

## Risk Management Implementation in Environmental Sanitation at PKU Muhammadiyah Hospital Surabaya

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### ABSTRAK

**Latar Belakang :** Data insiden keselamatan pasien di Rumah Sakit PKU Muhammadiyah Surabaya tahun 2024 menunjukkan tingginya angka insiden, dengan Kejadian Nyaris Cedera (KNC) sebesar 41,18%, sementara Kejadian Tidak Cedera (KTC) dan Kejadian Tidak Diharapkan (KTD) masing-masing menyumbang 29,41%. Data ini memberikan konteks kritis bagi penelitian ini, yang bertujuan untuk mengevaluasi penerapan manajemen risiko sanitasi lingkungan melalui tahapan identifikasi risiko, analisis risiko, evaluasi risiko, dan formulasi rekomendasi pengendalian risiko.

**Metode :** Penelitian ini mengkaji proses penerapan manajemen risiko sanitasi lingkungan, dengan fokus khusus pada tahapan identifikasi, analisis, dan evaluasi risiko, serta keselarasan antara kebijakan tertulis dan praktik di lapangan.

**Hasil :** Penelitian mengidentifikasi 13 risiko di area non-klinis, dengan 9 risiko tergolong sedang dan 4 tergolong rendah. Di antara risiko sedang, kekhawatiran akan keselamatan kebakaran muncul sebagai yang paling kritis, sementara risiko lainnya memerlukan pemantauan konsisten dan mitigasi terstruktur. Evaluasi mengungkapkan bahwa upaya pengendalian risiko yang ada belum optimal akibat budaya keselamatan yang lemah dan pelatihan berkelanjutan yang tidak memadai. Terdapat kesenjangan yang signifikan antara kebijakan manajemen risiko rumah sakit dan implementasi praktisnya.

**Simpulan:** Penerapan manajemen risiko sanitasi lingkungan di Rumah Sakit PKU Muhammadiyah Surabaya belum sepenuhnya memenuhi standar yang ditetapkan. Direkomendasikan agar rumah sakit memperkuat sistem pengendalian melalui audit internal berkala, pembaruan SOP di area rawan risiko, serta integrasi hasil evaluasi ke dalam rapat koordinasi lintas unit untuk memastikan mitigasi yang efektif dan berkelanjutan.

**Kata kunci:** Manajemen Risiko; Sanitasi Lingkungan; Keselamatan Pasien; Rumah Sakit

### ABSTRACT

**Background:** Patient safety incident data at PKU Muhammadiyah Hospital Surabaya in 2024 revealed a high rate of incidents, with near miss incidents (NMI) accounting for 41.18%, while no harm incidents (NHI) and adverse events (AE) each contributed 29.41%. The data provide the critical context for this study, which aims to evaluate the implementation of environmental sanitation risk management through the stages of risk identification, analysis, evaluation, and the formulation of risk control recommendations.

**Method:** This study examined the implementation of environmental sanitation risk management, with a specific focus on risk identification, analysis, and evaluation, as well as the congruence between written policies and field practices.

**Result:** The study identified 13 risks in non-clinical areas, with nine categorized as moderate and four low risks. Fire safety emerged as the most critical among the moderate risks, while other risks required consistent monitoring and structured mitigation. The evaluation revealed that existing risk control efforts were suboptimal due to a weak safety culture and insufficient ongoing training. A significant gap was found between the hospital's risk management policy and its practical implementation.

**Conclusion:** The implementation of environmental sanitation risk management at PKU Muhammadiyah Hospital Surabaya has not yet fully met established standards. It is recommended that the hospital enhance its control system through regular internal audits, periodic standard operating procedure updates in risk-prone areas, and the integration of evaluation results into cross-unit coordination meetings to ensure effective and sustainable mitigation.

**Keywords:** Risk Management; Environmental Sanitation; Patient Safety; Hospital

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## INTRODUCTION

Hospital environments are inherently high-risk due to the convergence of clinical procedures, human interaction, and infrastructural complexity. In healthcare settings, environmental sanitation encompasses a range of critical factors that significantly impact patient safety, occupational health, and environmental integrity.<sup>1</sup> These factors include access to clean water, effective waste management, maintaining optimal air quality, and implementing comprehensive infection control measures. In Indonesia, national assessments of water, sanitation, and hygiene (WASH) services in healthcare facilities revealed that although progress has been made in hygiene promotion and water supply, only 13% of hospitals met basic standards for safe waste disposal. This finding indicates systemic risk exposure.<sup>2</sup> Patient safety incidents remain a persistent challenge in hospitals, where various services pose risks that threaten patient safety and security.<sup>3</sup>

Risk management functions as an important preventive measure for companies, especially those engaged in service sectors that are prone to errors and complaints. Therefore, risk mapping based on work units is necessary to minimize accidents or errors involving patients, visitors, and employees.<sup>4</sup>

According to previous research, risk management at Surabaya A. Yani Islamic Hospital is functioning adequately but has not been optimized due to the COVID-19 pandemic, which caused monitoring and inspections to be inconsistent with schedules.<sup>5</sup> Risk analysis identified 25 potential risks in the Graha Building and the Old Building.<sup>5</sup> In the implementation of occupational safety and health (OSH) risk management at the new Medan Specialized Eye Hospital, risk identification and risk analysis processes showed 15 potential risks, consisting of 10 moderate risks and 5 high risks. These risks have the potential to cause accidents involving employees, visitors, and patients. Therefore, control measures are enforced to minimize incidents.<sup>6</sup>

Based on data at PKU Muhammadiyah Hospital Surabaya for 2024, there were 17 patient safety incident reports. Of these, seven incidents were classified as near miss incidents (NMI), five incidents were categorized as no harm incidents (NHI), and the remaining five were adverse events (AE). The proportion of NMI incidents (41.18%) indicates that many potential incidents were successfully prevented before causing harm. However, the still-high proportions of NHI and UI (each at 29.41%) suggest weaknesses in early detection system and risk control efforts,<sup>7</sup> particularly in clinical administrative areas such as prescription or medication administration errors. The high numbers in the NMI cases indicate that while many incidents were averted before causing direct harm, the risk of more serious incidents still requires close attention and evaluation.<sup>8</sup> This situation highlights challenges in maintaining patient safety and reducing the likelihood of incidents that could compromise the quality of care. Given that patient safety is a key indicator in assessing the quality of hospital care, consistent and sustained efforts are needed to enhance the effectiveness of risk management.<sup>4</sup>

Effective risk management is vital in hospitals because it enables the identification, analysis, and control of potential hazards that may threaten the safety of patients, health workers, and visitors.<sup>9</sup> In addition, optimal risk management plays an essential role in reducing incidents that may injure patients and in enhancing the sense of security within the hospital environment.<sup>10</sup> Without structured risk management, the likelihood of harmful incidents may rise and negatively impact care quality and patient satisfaction.<sup>11</sup> Therefore, this study aimed to examine the implementation of occupational safety and health risk management at PKU Muhammadiyah Hospital Surabaya, identify challenges that may arise during its implementation, and formulate appropriate recommendations to enhance its effectiveness. The results of this study are expected to serve as a reference for hospital management in strengthening the risk management system, particularly those related to occupational safety and health, to reduce the likelihood of workplace accidents and incidents that could endanger patients or healthcare personnel. Additionally, this study seeks to promote increased awareness among all hospital staff regarding the urgency of cultivating a safety culture and sustainable risk management to create a safe working environment and support the delivery of optimal healthcare services to the community.

**MATERIALS AND METHODS**

This study employed a qualitative case study approach, which involves the systematic examination of a particular problem through the analysis of specific events, processes, activities, or programs. The objective of this study was to investigate environmental sanitation risk management at PKU Muhammadiyah Hospital Surabaya.

The study population consisted of all work areas and units at the hospital, which included eight units with a total of 50 rooms that may pose potential hazards. The study sample encompassed work areas and units with the potential to result in workplace accidents. The sample was determined using purposive sampling, which entailed the selection of rooms deemed high-risk based on initial observations. These observations included, but were not limited to, operating rooms, intensive care units, and pharmacy installation rooms.

This study examined the risk management of environmental sanitation, with a specific focus on risk identification, analysis, and evaluation, as well as the alignment between written policies and field practices. Data analysis was conducted to identify potential hazards, determine the causes of accidents, and trace the sources of risk in the hospital work environment. This analytical process was guided by the AS/NZS 4360 risk management framework, utilizing qualitative analysis methods that emphasized systematic assessment of risk likelihood and severity of consequences.

This study was declared ethically feasible and received ethical approval from the Health Research Ethics Committee of Politeknik Kesehatan Kemenkes Surabaya with approval number: 00540/EE/2025/0067223578. All ethical procedures were strictly adhered to, including obtaining written informed consent from all participants prior to their involvement in the study. The confidentiality of participant identities and data was guaranteed throughout the research process.

**RESULT AND DISCUSSION**

The results of risk identification show that there are 13 types of risks with the potential to disrupt work safety and the environment, comprising nine risks classified as moderate and four risks classified as low. Risk analysis utilized a qualitative approach based on the AS/NZS 4360 Risk Matrix, which assesses risks based on a combination of likelihood and severity.<sup>12</sup> Through risk score calculations, each potential risk was classified into low, moderate, or high levels.

Risks classified as high and moderate require immediate and structured corrective actions, while risks in the low category can be monitored periodically. Decision-making is carried out by considering the risk tolerance limits established by the organization.<sup>13</sup> The evaluation of the risk management process at PKU Muhammadiyah Hospital Surabaya in 2025 is presented in Table 1.

**Table 1. Evaluation of risk management at PKU Muhammadiyah Hospital Surabaya in 2025**

No	Risk Component/Area	Internal Documents	Field Finding	Evaluation
1.	Risk of exposure to hazardous waste for the environment and staff	Standard operating procedure (SOP) on Hazardous Waste Management, Hazardous Waste Management Policy	Frequent waste spills observed; inadequate supervision by related staff	Waste spills create risks of environmental contamination and staff safety due to inadequate containment and supervision.
2.	Risk of contamination during linen collection and delivery process	SOP for Handling Dirty Linen, Procurement Plan for Covered Linen Trolleys in 2024	Open trolleys used without plastic cover; distribution route not separated	The use of uncovered trolleys increases airborne contamination risks; enclosed transport is necessary for safe linen handling.
3.	Risk of hazardous waste exposure to cleaning service staff	SOP on Cleaning Staff personal protective equipment (PPE), Daily Occupational Health and Safety Protocol (OHS)	Several staff members do not use complete PPE; safety briefings are not conducted regularly	Incomplete PPE use stems from inconsistent habits; regular briefings and peer learning are needed.
4.	Risk of the hazardous waste temporary storage area (TPS B3) being unclean and disorganized	TPS B3 Inspection Form, Environmental Inspection Schedule	Waste accumulation and improper mixing of different types of waste	Waste accumulation and mixing due to poor cross-unit oversight; routine collaborative inspections required.
5.	Risk of Code Red not being heard by all staff and patients during a fire incident	Code Red Protocol, Emergency Management Policy, Fire Alarm Procurement Plan (2023)	No automatic alarm system available; only manual loudspeakers used	The absence of automatic alarms delays fire warnings; manual systems and evacuation drills are essential.
6.	Risk of clean water quality exceeding environmental quality standards	Clean Water Testing Schedule, Water Quality Monitoring Form	No external laboratory used; internal test results deemed invalid	The absence of external lab verification leads to unreliable water quality results; cooperation with accredited labs is needed.
7.	Risk of exposure to laundry staff	SOP on Laundry Staff PPE, Laundry Supervision Schedule	Staff did not use PPE	Laundry staff neglect PPE use; practical training is necessary to improve compliance.
8.	Risk of inadequate cleanliness in several rooms	Environmental Sanitation SOP, Daily Cleaning Schedule	Bathroom and patient room areas were not optimally clean	Inconsistent cleanliness suggests staff fatigue; work rotation can help maintain performance and motivation.

No	Risk Component/Area	Internal Documents	Field Finding	Evaluation
9.	Risk of blockage in the piping system	Utility Maintenance SOP, Preventive Maintenance Schedule	Lack of regular inspections	Irregular inspections cause pipe blockages; preventive maintenance scheduling is crucial.
10.	Risk of damage/blockage in wastewater pump machinery	Machine Logbook, Facility Technician SOP, Utility Maintenance SOP, Preventive Maintenance Schedule	No preventive maintenance schedule; only reactive maintenance	Reactive pump maintenance misses early faults; routine checks prevent system disruption.
11.	Risk of fly and mosquito vectors in and around hospital rooms	Waste Disposal Schedule	Delayed waste removal causes odor and vectors	Waste buildup breeds vectors; more frequent disposal is needed to keep environment clean.
12.	Risk of laboratory test results not meeting quality standards	COD/BOD Test Results, Operational SOP of Wastewater Treatment Plant (IPAL)	Some test values exceed or fall below threshold limits	Wastewater treatment inefficiency due to worn components; routine maintenance ensures effluent quality.
13.	Risk of incorrect segregation of infectious waste with other waste	Waste Segregation SOP, Color Coding Label as per Ministry of Health Regulation	Some staff disregard color labels	Poor waste segregation from ignored color labels; clear visual markings reduce cross-infection risk.

The risk management at PKU Muhammadiyah Hospital Surabaya is guided by national and international standards, including AS/NZS 4360:2004<sup>12</sup> and Minister of Health Regulation No. 25 of 2019 concerning the Occupational Safety and Health Management System in Hospitals.<sup>14</sup> These standards require a systematic and integrated approach to identifying, analyzing, and managing risks that arise, both clinical and non-clinical. This approach includes risk mapping based on the characteristics of the work unit, frequency analysis, and potential impact of risks, as well as the development of appropriate mitigation strategies.

An evaluation of risk management implementation shows that the hospital has a number of risk control documents that are administratively complete. These include standard operating procedures (SOPs) for hazardous waste management, environmental sanitation guidelines, linen distribution procedures, and internal quality evaluation forms. However, on-site observations reveal inconsistencies between the content of these documents and their technical execution within relevant work units.

The discrepancy between policy and practice appears to stem from systemic issues rather than mere individual non-compliance. Key underlying causes include a lack of active leadership engagement and role modeling from management in daily safety practices, which fails to visibly champion the importance of these procedures. Furthermore, the absence of a meaningful reward and punishment system provides no tangible incentive for adherence, and infrequent, overly technical training fails to equip staff with practical skills or a deep understanding of the consequences of non-compliance. The hospital needs to strengthen technical training focused on field implementation, enhance cross-departmental supervision, and implement a reward and punishment system for procedure compliance. The evaluation also recommends that management review the effectiveness of existing SOP documents, accompanied by adjustments to operational dynamics in each service unit.

The risk of exposure to liquid waste and contaminated linen within the hospital is a clear example of the challenges in implementing risk management.<sup>14</sup> This is reinforced by research findings that emphasize the importance of human resources, supporting infrastructure, linen management processes, and the quality of clean linen as key efforts to reduce the risk of infection and cross-contamination in healthcare services.<sup>15</sup>

The risk of exposure to hazardous waste for medical personnel is caused by waste spills and weak internal supervision. The study *Analysis of Medical Waste Management Compliance in Health Facilities in Indonesia 2025* found that poor management of hazardous waste increases risks to public health and the environment, particularly due to inadequate separation, collection, and storage.<sup>16</sup> Airborne contamination during the linen distribution process, contributed by the use of open trolleys and non-separated transport routes, lead to an increased risk of nosocomial infections. The study *Environmental Implications of Hospital Laundry Services 2023* confirmed that uncovered linen transport significantly raises the level of airborne contamination and exposes both staff and patients to potential pathogens.<sup>17</sup>

Incomplete use of personal protective equipment (PPE) by cleaning service staff reflects inadequate awareness and insufficient safety education. A study on PPE compliance among healthcare workers during the COVID-19 pandemic in Indonesia found that increased knowledge and positive attitudes were significantly associated with better adherence to PPE protocols.<sup>18,19</sup> However, awareness alone is often insufficient. Compliance is frequently hindered by ergonomic factors (e.g., discomfort or poor fit), the lack of immediate feedback and correction from supervisors on the floor, and the normalization of deviance where unsafe practices become habitual within the team. Furthermore, the poor condition of the hazardous waste temporary storage area and disorganized waste handling processes indicate weak inter-unit coordination. A scoping review on hospital waste management compliance in Indonesia reported that inadequate internal oversight reduces the effectiveness of medical waste management practices.<sup>20</sup> Such coordination failure often arises from siloed departmental responsibilities, where the environmental services unit bears operational burden without clear input or accountability from the clinical units that generate the waste.

The lack of an automatic fire alarm system (Code Red) hinders evacuation and emergency mitigation responses. Although local studies on this issue are limited, compliance reports related to fire safety protocols emphasize the critical role of automatic detection and alarm systems in accelerating fire incident mitigation.<sup>21</sup> The persistence of this critical gap suggests a potential misallocation of resources or shortcomings in strategic risk prioritization by management, where immediate operational costs outweigh perceived long-term safety benefits. Assessing clean water quality solely through internal laboratory testing without external validation results in unreliable and potentially biased data. A case study on hospital wastewater treatment plant (WWTP) risk assessment in an Indonesian Class B hospital highlights how the absence of independent verification undermines monitoring credibility and emphasizes the need for external quality control to support accurate environmental sanitation assessments.<sup>22</sup>

Exposure among laundry staff due to the absence of personal protective equipment (PPE) use reflects suboptimal enforcement of safety protocols. A study on linen management and laundry worker health in Bandung reported that despite the availability of PPE, continuous education and practical supervision are essential to improve compliance and minimize occupational health risks.<sup>23</sup> The uneven cleanliness observed in bathroom and patient room areas suggests possible staff fatigue due to shift overload and lack of proper rotation. This indicates underlying issues in workforce management and resource allocation, where staffing shortage or inefficient scheduling lead to burnout and diminished service quality. A hospital environmental study further emphasized that visual inspections alone are not enough; a more systematic operational monitoring system is required to maintain hygiene standards and prevent microbial contamination.

Blockages in hospital water piping systems pose significant operational and safety risks. Regular preventive maintenance is crucial to mitigate these risks. A study published in the *Journal of Water Management* emphasizes that routine preventive maintenance can reduce the incidence of blockages in water piping systems by up to 40%.<sup>24</sup> This reduction not only ensures a continuous supply of clean water but also minimizes the potential for contamination and associated health risks. The reliance on reactive maintenance, as found in this study, indicates a short-term cost-saving culture that overlooks the higher long-term costs of emergency repairs and operational disruptions. By implementing a structured maintenance schedule, hospitals can enhance the reliability of their water systems, ultimately contributing to a safer environment for both patients and healthcare staff.<sup>25</sup>

Improper or delayed waste disposal in hospitals often leads to waste accumulation, which attracts vectors such as flies and mosquitoes and poses serious health risks to patients and staff. These vectors act as mechanical carriers of pathogens and thrive in unsanitary environments, potentially facilitating the transmission of infections. To mitigate these risks, hospitals must implement a more frequent and consistent waste disposal schedule as part of an integrated environmental sanitation strategy.<sup>26</sup> Beyond technical solutions, studies show that waste management compliance is heavily influenced by organizational culture and the perceived priority given to environmental services by hospital leadership.<sup>27</sup>

Inconsistent chemical oxygen demand (COD) and biochemical oxygen demand (BOD) test results that exceed or fall below permissible thresholds typically signal inefficiencies in wastewater treatment operations, primarily caused by worn-out components or neglected maintenance. These conditions compromise biological treatment performance, reduce effluent quality, and may violate regulatory standards. Hence, adherence to operational SOPs and the implementation of routine maintenance are essential to maintain effluent quality within acceptable environmental limits.<sup>28</sup> Improper segregation of infectious waste, often resulting from staff neglecting color-coded labeling in accordance with national health regulations, poses a substantial risk of cross-contamination and infection transmission. Inadequate compliance with waste segregation protocols compromises occupational safety and environmental hygiene. Studies show that clearly visible labels and routine staff training improve compliance and reduce segregation errors in healthcare facilities.<sup>29</sup> However, training and labels are ineffective when the root cause is a lack of accountability among clinical staff and the absence of consequences for repeated non-compliance. A literature review on hospital wastewater treatment plants confirms that operational issues, including calculation errors and units not meeting design criteria, are common and require tightened monitoring and strict adherence to SOPs for resolution.<sup>30</sup>

## **CONCLUSION**

This study concludes that PKU Muhammadiyah Hospital Surabaya has identified 13 non-clinical environmental sanitation risks, with nine categorized as moderate and four as low. Among the moderate risks, fire safety represents the most critical issue, while other risks require ongoing supervision and mitigation. Existing risk controls are not yet optimal and require reinforcement of safety culture and continuous training. The implementation of environmental sanitation risk management remains below the expected standards due to a gap between policy and actual practice. Lastly, risk mitigation efforts should be systematic, continuous, and supported by effective communication across hospital units.

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