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Analysis of Factors Affecting Hospital Risk Management in Indonesia: The SEM-PLS Approach

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Abstract

Healthcare workers, especially those in hospitals, face a variety of complex hazards and exposures. One of the essential aspects of reducing risks and dangers is effective risk management. This study used a cross-sectional approach to survey the implementation of occupational health and safety management systems in Indonesian hospitals and to identify factors predisposing hospital risk management in Indonesia. A purposive sampling method was employed to select 90 hospitals distributed across 10 provinces in Indonesia. Data were analyzed using descriptive analysis, correlation, and SEM-PLS. A total of 44 hospitals (48.9%) had complete status plenary, and the majority were type C hospitals (43.3%). The results of SEM-PLS analysis showed that the hazard and risk identification analysis and Standard Operating Procedures (SOPs) factor-variables significantly predisposed the high quality of hospital risk management in Indonesia, with path values of 0.282 and 0.469, respectively. Enhancing hospital risk management in Indonesia could be achieved by increasing the use of appropriate SOPs and conducting a thorough analysis of hazards and risk identification.

Keywords: healthcare, hospital risk management, SEM-PLS

Introduction

Healthcare services workers, especially at hospitals, face high demands in their daily working conditions. In addition to high workloads, staff shortages, and shift work, the workers have to deal with suffering patients and face death, along with pressure from family, stressful work hours, a perceived lack of appreciation and sometimes conflicts with other professions.[1,2] Workers in this sector experience physical and psychological burdens continuously, which could have an impact on their safety and health.[3] According to Wagner,[4] in the field of healthcare services, especially at hospitals, more studies have focused on the safety culture. However, in reality, many of these studies on occupational safety pay more attention to patient safety than occupational safety or even more comprehensive safety (patients, workers, and the environment). In several studies, occupational safety culture is considered ancillary to patient safety culture and does not represent the primary aspect of safety.[5–7]

The role of risk management is to enable organizational leadership to identify, analyze, and evaluate risks for modification using risk mitigation measures to a level that meets the organization's risk criteria. Organizations of all types and sizes face internal and external factors and predispose that create uncertainty about whether and when they will achieve institutional goals.[8] Previously, the assessment of the reliability of the Hospital Occupational Health and Safety Management System (Hospital OHS-MS) has been focused more on patient safety and service quality rather than risk management.[9,10]

This study explored the influence of hospital risk management variables on risk control success. While occupational health and safety (OHS) in healthcare facilities has traditionally prioritized patient safety and service quality, worker safety has often been disregarded. A study in England highlights several obstacles to implementing risk management in hospitals, such as ineffective communication, a lack of transparency and consistency, and inadequate risk assessment guidance. These challenges undermine risk management's ability to promote safety for everyone involved.[11] This study

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aimed to investigate impacts of standard compliance factors, competence, hazard and risk identification analysis, and risk management on risk management in hospitals in Indonesia.

Method

This study used a cross-sectional design with a survey method to implement the Hospital OHS-MS. A total of 90 selected hospitals participated in this study. The sample consisted of 90 hospitals across 10 provinces, including West Sumatra, South Sumatra, Lampung, Banten, West Java, Jakarta, Special Region of Yogyakarta, Central Java, East Java, and East Kalimantan. The hospital sample selection technique used a purposive sampling approach. Regional samples (10 provinces) were selected in response to a request by the Director General of Occupational Health and Sports, Indonesian Ministry of Health.

Subsequently, in collaboration with an Islamic non-governmental organization (NGO), hospitals from those 10 provinces were carefully identified to serve as representative samples. The selection criteria primarily focused on the feasibility of the Islamic NGO's regional implementation team regarding human resources. The specified criteria included hospitals of type A, B, C, and D, with status accreditation plenary, main, intermediate, and base, encompassing both government and private institutions, that are cost-effective and open to cooperation with the human resources of the Islamic NGO regional implementation team. Data collection was conducted through the distribution of pre and post-questionnaires and walkthrough inspections, followed by focus group discussions (FGD). The study took place on July-October 2022.

The research instruments and questionnaires refer to the Regulation of the Minister of Health of the Republic of Indonesia No. 66 of 2016 concerning the Hospital OHS-MS.[12] The latent variables studied in this study included compliance with exogenous variables (standards (St), competence (Ko), hazard and risk identification analysis (Hr), Standard Operational Procedure/SOP (So), and endogenous variables (hospital risk management (Mr)). Each latent variable contains indicators measured based on the Regulation of the Minister of Health of the Republic of Indonesia No. 66 of 2016. Details of each indicator for each variable are presented in Table 1.

This study examined the direct predispose and correlation of several factors on risk management with several hypotheses, as follows: (H1) There is a direct predispose of standard compliance factors on risk management; (H2) There is a direct predispose of competence factors on risk management; (H3) There is a direct predispose of hazard and risk identification on risk management; (H4) There is a direct predispose of risk management factors on risk management; (H5) There is a correlation between each pair of standards compliance factors, competence, hazard and risk identification analysis, and SOPs (Figure 1a).

Data was collected at 90 hospitals in Indonesia, including both public and private hospitals, with type A, B, C, and D hospital standards and plenary, primary, intermediate, and basic accreditation categories. The participants in this study were hospital staff specifically tasked with implementing and overseeing the OHS-MS at the hospital, encompassing the individual who holds the position of authority or leadership within the OHS-MS unit or committee. Data collection was acquired by administering pre- and post-questionnaires, then continued with an inspection walkthrough. The FGD was attended by the top management and shareholders of the hospital.

Hospital risk management is defined as the application of hospital risk management, including identifying, analyzing, and eliminating hazards and/or mitigating to an acceptable or tolerable level of hazards and subsequent risks that could threaten the organization's continuity.[13] Commitment is defined as efforts made by the hospital management regarding safety procedures, policies, and practices,[14] of which are applied to all levels of the hospital.[15] Understanding related to hazards and risks is defined as the hospital's understanding of hazards and risks as evidenced by process management knowledge actions as well as analysis actions identifying hazards and risks.[13] Risk management is defined as a risk management system implemented based on a flow of activities, including identification of potential hazards, risk analysis, monitoring and evaluation, and risk management with trials or follow-up, including risk registers.[16]

This study used descriptive analysis, correlation, and the Structural Equation Model Partial Least Square (SEM-PLS). A descriptive analysis was conducted to determine general profiles of 90 hospitals included in this study. A correlation between exogenous latent variables was carried out to examine the direction of relationship and closeness between exogenous latent variables that predispose risk management in hospitals. Next, SEM-PLS analysis was used to determine how each standard latent variable, competence, hazard, risk identification analysis, and SOP directly affected hospital risk management. The analysis used Smart-PLS 4 statistical software (licensed).

Table 1. Exogenous and Endogenous Latent Variables and Indicators

Latent Variables	Indicator Code	Indicator
Compliance with Standards	St1	1. Does the hospital have guidelines/SOPs that regulate Hazardous and Toxic Materials and their waste under World Health Organization (WHO) and statutory regulations?
	St2	2. Are there guidelines and SOPs for safe Hazardous and Toxic Materials management?
	St3	3. Has supervision been carried out on inventory, storage, handling, and use of Hazardous and Toxic Materials?
	St4	4. Has training and Hazardous and Toxic Materials spill simulation been carried out?
	St5	5. Is there a special Hazardous and Toxic Materials storage cupboard available?
	St6	6. Is there a body watering place available if exposed to Hazardous and Toxic Materials management (body wash)?
	St7	7. Is there an eye-washer available?
	St8	8. Is Personal Protective Equipment (PPE) available, and is the use of PPE correct and by potential dangers?
	St9	9. Has sharp waste been handled (sharp containers, SOPs, special officers, etc.)
	St10	10. Has contaminated equipment been handled (sterilization, autoclave, radiology, etc.)
	St11	11. Has medical waste been handled (SOPs, trained officers, temporary waste storage area, etc.)
	St12	12. Is there proof of permits related to Water Treatment Plant, Hazardous and Toxic Materials storage (which is still valid) Incinerator/third party MOU related to Hazardous and Toxic Materials management if carried out by another party, along with transporter permits?
	St13	13. Has the Hazardous and Toxic Materials symbol been installed in places where Hazardous and Toxic Materials is found?
	St14	14. Is there proof of procurement/purchase of Hazardous and Toxic Materials accompanied by Material Safety Data Sheet (MSDS) from the supplier?
	St15	15. Does the hospital have a complete and up-to-date Hazardous and Toxic Materials and waste list under WHO and statutory regulations?
	St16	16. Has the hospital mapped risk areas for Hazardous and Toxic Materials?
Competence	Ko1	1. Is the determination of the coordinating officer (person in charge) of the Hospital OHS-MS organization based on certain qualifications?
	Ko2	2. Are members appointed to the Hospital OHS-MS organization based on certain qualifications?
	Ko3	3. Are members appointed to the Hospital OHS-MS organization based on certain qualifications?
Hazard and Risk Identification Analysis	Hr1	1. Has the hospital prepared a strategic disaster management plan (Hospital Disaster Plan)?
	Hr2	2. Has the hospital identified major internal and external disasters (Condition Risk Analysis) that may occur in the community?
	Hr3	3. Has the hospital carried out a self-assessment of readiness to face emergencies using the HSI (Hospital Safety Index) from WHO?
	Hr4	4. Does the hospital have an emergency room and a decontamination room that complies with statutory regulations?
	Hr5	5. Has the hospital carried out a hazard vulnerability analysis (HVA) in the hospital?
	Hr6	6. Has the Hospital made efforts to control emergency conditions in the form of forming an emergency and disaster response team?
SOPs	So1	1. Does the hospital have documented rules/regulations/SOPs related to the management of support systems (infrastructure)?
	So2	2. Are there SOPs for contractors, suppliers, patient visitors, patient introducers, guests, and other parties?
	So3	3. Are there any guidelines and SOPs related to fire safety?
	So4	4. Does the hospital have guidelines/SOPs that regulate Hazardous and Toxic Materials and waste under WHO and statutory regulations?
	So5	5. Has sharp waste been handled (sharp containers, SOPs, special officers, etc.)
	So6	6. Has medical waste been handled (SOPs, trained officers, garbage disposal, etc.)
	So7	7. Are there guidelines and SOPs for safe Hazardous and Toxic Materials management?
	So8	8. Does the hospital have regulations/rules/SOPs regarding Hospital OHS-MS recording and reporting?
	So9	9. Does the hospital have guidelines/SOPs regarding emergency response?
	So10	10. Is there a Spill Management program (SOPs, spill kit, trained officers)?
	So11	11. Have you ensured that there is a SOP?
Risk management	Mr1	1. Is there a program regarding the management of work safety in hospitals?
	Mr2	2. Is there a program for managing security in hospitals?
	Mr3	3. Is there a work unit that is responsible for work safety?
	Mr4	4. Is there a work unit responsible for security?
	Mr5	5. Are there any guidelines/SOPs regarding providing identity to waiters, visitors, staff, and all third parties who work in the Hospital?
	Mr6	6. Has the hospital carried out regular inspections/checks of facilities, made improvement plans, and carried out repairs?
	Mr7	7. Has the hospital mapped risk areas for possible accidents and security disturbances?
	Mr8	8. Has the hospital installed CCTV monitors in safety and security risk areas?
	Mr9	9. Is there a Lock Out Tag Out (LOTO) Procedure?
	Mr10	10. Is there SOPs sign and label for work safety and security?

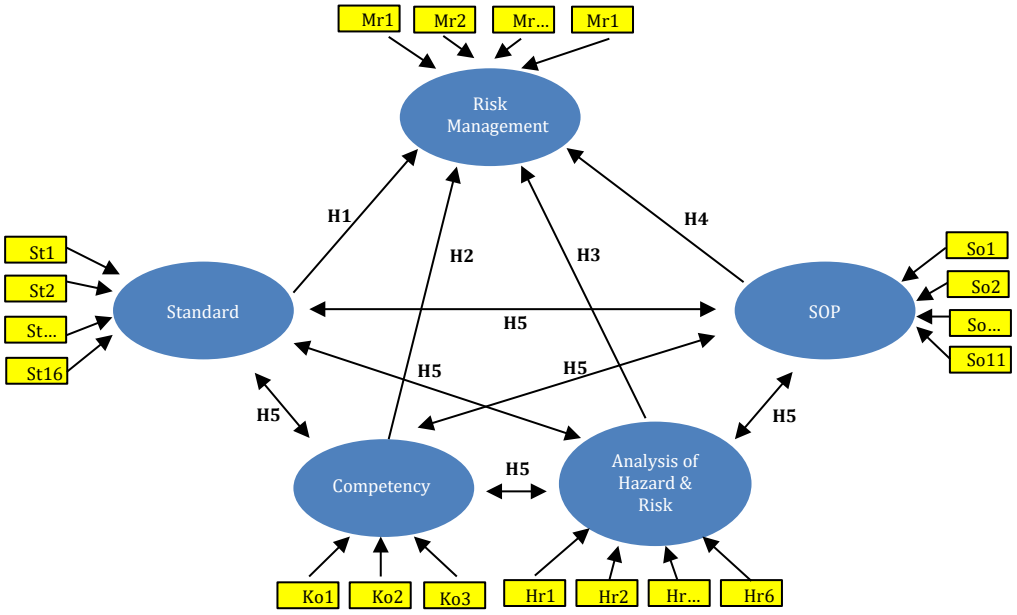

Figure 1a. Conceptual Framework

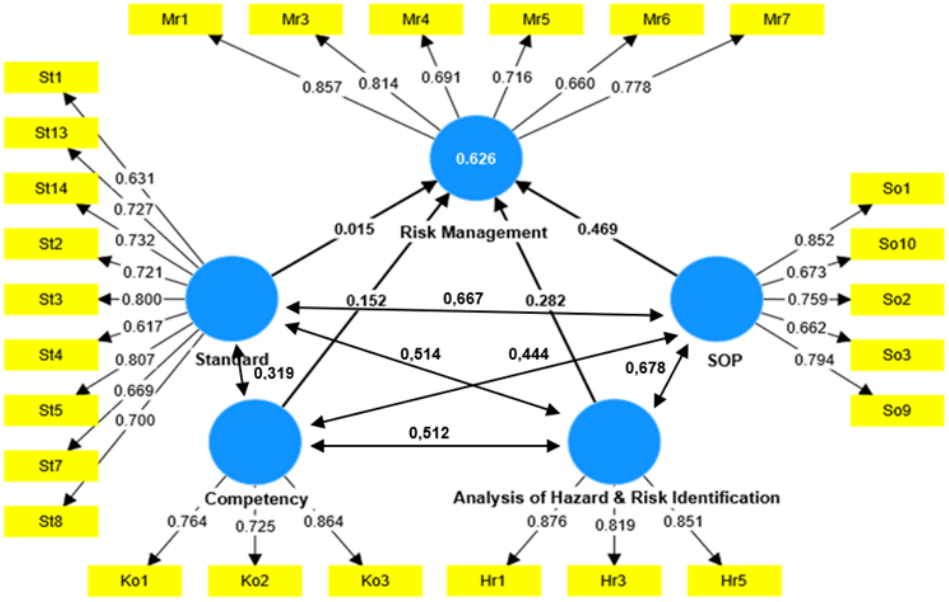

Figure 1b. Final Model of Factors that Affecting Hospital Risk Management in Indonesia

Many researchers are interested in the SEM-PLS method as it lets them estimate complicated models with many indicators and structural paths without assuming that the data is distributed in a certain way.[17,18] It could also be used with smaller sample sizes with higher coefficient values. The minimum path expected to be significant is between 0.21 and 0.3 at a significance level of 5%, which is 69 samples.[19]

Evaluation of reflective measurement model is the first step in using the SEM-PLS for analysis, then evaluation of the structural model. In assessing the reflective measurement model, the first step is to evaluate the reliability of the indicators for each latent variable in which the loading factor value is above 0.708. The indicator values could be considered between 0.4 and 0.708 as long as they meet the internal criteria of reliability, consistency, or convergent validity. Then, Cronbach's alpha value between 0.6 and 0.95 was used to check the reliability consistency. Finally, use an Average Variance Extracted (AVE) value >0.5 to check the model's validity. The final stage evaluates discriminant validity using the Heterotrait-Monotrait Ratio (HTMT Ratio) correlation value criterion; the recommended value is 0.9 or 0.85. Several things need to be looked at to examine how good the SEM model is when assessing the structural model. These

are collinearity (VIF <3), adjusted R2 and R2 values (0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, respectively), and Q2.[19]

Results

Most hospitals interviewed in this study were type C, with a total of 39, or 43.3%, and almost half of the total hospitals had complete accreditation status (48.9%). There were still quite a lot of hospitals with basic accreditation status (23.3%). From Table 2, information is also obtained that the number of human resources at the hospital is 476, with a very high range of 2.777.

The results in Table 3 show that the overall criteria for the goodness of the model in both reflective measurement model and structural model have been met, in which for reliability, the value of the loading factor for each indicator is in the range of 0.617 to 0.876. The Cronbach's alpha value of each latent variable ranges from 0.701 to 0.880. This model could also be valid in which the overall AVE value is >0.5, and the Heterotrait-Monotrait correlation value in Table 4 shows <0.9.

Table 5 shows a significant and positive predispose of hazard and risk identification analysis and SOPs on risk management in hospitals, with path values of 0.282 and 0.469, respectively. A correlation test was carried out between factor-variables, and all factor-variables have a positive correlation. The better the compliance with standards at the hospital, the better the competence (r = 0.319), hazard and risk identification analysis (r = 0.514), and SOPs (r = 0.667). Likewise, the better the competence, the better the analysis of hazards and risk identification (r = 0.512) and SOPs (r = 0.444). Lastly, the better the analysis of hazards and risk identification, the better the SOPs (r = 0.678).

Discussion

Based on the results of the hypothesis test (Table 5), there is no significant predispose between meeting standards and risk management, with a path coefficient value of 0.015. There were many reasons why fulfilling a standard did not have a direct predisposition to a hospital's risk management. In Figure 1b, nine selected indicators significantly measure the standard compliance variable, in which the three most dominant indicators are the availability of special Hazardous and Toxic Materials storage cabinets (loading factor = 0.807), monitoring of inventory, storage, handling, and use activities, Hazardous and Toxic Materials (loading factor = 0.8), and there is evidence of Hazardous and Toxic Materials procurement along with an MSDS from the supplier (loading factor = 0.732). If compliance with a standard has not been implemented optimally, such as compliance with basic provisions, codes, regulations, or applicable laws, weak supervision also predisposes the implementation of standards, affecting the process safety.[6,22] Hence, implementing standards is not optimal and does not affect risk management.

Competence had a positive relationship with risk management, although it was insignificant, with a path value of 0.152. This positive relationship means that the better the competence is, the tendency for aspects of hospital risk management would also be better. Process safety competence is an element of knowledge, behavioral skills, and attitudes needed to carry out work related to process safety. This component is very important in the successful implementation

Table 2. Distribution of Hospital Characteristics

Characteristic	Category	Number (n)	Percentage (%)
Hospital type*	A	9	10
	B	13	14.4
	B Special	2	2.2
	B Education	4	4.4
	C	39	43.3
	C Special	5	5.6
	D	18	20
	Total	90	100
Hospital status**	Plenary	44	48.9
	Main	17	18.9
	Intermediate	8	8.9
	Base	21	23.3
	Total	90	100
Number of hospital human resources	median [min; max]	476	[77; 2854]

Notes:

**Based on the Indonesian Ministry of Health Regulation No. 03 of 2020* [20]

***Based on the Indonesian Ministry of Health Regulation No. 12 of 2020* [21]

Table 3. Reflective Measurement and Structural Model

Latent Variable	Indicator	Reliability		Validity	VIF		R2	R2-adj	Q2
		Outer loading	Cronbach's alpha	AVE	Outer	Inner			
Standard	St1	0.631	0.880	0.510	1.441	1,914	0.626	0.608	0.617
	St13	0.727			1.728				
	St14	0.732			2.098				
	St2	0.721			2.205				
	St3	0.800			2.243				
	St4	0.617			1.63				
	St5	0.807			2.593				
	St7	0.669			1.696				
	St8	0.700			1.931				
Competence	Ko1	0.764	0.701	0.619	1.279	1,388			
	Ko2	0.725			1.422				
	Ko3	0.864			1.454				
Analysis of hazard & risk identification	Hr1	0.876	0.808	0.720	1.827	2,079			
	Hr3	0.819			1.766				
	Hr5	0.851			1.686				
Standard Operating Procedure	So1	0.852	0.807	0.565	2.151	2,656			
	So10	0.673			1.515				
	So2	0.759			1.48				
	So3	0.662			1.445				
	So9	0.794			1.727				
Risk management	Mr1	0.857	0.848	0.571	2.95	-			
	Mr3	0.814			2.401				
	Mr4	0.691			1.629				
	Mr5	0.716			1.633				
	Mr6	0.660			1.585				
	Mr7	0.778			1.821				

Table 4. Discriminant Validity

	Hr	Co	Mr	So
Analysis of Hazard and Risk Identification				
Competence	0.641			
Risk management	0.805	0.624		
Standard Operating Procedure	0.817	0.553	0.863	
Standard	0.571	0.397	0.602	0.824

Table 5. Hypothesis Test Results of Factors that Affecting Hospital Management in Indonesia and Correlation Between Factor-Variables

Hypothesis Test Results of Factors that Affecting Hospital Management in Indonesia					
Path		**Coeff**	**St. Dev**	**T-stat**	**P-value**
From	**To**				
Standard	Risk Management	0.015	0.097	0.158	0.875
Competency		0.152	0.089	1,711	0.087
Analysis of Hazard and Risk Identification		0.282	0.101	2,793	0.005*
Standard Operating Procedure		0.469	0.123	3,822	0,000*

Correlation between Factor-Variables			
Variable	**St**	**Ko**	**HR**
Standard	-		
Competency	0.319		
Analysis of Hazard and Risk Identification	0.514	0.512	
Standard Operating Procedure	0.667	0.444	0.678

of a process safety management program in the process industry at a hospital.[22] Based on significant indicators measuring the competency variable in this model, it could be said that within a 90% confidence interval, the better the determination of the coordinating officer or person in charge of the OHS-MS organization in the hospital who met the specific competence qualifications and education required, the clearer the functions and duties of the committee or installation. The hospital's OHS-MS was known, and the more precisely the person in charge of the hospital's OHS-MS organization was determined based on certain classifications or qualifications, the better the risk management would be.

Competence, collaboration, and independence are three pillars supporting effective risk management.[23] The sustainability of an organization is enhanced by including risk identification and assessment during strategy planning and

by implementing risk mitigation measures using good governance and compliance during strategy implementation. The suitability of qualifications of members appointed in the Hospital OHS-MS organization was the most dominant indicator describing the competence variable, in which the factor loading was the highest (0.864). The second highest indicator was the function and duties of the Hospital OHS-MS committee or installation (loading factor = 0.764), followed by the indicator of the suitability of qualifications of coordinating officers in the Hospital OHS-MS organization (loading factor = 0.725).

Competence can be defined as a person's ability to do certain work, and process safety competence is a competence related to inside prevention and mitigation.[23] It can be said that the ability to perform work related to process safety is determined by a person's knowledge and skills, which could be obtained through training. However, building process safety competence is more than that, as it requires establishing behaviors, attitudes, and mindsets necessary to perform process safety-related work efficiently, maintaining a chronic anxiety mentality allowing these individuals to continuously identify and solve process safety problems, and understanding the ever-changing boundaries of process safety knowledge to recognize the need for continuous improvement. Thus, process safety competency should be defined as a combination of knowledge, skills, behavior, and attitudes required to perform work related to process safety.[24] The findings of this study were consistent with a study by Majid *et al.*[25] on the impact of personnel competence on safety performance in the aviation sector, finding that airport personnel competence had a significant direct predispose on aviation safety performance of 81.8% and a significant direct predispose on safety risk management of 98.1%.

The third factor, hazard and risk identification analysis, had a positive and significant relationship to management in a hospital (path coefficient = 0.282). The better the identification of hazards and risk evaluation in a facility or hospital in all its activities, the better the implementation of risk management in the hospital. The three indicators that were the most dominant and included in the model, respectively, were that the hospital had prepared a strategic disaster management plan (hospital disaster plan), the hospital had taken an HVA, and the hospital had carried out a self-assessment analysis. Assessment of readiness to face emergencies used a Hospital Safety Index (HSI) from WHO, in which the path coefficient values were 0.876, 0.651, and 0.876, respectively. Risk assessment provides support for decision making in selecting between alternatives, accepting activities and products, and implementing risk reduction measures.[16]

The results of the HSI confirmed that hospitals needed to continue operating during a disaster, meaning it was very important to carry out regular HSI-level assessments. This study showed that the HSI scores of hospitals in Jakarta (0.766), West Java (0.673), and Special Region of Yogyakarta (0.709) provinces were in category A (scores between 0.66 and 1.00). It means that hospitals could provide services during and after a disaster. However, hospitals in the Special Region of Yogyakarta Province must improve their office and warehouse equipment and supplies, currently in category C.

On the other hand, hospitals in North Sumatra were in category B (score between 0.36 and 0.65) with a score of 0.507. Major and immediate improvements must be made to several things in terms of emergency and disaster management, which were still in category C, especially in terms of coordinating emergency and disaster management activities, hospital emergencies and disaster response and recovery planning, and communication and information management. Hospitals in category A would continue to function in emergencies and disasters. However, it is recommended that measures continue to increase emergency and disaster management capacity and that medium- and long-term measures should be taken to increase safety levels in the event of emergencies and disasters. Hospitals in Category B still have risks when facing disasters. It is recommended that all elements (structural, non-structural, and emergency disaster management) in hospitals be improved.[26] The average HSI level of the hospitals studied was B, indicating that their functional ability during and after emergencies and disasters is potentially at risk, so intervention measures are needed in the short term.[27]

Risk management is an important part of safety analysis, and hazard identification is the first step in a risk management process.[28] Hazard identification is a systematic project involving a lot of work. For effective identification purposes, hazard identification requires a participation of all workers across the institution, not departments or individuals. Hazard identification, assessment, and risk management are essential for safe and efficient industrial systems.[29] Hazard control and prevention efforts are significantly related to safety compliance, safety participation, safety motivation, and safety knowledge.[30]

According to a study in Iran,[31] several variables predispose the implementation of clinical risk management in hospitals, which are workers' understanding of risk management, policies and procedures related to risk management, training on risk management, and the position of the risk management program at the hospital. Risk identification and analysis are integral parts of risk management process.[32] This also means that if the hazard and risk analysis process is

implemented well, it will be directly proportional to the hospital's risk management quality.

The SOPs are written instructions, either in electronic or printed form, including steps related to tasks assigned and explain steps which must be carried out. In this study, the SOPs variable had a direct predisposition to risk management in hospitals, with a path value of 0.469. This coefficient value showed that SOPs were the most dominant variable in their predisposition to hospital management. A positive value means that the better the SOPs, the better the risk management aspect of the hospital will be. Good procedures also describe the process, hazards, equipment, protective equipment, and controls in sufficient detail so that operators understand the hazards, verify that the controls have been implemented, and confirm that the response process is in the intended manner.

In every work activity, SOPs must be available and easily accessed; existing SOPs must be documented, accurate, and regularly updated; and SOPs must be well maintained and enforced. In this study, the most important and dominant indicator for the SOPs variable for risk management was the presence of rules and regulations for managing supporting facilities and infrastructure systems. This indicator had the highest loading factor at 0.852. Furthermore, the second highest dominant indicator was that hospitals have SOPs related to emergency response (loading factor = 0.794), followed by the third indicator, the existence of SOPs for external parties such as contractors, suppliers, patients, visitors, patient deliverers, guests, and other external parties, with a loading factor of 0.759.

The combination of pair relationships between factor-variables (exogenous latent) had a positive relationship. This indicated that the better a factor-variable affects the goodness of other factor-variables, SOPs were a variable factor that had an important effect on good compliance with standards and high-risk and hazard identification analysis. Both show the highest correlation values in the model, respectively, 0.678 and 0.667. Due to limitations of this study, a more detailed discussion exhaustively analyzes a complex relationship between endogenous and exogenous variables, such as how standards and risk management interact through competence and SOPs. However, this topic deserves a comprehensive discussion in the future to shed more light on the subject.

Conclusion

This study finds SOPs to be the main element that positively influences risk management in Indonesian hospitals. Effectively-executed SOPs are strongly associated with high standards of hazard and risk identification studies conducted at hospitals. Increasing the quantity of hospital samples in Indonesia is recommended for future studies to make them more representative. Apart from interventions with factors that dominate risk management, integrating the Hospital OHS-MS with patient safety can be an alternative to boost the program.

Abbreviations

OHS-MS: Occupational Health and Safety Management System; OHS: Occupational Health and Safety; FGD: focus group discussion; SOPs: Standard Operating Procedures; SEM-PLS: Structural Equation Model Partial Least Square; WHO: World Health Organization; PPE: personal protective equipment; MSDS: Material Safety Data Sheet; HVA: hazard vulnerability analysis; HSI: Hospital Safety Index

Ethics Approval and Consent to Participate

This study has received ethical approval from the Research Ethics Commission, Faculty of Public Health, Muhammadiyah University, Jakarta, with Ethical Review Number 10.015.C/KEPK-FKMUMJ/I/2024.

Competing Interest

The authors stated that no ethical issues arose after the publication of the manuscript.

Availability of Data and Materials

This study used secondary data that can be accessed with permission from PP Aisyiyah Muhammadiyah.

Authors' Contribution

DD conceptualized and designed the study, collected data, and analyzed and interpreted the results. FM guided data analysis, review, and manuscript approval. BW provided the latest research literature, prepared and reviewed draft manuscripts. BB analyzed, interpreted the result, and reviewed it.

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