According to the WHO, hospital waste management is considered adequate when the proportion of medical waste stands at 15%; however, in Indonesia, this figure reaches 72.7%. In March 2020, infectious waste in Malaysia rose by 10% compared to the previous month; Wuhan, China, saw an increase from 40 tons to 240 tons per day; and Jakarta experienced a 30% increase (Brunnel 2020, cited in Ferawati et al. 2022).

The Indonesian Minister of Health (2020) noted that although medical waste is classified as infectious, its management in Indonesia has not yet been optimal (Gusti et al. 2022). Infectious waste requires proper and safe handling; management practices must be improved immediately to ensure the health and safety of both healthcare workers and others within the hospital environment (Pradnyana & Bulda Mahayana 2020). Healthcare workers providing hospital services—who are responsible for generating infectious waste—face a high risk of accidents and disease transmission. They are the first to be directly exposed to infectious waste and are at risk of sustaining injuries from contaminated sharp objects. Globally, more than 35 million healthcare workers face this risk. Incidents of exposure to microorganisms occur across the healthcare workforce, with nurses facing a particularly high risk due to their frequent contact with patients. Nurses play a crucial role in infectious waste management, as they perform the majority of patient care procedures—such as administering injections, inserting IV lines, changing IV fluids, inserting urinary catheters, dressing wounds, and administering medication (Asriningrum 2018).

Infectious waste management performed by nurses encompasses segregation and containment. Segregation involves identifying appropriate disposal points for items such as used syringes, spilled patient bodily fluids (e.g., blood on the floor), excreted fluids, and disposable personal protective equipment (PPE) (Yufutriana et al. 2022). Containment requires the use of specialized receptacles that are sturdy, leak-proof, puncture-resistant, and secure against unauthorized opening, with the waste ultimately placed into designated yellow containers or plastic bags (Yufutriana et al. 2022). The process of segregating infectious waste demands that nurses possess the necessary knowledge, a thorough understanding, awareness, and proper skills (Yufutriana et al. 2022). Knowledge is a key factor in the success of hospital waste management (Fahriyah et al., 2016). A higher level of knowledge regarding medical waste management among nurses correlates with better practices in handling such waste (Reknasari Nopi & Nurjazuli 2019).

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Research conducted by Huda (2019) reveals that several factors influence nurses' behavior regarding the segregation of infectious and non-infectious waste. Factors proven to be significant include the nurses' level of knowledge (p = 0.019), attitude (p = 0.035), availability of facilities (p = 0.038), availability of information (p = 0.033), and the presence of supportive policies (p = 0.011), as the significance value for each was below 0.05. Conversely, the factors of highest educational attainment (p = 0.943) and length of service (p = 0.256) did not show a significant influence. Among these variables, policy emerged as the most dominant factor, with an Exp(B) value of 19.040, highlighting the powerful role of regulations in shaping nurses' behavior regarding waste segregation.

Meanwhile, a study by Budi Fauzan (2024) indicates that at Pertamedika Hospital Banda Aceh, the management of hazardous and toxic (B3) waste was effectively carried out by 86.9% of respondents. The majority of respondents possessed good knowledge (91.5%), held a positive attitude toward waste management (91.7%), had a substantial length of service (93.8%), had undergone relevant training (91.7%), and had access to adequate facilities (89.9%). Chi-square tests demonstrated significant associations between knowledge (p = 0.003), attitude and training (p = 0.002), and length of service and facility availability (p = 0.001) regarding the effectiveness of hazardous and toxic (B3) medical waste management at Pertamedika Hospital Banda Aceh.

The following is the data table regarding the volume of infectious waste from 2022 to 2024 at Unhas Teaching Hospital, which will serve as the research site.

Table 1. Data on the Quantity of Infectious Waste at Unhas Teaching Hospital

No	Tahun	Satuan	Jumlah Limbah Infeksius
1	2022	Ton	26,297
2	2023	Ton	45,57392
3	2024	Ton	39,04625

Source: Secondary data, 2026

Data presented in Table 1. regarding infectious waste at Unhas Teaching Hospital reveals annual fluctuations in the volume of such waste. The total rose to 45.57392 tons in 2023 and fell to 39.04625 tons in 2024; these changes correlate with patient visit numbers, as higher patient volumes result in greater waste generation. A notable spike occurred in April 2023, with infectious waste reaching 11.1382 tons—compared to 1.372 tons in April 2022 and 1.33400 tons in April 2024—driven by an increase in patient visits during that month. These significant fluctuations in infectious waste volume highlight waste management dynamics that warrant further investigation, specifically regarding the factors influencing infectious waste generation; consequently, a study will be conducted to examine the factors affecting nurses' behavior regarding infectious waste management at Unhas Teaching Hospital.

Table 2. Number of Nurses per Ward at Unhas Teaching Hospital

No	Ruangan	Jumlah Perawat Tiap Ruangan
1	Ruang VIP	13
2	Ruang Rawat Katinting	23
3	Ruang Rawat Pinisih	24
4	Ruang Rawat Sandek	18
5	Ruang Rawat Mata	13
6	Ruang ICU	19
7	Ruang NICU	12
8	Ruang PICU	9
9	Ruang Bedah Sentral	22
10	Ruang Kemoterapi	13
11	Ruang Dialisis	10

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No	Ruangan	Jumlah Perawat Tiap Ruangan
12	Ruang IGD	17
13	Ruang Rawat Jalan	20
14	Ruang Radiologi	1
15	Ruang Rehabilitasi	2
16	Ruang Fer	2
17	Ruang Radioterapi	2
18	Ruang Bedah Mata	10
	Total	230

Source: Secondary data, 2026

Based on Table 2, which details the number of nurses in each ward at Unhas Teaching Hospital, the areas generating the largest amounts of infectious waste are the Emergency Department (IGD), Eye Surgery Unit, Central Surgery Unit, ICCU, Katinting Ward, Chemotherapy Unit, Phinisi Ward, and Sandeg Ward.

2. RESEARCH METHOD

The author employed a quantitative research approach with a cross-sectional study design. The study was conducted at the Unhas Teaching Hospital in 2025, located at Jl. Perintis Kemerdekaan Km. 10, Tamalanrea, Makassar, South Sulawesi. Data collection took place between January and July 2025. The study population consisted of 230 nurses, with a sample of 146 nurses determined using Slovin's formula.

Data collection in this study involved two types: primary data (via questionnaire distribution) and secondary data (infectious waste volumes at the Unhas Teaching Hospital from 2022 to 2024). Data processing was performed using SPSS 26 (Statistical Package for the Social Sciences) for Windows. The processing stages comprised editing, coding, scoring, data entry, and data cleaning. Data analysis involved univariate, bivariate, and multivariate analyses (specifically, logistic regression). The processed data were presented in tabular format and subsequently integrated with textual explanations.

3. RESULT AND DISCUSSION

Table 3. Distribution of Respondent Characteristics by Age Group at Unhas Teaching Hospital

No	Kelompok Umur	Frekuensi (n)	Persentase (%)
1.	19 - 30	54	37.0
2.	31 - 50	92	63.0
	Total	146	100,0

Source: Primary Data, 2026

Based on Table 3, the distribution of respondents by age at Unhas Teaching Hospital shows that out of a total of 146 respondents, the majority fell into the middle-adulthood age group (31–50 years), comprising 92 respondents (63.0%). Meanwhile, the smallest number of respondents was in the young adult age group (19–30 years), comprising 54 respondents (37.0%).

Table 4. Distribution of Respondent Characteristics by Gender at Unhas Teaching Hospital

No	Jenis Kelamin	Frekuensi (n)	Persentase (%)
1.	Laki – laki	32	21.9
2.	Perempuan	114	78.1
	Total	146	100,0

Source: Primary Data, 2026

Based on Table 4. the distribution of respondents by gender at the Unhas Teaching Hospital shows that, out of 146 respondents, the majority were female, comprising 114 individuals or 78.1%.

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Table 5. Distribution of Respondent Characteristics Based on Highest Level of Education at Unhas Teaching Hospital

No	Pendidikan Terakhir	Frekuensi (n)	Persentase (%)
1.	SMA	2	1.4
2.	Diploma	8	6.5
3.	S1	124	84.9
4.	S2	12	8.2
5.	S3	0	0
	Total	146	100,0

Source: Primary Data, 2026

Based on Table 5, the distribution of respondents by highest level of education at Unhas Teaching Hospital shows that, out of a total of 146 respondents, the majority held a Bachelor's degree (S1)—specifically 124 individuals (84.9%). Meanwhile, the least common highest level of education was high school (SMA), with 2 respondents (1.4%).

Table 6. Distribution of Respondent Characteristics Based on Length of Service at Unhas Teaching Hospital

No	Lama Masa Kerja	Frekuensi (n)	Persentase (%)
1.	< 2 Tahun	21	14.4
2.	2 – 5 Tahun	35	24.0
3.	>5 Tahun	90	61.6
	Total	146	100,0

Source: Primary Data, 2026

Berdasarkan Tabel 4.4, distribusi responden menurut lama masa kerja di Rumah Sakit Pendidikan Unhas menunjukkan bahwa dari 146 responden, mayoritas telah bekerja lebih dari lima tahun (>5 tahun), yaitu sebanyak 90 orang 61,6%. Sementara itu, jumlah responden dengan masa kerja paling singkat, yaitu kurang dari dua tahun (<2 tahun), sebanyak 21 orang 14,4%.

Table 7. Distribution of Respondent Characteristics Based on Employment Status at Unhas Teaching Hospital

No	Status Kepegawaian	Frekuensi (n)	Persentase (%)
1.	PNS	28	19.2
2.	Pegawai Kontrak	45	30.8
3.	Pegawai Tetap	28	19.2
4.	PTT (Pegawai Tidak Tetap)	38	26.0
5.	PKWT (Pegawai Kontrak Waktu Tertentu)	7	4.8
Total		146	100,0

Source: Primary Data, 2026

Based on Table 7, the distribution of respondents by employment status at Unhas Teaching Hospital shows that, out of a total of 146 respondents, the largest group consists of contract employees, numbering 45 (30.8%). Meanwhile, the employment status with the fewest respondents is PKWT (Fixed-Term Contract Employee), with 7 individuals (4.8%).

Table 8. Distribution of Respondents Based on Predisposing Factors at Unhas Teaching Hospital

No	Faktor Predisposisi	Frekuensi (n)	Persentase (%)
1.	Baik	129	88.4
2.	Kurang Baik	17	11,6
	Total	146	100,0

Source: Primary Data, 2026

Referring to Table 7, the distribution of respondents based on the predisposing factor variable at Unhas Teaching Hospital

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shows that, out of a total of 146 respondents, the majority fell into the "good" category—comprising 129 respondents (88.4%)—while a small minority fell into the "poor" category, comprising 17 respondents (11.6%).

Table 9. Distribution of Respondents Based on Supporting Factors at Unhas Teaching Hospital

No	Pendukung	Frekuensi (n)	Persentase (%)
1.	Baik	103	70.5
2.	Kurang Baik	43	29.5
	Total	146	100,0

Source: Primary Data, 2026

Table 9 shows the distribution of respondents regarding the supporting factor variable at Unhas Teaching Hospital; out of a total of 146 respondents, the majority (103 respondents, or 70.5%) rated it as good, while a minority (43 respondents, or 29.5%) rated it as less than good.

Table 10. Distribution of Respondents Based on Driving Factors at Unhas Teaching Hospital

No	Faktor Pendorong	Frekuensi (n)	Persentase (%)
1.	Baik	106	72.6
2.	Kurang Baik	40	27,4
	Total	146	100,0

Source: Primary Data, 2026

Table 10. shows the distribution of respondents based on the "enabling factors" variable at Unhas Teaching Hospital; out of a total of 146 respondents, the majority (106 respondents, or 72.6%) rated the factors as good, while a minority (40 respondents, or 27.4%) rated them as not good.

Table 11. Distribution of Respondents Based on Infectious Waste Management at Unhas Teaching Hospital

No	Faktor Pendorong	Frekuensi (n)	Persentase (%)
1.	Baik	126	86.3
2.	Kurang Baik	20	13,7
	Total	146	100,0

Source: Primary Data, 2026

Table 11 shows the distribution of respondents regarding the "driving factors" variable at Unhas Teaching Hospital; out of a total of 146 respondents, the majority (126 respondents, or 86.3%) rated the factors favorably, while a minority (20 respondents, or 13.7%) rated them unfavorably.

Table 12. Influence of nurses' predisposing factors on infectious waste management behavior at Unhas Teaching Hospital

No	Faktor Predisosisi	Pengelolaan Limbah Infeksius				Total		*fisher's exact*
		Baik		Kurang Baik				
		n	%	n	%	N	%	
1.	Baik	114	88.4	15	11.6	129	100	0,060
2.	Kurang Baik	12	70.6	5	29.4	17	100	
	Total	126	86.3	20	13.7	146	100	

Source: Primary Data, 2026

Table 12 shows that among the 146 respondents who reported good predisposing factors, 114 (88.4%) rated infectious waste management as good, while 15 (11.6%) rated it as poor. Meanwhile, among the 17 respondents who reported poor predisposing factors, 12 (70.6%) rated infectious waste management as good, and 5 (29.4%) rated it as poor.

The study results, based on the bivariate analysis using Fisher's exact test, yielded an exact significance value of 0.060 (which is greater than 0.05). Consequently, the null hypothesis (Ho) is accepted and the alternative hypothesis (Ha) is rejected, indicating that there is no significant influence of predisposing factors on infectious waste management at the Unhas Teaching Hospital.

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Tabel 13. Pengaruh faktor pendukung perawat terhadap perilaku pengelolaan limbah infeksius di Rumah Sakit Pendidikan Unhas

No	Faktor Pendukung	Pengelolaan Limbah Infeksius				Total		*P value*
		Baik		Kurang Baik				
		n	%	n	%	N	%	
1.	Baik	93	90.3	10	9.7	103	100	0.030
2.	Kurang Baik	33	76.7	10	23.3	43	100	
	Total	126	86.3	20	13.7	146	100	

Source: Primary Data, 2026

Table 13 shows that among the 146 respondents, 103 (100%) rated the supporting factors as good; of these, 93 (90.3%) assessed infectious waste management as good, while 10 (9.7%) assessed it as poor. Meanwhile, among the 43 respondents (100%) who rated the supporting factors as poor, 33 (76.7%) assessed infectious waste management as good, and 10 (23.3%) assessed it as poor.
The chi-square analysis yielded a p-value of 0.030 (less than 0.05); therefore, it is concluded that the alternative hypothesis (Ha) is accepted and the null hypothesis (Ho) is rejected, indicating a significant influence of supporting factors on infectious waste management at the Unhas Teaching Hospital.

Table 14. Influence of factors motivating nurses on infectious waste management behavior at Unhas Teaching Hospital

No	Faktor Pendorong	Pengelolaan Limbah Infeksius				Total		*P value*
		Baik		Kurang Baik				
		n	%	n	%	N	%	
1.	Baik	97	91.5	9	8.5	106	100	0.003
2.	Kurang Baik	29	72.5	11	27,5	40	100	
	Total	126	86.3	20	13.7	146	100	

Source: Primary Data, 2026

Table 14 shows that among the 146 respondents who rated the enabling factors as "good" (100%), 97 (91.5%) rated infectious waste management as "good," while 9 (8.5%) rated it as "poor." Meanwhile, among the 40 respondents who rated the enabling factors as "poor" (100%), 29 (72.5%) rated infectious waste management as "good," and 11 (27.5%) rated it as "poor."

The chi-square analysis yielded a p-value of 0.003 (less than 0.05); therefore, it can be concluded that the alternative hypothesis (Ha) is accepted and the null hypothesis (Ho) is rejected, indicating a significant influence of enabling factors on infectious waste management at Unhas Teaching Hospital.

Table 15. Model Fit Test Results

	Chi-squeare	df	*Sig. (2- tailed)*	Keterangan
Hosmer dan Lemeshow	0,369	4	0,985	Layak

Source: Primary Data, 2026

Based on Table 15, the significance value obtained is 0.985 (> 0.05); therefore, H0 is accepted (Model Fit). This indicates that the binary logistic regression model is suitable for further analysis, as there is no significant difference between the predicted classifications (predicted probabilities) and the observed classifications (observed probabilities).

Table 16. Coefficient of Determination Test Results

Step	*-2 Log likelihood*	*Cox & Snell R Square*	*Nagelkerke R Square*
1	105.324a	0,075	0,136

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Based on Table 16, the Nagelkerke R-Square value of 0.136 indicates that the independent variables (predisposing factors, enabling factors, and reinforcing factors) account for 13.6% of the variance in the dependent variable (infectious waste management), with the remainder explained by other variables not included in the study.

Tabel 17. Hasil Uji *Omnibus Tests of Model Coefficients*

		Chi-square	df	Sig.
Step 1	Step	11.317	3	0,010
	Block	11.317	3	0,010
	Model	11.317	3	0,010

Source: Primary Data, 2026

Based on Table 17, the results show a significance value of 0.010 (< 0.05); therefore, Ho is rejected and Ha is accepted, indicating that predisposing, enabling, and reinforcing factors influence infectious waste management at Unhas Teaching Hospital.

Table 18. Wald Test Results

		B	S.E	*Wald*	df	Sig.	E.xp(B)
Step 1	Faktor Predisposisi_ X1	.422	.702	.362	1	.547	1.525
	Faktor Pendukung_ X2	.754	.559	1.819	1	.177	2.125
	Faktor Pendorong_ x3	1.24 7	.516	5.843	1	.016	3.479
	Constant	.241	.589	.167	1	.683	1.272

Source: Primary Data, 2026

Based on Table 18, the results of the test regarding the influence of the independent variables on the dependent variable are as follows:

a) The significance value for the predisposing factor variable (X1) is 0.547 (> 0.05); therefore, Ho is accepted and Ha is rejected, meaning that the predisposing factor does not influence infectious waste management at Unhas Teaching Hospital.
b) The significance value for the enabling factor variable (X2) is 0.117 (> 0.05); therefore, Ho is accepted and Ha is rejected, meaning that the enabling factor does not influence infectious waste management at Unhas Teaching Hospital.
c) The significance value for the reinforcing factor variable (X3) is 0.016 (< 0.05); therefore, Ho is rejected and Ha is accepted, meaning that the reinforcing factor influences infectious waste management at Unhas Teaching Hospital.

Tabel 19 Pemodelan Regresi Logistik Biner *Odds Ration*

		B	S.E	Wald	df	Sig.	E.xp(B)
Step 1	Faktor Predisposisi_ X1	.422	.702	.362	1	.547	1.525
	Faktor Pendukung_ X2	.754	.559	1.819	1	.177	2.125
	Faktor Pendorong_ x3	1.247	.516	5.843	1	.016	3.479
	Constant	.241	.589	.167	1	.683	1.272

Source: Primary Data, 2026

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ln = a + β1.X1 + β2.X2 + β3.X3 = 0.241 + 0.422 + 0.754 + 1.247

The odds ratio or Exp(B) value for the predisposing factor variable (X1) is 1.525; this indicates that an increase in the predisposing factor is associated with a 1.525 times greater likelihood of having good infectious waste management.

The odds ratio or Exp(B) value for the enabling factor (X2) is 2.125; this indicates that an increase in the enabling factor is associated with a 2.125 times greater likelihood of having good infectious waste management.

The odds ratio or Exp(B) value for the reinforcing factor (X3) is 3.479; this indicates that an increase in the reinforcing factor is associated with a 3.479 times greater likelihood of having good infectious waste management.

Tabel 20. *Classification Table*

			Predicted		
			Pengelolaan_Limbah_Infeksius_Y1		Percentage Correct
	Observed		Kurang Baik	Baik	
Step 1	Pengelolaan_Limbah_Infeksius_Y1	Kurang Baik	0	20	.0
		Baik	0	126	100.0
	Overall Percentage				86.3

Source: Primary Data, 2026

Based on the classification table, there were 0 nurses with poor infectious waste management practices; among them, 20 were predicted to have good performance, resulting in a prediction accuracy of 0%. There were 126 nurses with good performance; among them, 0 were predicted to have poor performance, resulting in a prediction accuracy of 100%. Consequently, the model's overall prediction accuracy is 86.3%.

Tabel 21 Hasil Observasi Faktor-Faktor Yang Mempengaruhi Perilaku Perawat Pengelolaan Limbah Infeksius Di Rumah Sakit Pendidikan Unhas

Faktor pendukung (*enabling factors*) Ketersediaan fasilitas atau sarana prasana		Jawaban	
No	Pertanyaan	Tersedia	Tidak Tersedia
1.	Tersedia tempat/wadah limbah infeksius berlapis kantong warna kuning.	✓	
2.	Tersedia tempat limbah infeksius dan non infeksius dengan kantong warna sesuai dengan jenis limbah.	✓	
3.	Tersedia di dinding atas tempat limbah medis tersedia prosedur pembuangan limbah medis.		✓
4.	Tersedia sarung tangan sewaktu memilah limbah infeksius.	✓	

Source: Primary Data, 2026

Discussion

The Influence of Nurses' Predisposing Factors on Infectious Waste Management Behavior at Unhas Teaching Hospital

1. Knowledge

Knowledge is the result of "knowing," which occurs after an individual perceives a specific object. Perception takes place through the human senses: sight, hearing, smell, taste, and touch. The majority of human knowledge is acquired through the eyes and ears. Knowledge can be obtained in various ways—whether through personal initiative or via others—using visual, audio, or audiovisual

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methods. Furthermore, knowledge is acquired through experience and learning processes, whether formal or informal (Notoatmodjo, 2017, as cited in Poetra et al., 2024).

According to Notoatmodjo (as cited in Yufutriana et al., 2022), an individual's knowledge is defined as the understanding of an object—gained through seeing and listening—that can be developed into a form of practice. An individual's knowledge is influenced by various internal and external factors. Internal factors include age, motivation, and education, while external factors include sociocultural aspects, the environment, and mass media influence.

Hypothesis testing conducted by the researchers revealed no influence of the knowledge indicator on infectious waste management. This is demonstrated by the Fisher's exact test, which yielded an exact significance value of 0.060 (greater than 0.05); thus, it is concluded that the null hypothesis (Ho) is accepted and the alternative hypothesis (Ha) is rejected. This indicates no significant influence of the predisposing factor (knowledge) on infectious waste management at the Unhas Teaching Hospital.

These findings align with the distribution of respondents, showing that nurses with a "good" knowledge assessment generally also demonstrated a positive assessment regarding infectious waste management. However, 12 respondents rated the predisposing factor (knowledge) as "poor," and of these, 5 also rated infectious waste management as "poor." This indicates that knowledge is not the sole factor directly influencing behavior regarding infectious waste management.

The study results indicate no significant relationship between knowledge and nurse behavior, implying that increasing knowledge alone is insufficient to alter or improve nurses' practices regarding infectious waste management. This suggests that factors beyond knowledge—specifically enabling factors such as the availability of hospital facilities and infrastructure—play a more dominant role in influencing nurse behavior.

Direct field observations of nurses at the Unhas Teaching Hospital yielded results that differed from the statistical findings. Nurses who appeared to possess good knowledge demonstrated consistent behaviors, such as always using Personal Protective Equipment (PPE) during medical procedures likely to generate infectious waste and disposing of waste into the appropriate containers based on type (e.g., sharps in safety boxes and infectious waste in yellow bags).

Nurses' knowledge requires continuous improvement; the hospital could enhance staff capabilities by conducting training sessions on medical waste management not only for nurses and cleaning staff but for all employees at the Unhas Teaching Hospital. This aligns with research by Erni et al. (2024), which found that the knowledge of sanitation workers did not influence the management of hazardous and toxic (B3) solid medical waste at Kumpulan Pane Regional General Hospital (RSUD). Their study revealed that sanitation workers' knowledge had no impact on B3 solid medical waste management practices; in other words, possessing knowledge does not necessarily translate into tangible improvements in waste management practices unless supported by other factors, such as enabling elements like institutional policies.

In conclusion, the study suggests that a lack of knowledge regarding medical waste management does not necessarily result in poor waste management practices. Healthcare workers at the hospital still require further education on medical waste management. The knowledge required by nurses at the Unhas Teaching Hospital includes an understanding of medical waste types and classifications—specifically, the ability to distinguish between infectious, cytotoxic, chemical, and radioactive waste. In addition, nurses must understand waste segregation and containment procedures in accordance with applicable standard operating procedures (SOPs), including the use of appropriate containers, biohazard symbols, plastic bag color-coding, and correct packaging methods.

Occupational health and safety (OHS) regarding infectious waste—such as the risks of needle-stick injuries and exposure to patients' bodily fluids, as well as the importance of the complete and correct use of personal protective equipment (PPE). This knowledge must be reinforced by an understanding of hospital policies, government regulations, and technical standards for infectious waste management, ensuring that every action taken by nurses aligns with applicable guidelines. With

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adequate knowledge, nurses are expected to adopt professional and safe work practices and contribute to minimizing the negative impact of infectious waste on human health and the surrounding environment.

2. Attitude

Attitude refers to a nurse's response or assessment regarding the segregation of infectious and non-infectious medical waste to prevent health issues such as infectious diseases (Huda et al. 2020). It is a mental state or individual disposition that influences how one thinks, feels, and behaves toward a specific object, person, or situation.

The study results, derived from a bivariate analysis using Fisher's exact test, yielded an exact significance value of 0.060 (greater than 0.05). Consequently, the null hypothesis (Ho) was accepted and the alternative hypothesis (Ha) rejected, indicating no significant influence of the predisposing factor (attitude) on infectious waste management at the Unhas Teaching Hospital.

This aligns with the distribution of respondents, which shows that when nurses' attitudes were rated positively, infectious waste management practices also tended to be rated positively. However, among the 12 respondents whose predisposing factor (attitude) was rated negatively, five also rated infectious waste management practices negatively. This suggests that the attitude indicator does not directly determine the assessment of infectious waste management practices.

From the perspective of Lawrence Green's behavioral theory, attitude—as a component of predisposing factors—serves as a source of motivation or initial intent that drives nurses to act in accordance with infectious waste management procedures. However, attitude cannot stand alone as the sole determinant of behavior; translating attitude into actual practice requires support from enabling factors (such as the availability of facilities and infrastructure) and reinforcing factors (such as supervision, policies, or incentives from environmental health and infection prevention and control units). Therefore, even if the majority of respondents hold a positive attitude, infectious waste management practices may not necessarily be optimal without adequate facility support and policies. Conversely, a less-than-ideal attitude can be "compensated for" by strong enabling and reinforcing factors, ensuring that waste management behavior remains compliant with standards.

Direct observations conducted in several wards at Unhas Teaching Hospital revealed that the majority of nurses demonstrated a positive attitude and compliance regarding infectious waste management procedures. For instance, nurses were observed wearing gloves while performing medical procedures—such as administering injections, inserting IV lines, or dressing wounds. Upon completion of the procedure, the used gloves were immediately disposed of in designated infectious waste receptacles—specifically, containers lined with yellow plastic bags marked with the biohazard symbol, in accordance with the provisions of the Minister of Health Regulation Number 2 of 2023.

These actions demonstrate that the nurses possess a sound understanding and positive attitude regarding the importance of safe infectious waste management, while also reflecting a commitment to preventing cross-infection and protecting the environment. This observed behavior contrasts with the statistical analysis results—which indicated that predisposing factors (specifically attitude) did not have a significant partial influence—yet it clearly manifests in actual field practice.

This aligns with findings by Sari et al. (2020), who reported no significant relationship between attitude and solid medical waste management behavior ($p = 0.129$). It is also consistent with research by Ratnawati et al. (2021), which similarly found no association between attitude and the quality of waste management (p-value 0.069).

3. Education

Education refers to the health-related educational background completed by nurses prior to working at the Unhas Teaching Hospital. Education serves as the foundation for transforming nurses' mindsets and approaches, ensuring that their work does not result in harmful environmental impacts (Rangkuti et al. 2023). Education is an effort to develop personality and capabilities both within and outside the school setting, and it is a lifelong process (Notoatmodjo, 2016, cited in Hasiu et al., 2024).

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The research findings, based on a bivariate analysis using Fisher's exact test, yielded an exact significance value of 0.060 (which is greater than 0.05). Consequently, the null hypothesis (Ho) was accepted and the alternative hypothesis (Ha) was rejected, indicating no significant influence of predisposing factors—specifically education—on infectious waste management at the Unhas Teaching Hospital.

This aligns with the distribution of respondents, which shows that when nurses' education is rated positively, infectious waste management practices also tend to be rated positively. However, among the 12 respondents who rated the predisposing factor (education) as poor, five also rated infectious waste management practices as poor. This suggests that the education indicator does not directly influence the assessment of infectious waste management practices.

Observational data further indicate that, regardless of differences in formal education, nurses with both higher and lower levels of education demonstrated good behavior regarding infectious waste management. This is because factors such as training, work experience, and the work environment also influence nurses' behavior.

Despite the provision of training and adequate facilities for infectious waste management, no difference in waste management behavior was found between nurses who had undergone training and those who had not. Furthermore, infectious waste management behavior did not differ significantly based on the nurses' educational levels. This is likely because all nurses were accustomed to following standard hospital procedures or were subject to supervision, rendering individual factors seemingly inconsequential. Therefore, improving the quality of infectious waste management in the hospital depends not only on educational attainment but also on institutional support in fostering a safe and responsible work culture.

The results of this study align with those of Hasiu et al. (2024); statistical testing using the Pearson chi-square test yielded a p-value of 0.563 (greater than the significance level of $\alpha = 0.05$), leading to the acceptance of the null hypothesis (Ho). This indicates no relationship between education level and the actions of healthcare workers regarding medical waste management at the North Buton Regency Regional General Hospital. These findings are also consistent with the study conducted by Pokhrel (2024) at Pasar Rebo Regional General Hospital, where chi-square analysis revealed no significant relationship between education level and nurses' behavior regarding solid medical waste segregation (p-value > 0.05).

4. Length of Service

Length of service refers to the duration a nurse has worked at the Unhas Teaching Hospital; generally, it denotes the time an employee has spent working at a specific location. This factor can influence employees in either a positive or negative manner.

The study results, derived from a bivariate analysis using Fisher's exact test, yielded an exact significance value of 0.060 (which is greater than 0.05). Consequently, the null hypothesis (Ho) was accepted and the alternative hypothesis (Ha) was rejected, indicating no significant influence of the predisposing factor—length of service—on infectious waste management at the Unhas Teaching Hospital.

These findings align with the distribution of respondents, which shows that nurses with longer tenure generally rated infectious waste management favorably. However, 12 respondents rated the predisposing factor (length of service) unfavorably, and of these, five also rated infectious waste management unfavorably. This indicates that length of service does not directly influence infectious waste management practices.

Nurses with long tenure do not automatically exhibit better waste management practices unless supported by up-to-date knowledge, regular training, and adequate facilities. Conversely, nurses with shorter tenure who receive proper training and information can demonstrate waste management behaviors that meet standards. Furthermore, without continuous guidance and supervision from the hospital, work experience alone is insufficient to guarantee the correct implementation of waste management standards. These findings align with the study by Herawati et al. (2021), which showed

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no relationship between length of service and nurses' behavior regarding medical waste management in the Special Unit of Muhammadiyah Selogiri Hospital (p-value = 0.547).

This study also aligns with Huda et al. (2020), demonstrating that length of service does not influence the behavior of segregating infectious and non-infectious medical waste (p=0.256 > 0.05). While nurses with over five years of experience possess extensive experience, this does not guarantee superior medical waste segregation compared to nurses with less than five years of experience. Additionally, the results are consistent with the study conducted by Pokhrel (2024) at Pasar Rebo Regional General Hospital; using chi-square analysis, the study found that the predisposing factor (length of service) had no significant relationship with nurses' behavior regarding solid medical waste segregation (p-value > 0.05).

The Influence of Nurse-Related Supporting Factors on Infectious Waste Management Behavior at Unhas Teaching Hospital

The availability of facilities and infrastructure serves as a means to achieve specific objectives and supports the processes required to reach desired outcomes. Facilities encompass everything that facilitates the smooth execution of tasks—including various types of equipment and work tools—acting as either primary instruments or aids in the performance of duties. The adequacy of facilities significantly influences the workload associated with carrying out an individual's tasks and responsibilities (Laksono, 2021, cited in Frida et al., 2024).

This is evidenced by the results of a bivariate analysis using the chi-square test, which yielded a p-value of 0.030 (less than 0.05). Consequently, it can be concluded that the alternative hypothesis (Ha) is accepted and the null hypothesis (Ho) is rejected, indicating a significant influence of supporting factors (facilities and infrastructure) on infectious waste management at the Unhas Teaching Hospital. In other words, the better the supporting factors, the better the infectious waste management.

This aligns with the distribution of respondents, which shows that when supporting factors are rated positively, infectious waste management tends to be rated positively as well. However, 33 respondents rated the supporting factors (facilities and infrastructure) poorly, and among them, 10 rated infectious waste management poorly. This indicates that supporting factors influence the assessment of infectious waste management.

Supporting factors—specifically the availability of facilities and infrastructure—showed a significant relationship with nurses' behavior based on the chi-square test (p = 0.030); however, the partial test (t-test) result was not significant (p = 0.126). This indicates that the mere presence of facilities is insufficient; it must be accompanied by motivation and other forms of support to ensure optimal waste management behavior.

Observations revealed that while most facilities—such as yellow waste bins and personal protective equipment (PPE)—were available, not all rooms displayed written information or procedures regarding waste disposal protocols. This reinforces the finding that incomplete facilities can hinder adherence to standard practices.

These findings align with the study by Huda et al. (2020), titled "Factors Influencing Nurses' Behavior in Segregating Infectious and Non-Infectious Waste in Class 3 Inpatient Wards at Haji General Hospital, Medan," which reported a p-value of 0.004. The results also align with the study by Frida et al. (2024), titled "Factors Associated with Infectious Waste Management Among Nurses in Inpatient Wards at South Tangerang City General Hospital," which obtained a p-value of 0.000 (< 0.05), indicating that the availability of facilities influences infectious waste management.

The Influence of Driving Factors on Infectious Waste Management at Unhas Teaching Hospital

Policies serve as the primary guide for the conduct of organizational members or the public. They must allow for interpretation based on specific prevailing conditions (Frida et al., 2024). Hospital-level measures include written regulations on clinical waste management—aligned with higher-level regulations and acknowledged by nursing staff—as well as a system of sanctions and

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rewards regarding adherence to standard operating procedures for infectious medical waste disposal; these measures are known to nurses in waste-generating units who are responsible for disposing of solid medical waste (Huda, 2020, cited in Frida et al., 2024).

This is demonstrated by the results of a bivariate analysis using the chi-square test, which yielded a p-value of 0.003 (less than 0.05). Consequently, it can be concluded that the alternative hypothesis (Ha) is accepted and the null hypothesis (Ho) is rejected, indicating a significant influence of the enabling factor (policy) on infectious waste management at Unhas Teaching Hospital. In other words, the better the enabling factor, the better the infectious waste management.

This aligns with the distribution of respondents, which shows that when the enabling factor (policy) is rated positively, infectious waste management tends to be rated positively as well. However, 29 respondents rated the enabling factor poorly, and among them, 11 also rated infectious waste management poorly. This indicates that the policy indicator influences the assessment of infectious waste management.

The enabling factor—specifically policy—shows a highly significant relationship based on both the chi-square test ($p = 0.003$) and the partial test ($p = 0.012$). This demonstrates that the enabling factor is the most dominant variable influencing nurses' infectious waste management behavior.

Observations by the researcher indicate that the hospital has established an Infection Prevention and Control (IPC) system. IPC oversees the relevant regulations and supervision, including the monitoring of infectious waste management. Supervisors or waste coordinators play a role in ensuring that every staff member adheres to waste management standards. Such support significantly helps improve nurses' compliance with the policies established by the hospital.

Therefore, the hospital needs to implement policies that include written regulations on infectious waste management—based on higher-level regulations and communicated to nurses—as well as sanctions and rewards regarding adherence to standard operating procedures for infectious waste disposal. These measures should be known to nurses in waste-generating units, thereby influencing their actions in disposing of infectious waste according to its type.

This is consistent with research by Tarigan (2009), as cited in Huda et al. (2021), which found that written hospital regulations on clinical waste management—incorporating sanctions and rewards for adhering to standard operating procedures for solid medical waste disposal and communicated to nurses in waste-generating units—influence nurses' actions regarding solid medical waste disposal. Hospital policy is associated with the respondents' actions in disposing of solid medical waste.

Medical waste management by nurses must be conducted properly and systematically to control potential risks regarding both health aspects and performance metrics. According to Huda et al. (2021), an Exp(B) value of 19.040 indicates that nurses supported by effective policy implementation are 19.040 times more likely to segregate infectious and non-infectious medical waste compared to those without such support; this factor plays a dominant role in improving nurses' waste segregation behavior. It is crucial for hospital management to continuously evaluate nurses' performance regarding medical waste segregation, at least once a month.

Research findings by Frida et al. (2024)—specifically the Chi-Square test results yielding a p-value of 0.005 (< 0.05)—indicate a relationship between policy and infectious waste management practices among nurses in the inpatient wards of the South Tangerang City General Hospital.

These findings align with the study by Huda et al. (2020) titled "Factors Influencing Nurse Behavior in Segregating Infectious and Non-Infectious Waste in Class 3 Inpatient Wards at Haji General Hospital, Medan," which reported a p-value of 0.000. This indicates a relationship between policy and nurse behavior regarding the segregation of infectious and non-infectious waste in the Class 3 inpatient wards of Haji General Hospital, Medan.

The Simultaneous Influence of Predisposing, Enabling, and Reinforcing Factors on Infectious Waste Management Behavior at Unhas Teaching Hospital

In this study, the researchers employed two analytical approaches: the chi-square test for bivariate analysis and logistic regression for multivariate analysis. Although both methods were used,

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conclusions regarding the hypotheses were based on the chi-square test results, as a greater number of variables demonstrated a significant influence on infectious waste management in that test. Meanwhile, a partial test (Wald test) was conducted as part of the multivariate analysis to assess the individual contribution of each variable.

Logistic regression is an analysis that explains the correlation between one or more independent variables and a single dependent variable that is dichotomous in nature. A dichotomous variable is one that has only two possible values or states—such as high or low, yes or no, or prosperous and non-prosperous (Situngkir & Sembiring, 2023). In logistic regression, the dependent variable is non-metric (categorical), whereas independent variables can be metric, non-metric, or a combination of both. Metric data includes ratio and interval data, while non-metric data includes nominal and ordinal data (Rahmadani et al., 2023). Logistic regression does not require classical assumption testing. There are two types of logistic regression models: binary and multinomial; the binary model is used when predicting two categories, while the multinomial model is used when predicting more than two categories (Savitri et al., 2021).

Binary logistic regression is a data analysis method used to examine the relationship between independent variables and a dependent variable where the dependent variable is categorical; specifically, binary logistic regression involves two categories, typically coded as 0 and 1 (Nareswari & Handayani, 2023). The Wald test and the Omnibus Tests of Model Coefficients are utilized within the logistic regression model.

Based on the Wald test results—specifically the partial test—only the enabling factor (X3) emerged as a significant predictor (p=0.016). The significance value for the predisposing factor variable (X1) was 0.547 (> 0.05), and the value for the reinforcing factor variable (X2) was 0.117 (> 0.05); this indicates that predisposing and reinforcing factors do not influence infectious waste management at Unhas Teaching Hospital. However, the Omnibus Tests of Model Coefficients analysis demonstrated that, simultaneously, all three factors influence waste management (p=0.010).

In conclusion, the logistic regression results indicate that the three factors simultaneously influence infectious waste management (p=0.010). However, in the partial analysis, only the enabling factor was a significant predictor (p=0.016), with an Odds Ratio of 3.48.

4. CONCLUSION

Based on the research findings and discussion, the following conclusions can be drawn regarding the study—which utilized non-probability sampling: there is no influence of predisposing factors on infectious waste management behavior at Unhas Teaching Hospital; there is an influence of enabling factors on infectious waste management behavior at Unhas Teaching Hospital; there is an influence of reinforcing factors on infectious waste management behavior at Unhas Teaching Hospital; and there is a simultaneous influence of these three factors (predisposing, enabling, and reinforcing) on nurses' infectious waste management behavior at Unhas Teaching Hospital.

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