Original Article

Correlation of various risk management factors for risk control at general hospital: A cross-sectional study

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Abstract

Background: Hospitals are high-risk workplaces requiring effective risk management to protect healthcare workers, patients, and the environment. In Indonesia, implementing Hospital Occupational Health and Safety (K3RS) remains challenging, particularly in identifying factors that influence successful risk control.

Objective: To determine the factors associated with risk management at Dr. Rivai Abdullah General Hospital in Banyuasin and to identify the most dominant factor.

Methods: A quantitative study with a cross-sectional design involved 77 healthcare workers and managerial staff. Data were collected using a structured questionnaire and secondary documents, then analyzed with Spearman's rho correlation and multiple logistic regression.

Results: Significant factors associated with risk management included occupational health training (p=0.02), attitude (p=0.006), human resources availability (p=0.007), budget (p=0.010), facilities and infrastructure (p<0.001), effective communication (p<0.001), environment (p<0.001), and hospital occupational health and safety implementation (p=0.003). The most dominant factor was the environment (OR=0.016; 95%CI 0.002–0.130), explaining 35.1–48.1% of risk management variation.

Conclusion: Risk management is influenced by both individual and organizational factors, with the environment as the key determinant. Hospitals should prioritize improving the work environment, strengthening K3RS programs through monitoring and evaluation, enhancing inter-unit communication, and ensuring adequate support in human resources, budget, and training.

Background

Hospitals represent one of the highest-risk occupational environments due to their complex activities and the wide range of potential hazards that threaten both patients and healthcare workers. Such risks include exposure to infectious diseases, hazardous chemicals, ionizing radiation, as well as accidents related to medical equipment and the work environment. In addition, hospitals are vulnerable to extraordinary events such as fires and other internal disasters (Khoirotun Najihah et al., 2023).

National data indicate that occupational accidents in Indonesia remain relatively high. According to the Social Security Administration for Employment (BPJS Ketenagakerjaan), the number of recorded cases was 221,740 in 2020, rising to 234,370 in 2021, and reaching 265,334 in 2022 (Novianti & Windriya, 2023). Although these aggregated figures represent multiple industrial sectors, the increasing trend underscores the urgency of implementing occupational health and safety management

systems, particularly in hospitals. Unfortunately, specific data on occupational incidents within Indonesian hospitals, including at Dr. Rivai Abdullah General Hospital, remain limited and are rarely disseminated systematically. This highlights the importance of further research and documentation in the context of hospital occupational health and safety (K3RS).

International studies consistently report the elevated occupational risks in hospital settings. For instance, Bruyneel et al. (2025) found that excessive workload among healthcare professionals was associated with higher rates of occupational incidents and decreased patient safety. Similarly, Sulaiman et al. (2025) demonstrated that comprehensive occupational safety and health management systems significantly reduced accident rates in healthcare facilities. Moreover, Abdoos (2025) and Bailey & Lavelle (2025) emphasized that hospital-acquired infections remain one of the greatest threats to healthcare workers, thereby necessitating consistent mitigation strategies. These findings are particularly relevant in Indonesia, where healthcare workers frequently

interact with patients suffering from infectious diseases, thereby elevating occupational risk.

Hospital Occupational Health and Safety (K3RS) constitutes a fundamental component of hospital operations (Zulfahri & Juanita, 2025). K3RS aims not only to protect healthcare workers but also to ensure the safety of patients, visitors, and the hospital environment. With the increasing complexity of healthcare services, implementing effective risk management strategies has become a pressing challenge to achieve optimal risk control (Bruyneel et al., 2025; Bora et al., 2025; Gökalp, 2024).

Evidence further suggests that hospitals with well-implemented K3RS frameworks tend to report lower incident rates and higher job satisfaction among healthcare staff (Anandadiva et al., 2024). Structured risk management has also been shown to improve operational efficiency and service quality, thereby strengthening public trust in hospital care. Firmansyah (2022) highlighted that practical risk control measures—such as providing appropriate storage areas to prevent tripping hazards and ensuring adequate lighting in all hospital units—significantly reduced fatigue among staff and minimized environmental risks.

Implementing K3RS effectively should be regarded as a long-term investment for hospitals (Mantovani et al., 2024; Misini, Kustiani, & Astuti, 2025). By ensuring a safe work environment, hospitals can enhance workforce quality, reduce the financial burden of occupational incidents, and strengthen public confidence in healthcare services (Zhu et al., 2024; Zhang et al., 2024). Risk management thus plays a critical role in safeguarding both staff and patients, particularly at Dr. Rivai Abdullah General Hospital, Banyuasin. However, its implementation continues to face various challenges that may exacerbate potential hazards.

Accordingly, this study aims to identify the factors influencing risk management in general hospitals.

Methods

Study Design

This study employed a quantitative approach with a cross-sectional design. The cross-sectional design was chosen because it allows the measurement of both independent and dependent variables within a single period of time, without follow-up on the same respondents. In other words, all data were collected simultaneously, providing a snapshot of the relationships among variables at the point of measurement. As noted by Notoatmodjo (2020), this design is appropriate for assessing cause-and-effect relationships in a rapid, efficient, and practical manner within public health and nursing research. The study was conducted at Dr. Rivai Abdullah General Hospital, Banyuasin, a referral hospital with high service complexity and an ongoing risk management program. Data collection took place in May 2025, coinciding with the scheduled monitoring of the Hospital Occupational Safety and Health/Patient Safety and Quality Improvement (K3RS/PMKP) program, thereby ensuring data relevance.

Sampling

The study population consisted of all healthcare personnel and managerial staff directly involved in hospital risk management implementation. The total population was identified through hospital staffing records and related unit reports. The sample size was determined using Slovin's formula with a specified margin of error, resulting in 77 eligible respondents. A purposive sampling technique was applied, with inclusion criteria as follows: (1) healthcare personnel with a minimum of one year of service at Dr. Rivai Abdullah General Hospital, (2) direct involvement in risk management activities, (3) willingness to participate as indicated by signing informed consent, and (4) presence during data collection. Respondents not meeting the inclusion criteria or who declined participation were excluded. Purposive sampling was deemed appropriate because the study required participants who were directly relevant to the phenomenon under investigation.

Instruments

Data were collected using a structured questionnaire developed based on hospital risk management theory and the concept of Hospital Occupational Safety and Health (K3RS). The questionnaire comprised two main sections: (1) respondent characteristics, including age, education, position, length of service, and unit of work; and (2) research variables covering

internal and external factors such as occupational safety training, use of personal protective equipment (PPE), knowledge, attitudes, availability of human resources, budget allocation, facilities and infrastructure, effective communication, environmental conditions, and implementation of K3RS.

Data Collection

Data were obtained from both primary and secondary sources. Primary data were collected directly from respondents through the self-administered questionnaire. Prior to distribution, the researcher explained the study objectives, procedures for completing the questionnaire, and confidentiality assurances. Questionnaires were completed independently by respondents under the supervision of the researcher to minimize bias. Secondary data were collected through a review of hospital documents, including annual reports, human resources data, K3RS/PMKP program reports, and financial reports related to patient safety and risk management budget allocation. Data collection was conducted over a two-week period with a 100% response rate. To ensure data quality, verification and cross-checking of completed questionnaires were performed to avoid missing or incomplete responses.

Data Analysis

Data were analyzed using SPSS software. Analysis was conducted in several stages. First, univariate analysis was performed to describe the frequency distributions and percentages of respondent characteristics and study variables. Second, data normality was tested using the Kolmogorov-Smirnov test. Since the results indicated non-normal distribution ($p < 0.05$), Spearman's rho correlation was used for bivariate analysis to assess the strength and direction of associations between independent variables (risk management factors) and the dependent variable (risk management implementation). Third, multivariate analysis was performed using multiple logistic regression to identify the most influential factors. Logistic regression was chosen because the data did not meet the assumptions for multiple linear regression. Independent variables with a significance level of $p < 0.25$ in bivariate analysis were included in the regression model. Results were presented as odds ratios (OR) with 95% confidence intervals (CI) to indicate the relative risk of each factor. The Cox & Snell R Square and Nagelkerke R Square values were also reported to assess the explanatory power of the model.

Ethical Considerations

This study adhered to the ethical principles of health research, including beneficence, respect for persons, and justice. Ethical clearance was obtained from the Health Research Ethics Committee of the relevant institution prior to data collection. Respondents were provided with an information sheet detailing the study's objectives, procedures, benefits, and potential risks. Written informed consent was obtained after respondents reviewed and understood the information. Participation was voluntary, with respondents free to withdraw at any stage without consequences. Confidentiality was ensured by coding respondent identities and restricting data use to research and scientific publication purposes. Research findings were presented in aggregate form without identifying individual respondents, thereby maintaining anonymity.

Results

This section presents the distribution of respondent characteristics in the study on factors influencing risk management in general hospitals. The characteristics assessed included age, educational background, professional position, length of service, and work unit. These demographic and professional attributes provide an overview of the profile of healthcare workers and managerial staff involved in risk management implementation.

The majority of respondents were in the age group of 30–39 years (45.5%). In terms of educational attainment, most held a bachelor's degree (62.3%). Regarding professional position, the largest proportion were healthcare workers (54.5%), while unit managers (23.4%) and members of the Hospital Occupational Health and Safety/Quality Improvement (K3RS/PMKP) team (22.1%) were also represented. With respect to length of service, the highest proportion of respondents had 5–10 years of work experience (44.2%), reflecting sufficient tenure to understand the context of risk management. In terms of work unit distribution, most respondents were from the

Management/K3RS/PMKP Unit (31.1%), followed by inpatient wards (20.8%) and the emergency department (13%). This distribution indicates cross-unit involvement, encompassing both clinical and managerial settings, in the implementation of hospital risk management.

Table 1 presents the frequency distribution of responden.

Table 1. Frequency Distribution of Respondents by Demographic Characteristics

Variables	Frequency (n)	Percentage (%)
Age		
< 30 years	20	26
30–39 years	35	45,5
≥ 40 years	22	28,5
Education		
Diploma (D3)	15	19,5
Bachelor's degree (S1)	48	62,3
Master's degree (S2)	14	18,2
Position		
Healthcare worker	42	54,5
Unit manager	18	23,4
K3RS/PMKP team member	17	22,1
Length of Service		
< 5 years	21	27,3
5–10 years	34	44,2
>10 years	22	28,5
Work Unit		
Emergency Department	10	13
Inpatient Ward	16	20,8
Intensive Care Unit and Operating Room	7	9,1
Laboratory and Radiology	5	6,5
Pharmacy Department	6	7,8
Outpatient Clinic	9	11,7
Management Unit/K3RS/PMKP	24	31,1

Table 2. Association of Factors with Risk Management in General Hospitals

Variabel	Median	Minimum-Maximum	r	pvalue
Occupational safety training	10	10-14	0,265	0,02
Use of personal protective equipment (PPE)	10	10-16	0,266	0,19
Knowledge	10	9-15	0,242	0,34
Attitude	10	10-15	0,313	0,006
Availability of human resources	10	9-17	0,308	0,007
Availability of budget	13	9-17	0,291	0,010
Facilities and infrastructure	11	10-14	0,401	0,000
Effective communication	12	10-16	0,439	0,000
Environmental conditions	12	10-15	0,609	0,000
Implementation of K3RS	11	10-14	0,339	0,003

The analysis presented in Table 2 indicates that several variables were significantly associated with hospital risk management. Occupational safety training (r = 0.265; p = 0.020), attitude (r = 0.313; p = 0.006), availability of human resources (r = 0.308; p = 0.007), budget availability (r = 0.291; p = 0.010), facilities and infrastructure (r = 0.401; p < 0.001), effective communication (r = 0.439; p < 0.001), environmental conditions (r = 0.609; p < 0.001), and the implementation of K3RS (r = 0.339; p = 0.003) showed statistically significant associations. Among these, environmental conditions demonstrated the strongest relationship (r = 0.609), suggesting that the hospital environment plays a dominant role in supporting effective risk management. Conversely, the use of PPE (p = 0.190) and

knowledge (p = 0.340) were not significantly associated with risk management. Overall, these findings highlight that structural and organizational aspects (human resources, budget, facilities, and communication), together with behavioral factors (attitudes), make substantial contributions to the effectiveness of hospital risk management.

Table 3. Multivariate Logistic Regression Analysis of Factors Influencing Risk Management in General Hospitals

Variable	B	Sig. (p-value)	OR	95%CI
Environmental conditions	-4,159	0,000	0,016	0,002-0,130
Constant	2,773			

The logistic regression analysis presented in Table 3 indicates that environmental conditions were the most influential factor affecting risk management in hospitals. The regression coefficient (B) was –4.159 with a p-value of 0.000, indicating a highly significant association. The odds ratio (OR) of 0.016 with a 95% confidence interval (0.002–0.130) demonstrates that unfavorable environmental conditions drastically reduce the likelihood of effective risk management implementation. Furthermore, the Cox & Snell R Square value of 0.351 and the Nagelkerke R Square value of 0.481 suggest that the regression model explains 35.1% to 48.1% of the variance in hospital risk management, while the remaining proportion is influenced by factors outside the model. These findings underscore that environmental conditions are a key determinant that must be prioritized by hospitals in strengthening the implementation of risk management.

Discussion

The findings at Dr. Rivai Abdullah General Hospital, Banyuasin, revealed that occupational safety training had a significant association with risk management. Although the training instrument still requires refinement—given that only half of the items demonstrated validity—its reliability was high, with a Cronbach's alpha of 0.818, confirming its utility in capturing healthcare workers' perceptions of safety training. This supports Robbins' theory, which emphasizes that training must be aligned with actual workplace needs, using clear indicators to optimally support risk control in hospitals.

In addition to training, the use of personal protective equipment (PPE) was also correlated with occupational risk control. The study showed that nine out of ten items assessing PPE use were valid, and the instrument demonstrated very high reliability with a Cronbach's alpha of 0.893. This finding aligns with Geller's theory, which underscores the importance of measuring observable workplace behaviors to evaluate occupational safety. Managerial support, PPE availability, and healthcare worker compliance were identified as critical factors supporting the effectiveness of PPE use in hospitals.

Healthcare workers' knowledge levels were also linked to hospital risk management practices. The validity test revealed that seven of nine knowledge items were valid, with very high reliability (Cronbach's alpha = 0.926). This supports Bloom's theory, which posits that knowledge can be assessed through structured and specific questions. The study further highlighted the importance of clearly worded, relevant, and experience-based items to ensure accurate measurement of healthcare workers' knowledge levels (Enggriani, & Haryati, 2024).

Beyond knowledge, healthcare workers' attitudes toward hospital occupational health and safety (K3RS) were significantly related to the effectiveness of risk control. The attitude instrument demonstrated seven valid items out of ten, with high reliability (Cronbach's alpha = 0.870). Consistent with Azwar's theory, attitudes encompass cognitive, affective, and conative dimensions, all of which must be adequately represented in assessment items. Supportive attitudes toward safety procedures, PPE use, and individual commitment emerged

as key determinants of successful K3RS implementation in hospitals.

The study also identified a significant association between the availability of human resources (HR) and risk management. Out of nine HR-related items, seven were valid with a reliability value of 0.899. This finding reinforces Handoko's theory on the importance of adequate workforce quantity, competence, and distribution in supporting K3RS. HR evaluation should therefore address not only the number of staff but also their quality and placement according to the needs of each hospital unit.

Budget support was likewise found to influence the effectiveness of K3RS implementation. Although only six of nine items were valid, the instrument demonstrated very high reliability (Cronbach's alpha = 0.921). The perspective of the World Health Organization and prior studies confirm that sufficient and transparent financial allocation is critical for occupational safety program success. Budgetary provisions for PPE procurement, training, and facility improvement are essential elements for optimal risk control in hospitals.

Facilities and infrastructure were also shown to play an important role in supporting risk management. Despite only five of ten items demonstrating validity, the instrument maintained acceptable reliability (Cronbach's alpha = 0.794). This finding is consistent with Notoadmodjo's theory and other studies, which emphasize that the availability of physical facilities—such as safety equipment, evacuation routes, and workspace design—contributes significantly to creating a safe and healthy work environment. Continuous refinement of facility-assessment instruments is necessary to ensure they accurately reflect the actual conditions in each service unit (Agustina, Mustikawati, & Mulyani, (2025).

Finally, logistic regression analysis revealed that environmental conditions emerged as the dominant factor influencing risk management at Dr. Rivai Abdullah General Hospital. Although only two items were valid, the instrument's reliability remained acceptable. This finding is consistent with OSHA's framework and Nugraheni et al., who emphasize that physical environmental factors—including lighting, ventilation, cleanliness, and workspace organization—are critical to the effectiveness of K3RS systems. Hospitals must therefore prioritize improving workplace environmental conditions as a primary strategy to strengthen risk management and ensure the safety of both healthcare workers and patients.

Conclusion and Recommendation

This study demonstrates that hospital risk management is influenced by multiple factors at both the individual and organizational levels. Training, healthcare workers' attitudes, availability of human resources, budgetary support, facilities and infrastructure, effective communication, and environmental conditions were all found to contribute to the successful implementation of risk management. Among these, environmental conditions emerged as the most dominant factor, underscoring that a safe, well-organized, and conducive work environment is a critical prerequisite for establishing an effective hospital risk management system.

Hospitals are therefore advised to prioritize the improvement and maintenance of workplace environments as a primary strategy to strengthen risk management implementation. Furthermore, hospital occupational health and safety programs (K3RS) should be reinforced through regular monitoring, periodic evaluation, and integration with quality improvement systems to ensure a balance between patient safety and worker protection. Continuous human resource development through training and the cultivation of positive attitudes toward risk management should also be sustained, supported by adequate budget allocation and sufficient facilities. In addition, inter-unit communication must be enhanced to ensure that information on potential risks can be addressed promptly and appropriately.

Future research is recommended to explore additional factors beyond the scope of this study, such as organizational culture and leadership styles, in order to provide a more comprehensive understanding of the

determinants of successful risk management in hospitals.

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Declaration of conflict of interest

The authors declare no competing interests.

Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

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