



Predictors of Nurses' Readiness in Code Blue Events: A Quantitative Analysis

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ABSTRACT

Introduction: intra-hospital cardiac arrest (IHCA) is a life-threatening emergency requiring rapid and coordinated responses through a hospital emergency system known as code blue. Nurses are often the first responders, and their readiness directly influences patient survival outcomes. While most previous studies have focused on clinical timelines, protocol compliance, or simulation-based technical training, little attention has been given to the psychological and organizational determinants of readiness in real clinical settings. This study address this gap by examining how organizational, psychological, training and practical skill factors collectively influence nurses' readiness in Code Blue situations within resource-limited hospital. **Objective:** this study aimed to analyzed predictors of nurses' readiness in code blue response, emphasizing the relative contributions of organizational, psychological, training, and practical skill factors. **Methods:** This study applied a quantitative-explanatory design among 30 nurses assigned to the Code Blue team. Data were collected using validated structured questionnaire and analyzed using binary logistic regression. Instrument reliability was confirmed with Cronbach's alpha values above 0.70 for all subscales. Model assumptions were tested (VIF <5), and model fit was assessed using the Hosmer-Lemeshow test ($p=0.42$) and Nagelkerke pseudo- $R^2 = 0.776$. **Result:** Organizational factors were the only statistically significant predictor of nurses' readiness ($B=0.842$, $p=0.003$, OR 2.32). Practical skills showed a positive but non-significant trend ($p=0.070$) while psychological ($p=0.352$) and training ($p=0.881$) were not significant. These findings suggest that system-level and structural support play a more decisive role than individual attributes in shaping readiness.

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1. INTRODUCTION

Intra-hospital cardiac arrest (IHCA) is a serious condition defined as the application of chest compressions with or without a defibrillator to a patient who is being treated in an inpatient bed (Penketh & Nolan, 2022). Although IHCA carries a high risk of death, mortality rates among these patients have shown a downward trend over time (Jerkeman et al., 2022; Penketh & Nolan, 2022). Research shows that initiating CPR within 1 minute, defibrillation within 2 minutes, and administering epinephrine within 5 minutes are correlated with improved survival rates after cardiac arrest. However, survival rates still vary significantly between hospitals. Although the American Heart Association (AHA) guidelines have recommended these interventions, several factors can hinder the effective and timely implementation of these interventions (Guetterman et al., 2019; Mentzelopoulos et al., 2021).

IHCA is a dynamic event that requires rapid intervention from highly skilled individuals, with the support of coordinated teamwork and effective communication (Anderson et al., 2021). One way to improve survival rates in IHCA is to implement a special system or code that facilitates patient management in hospitals. The globally recognized hospital emergency code is designed to provide a rapid and coordinated response in emergency situations, particularly cardiac arrest, by efficiently conveying information about the emergency condition to the relevant medical team (Çetin et al., 2023). The code blue system is an essential component of emergency care for IHCA patients, involving a specialized team of certified doctors and nurses (Wiliastuti et al., 2018). This team is responsible for performing life-saving measures, such as Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS), with the support of emergency equipment such as medical carts, defibrillators, intubation equipment, oxygen, ambu bags, and resuscitation medications (Anjorin, 2020). Previous research has shown that the implementation of Code Blue with a professional team and effective execution can improve patient survival rates, making this system an important standard for hospitals (Çetin et al., 2023; Kuday Kaykisiz et al., 2017). The implementation of code blue has proven to be effective in improving patient survival rates; however, the implementation of code blue still faces various challenges. These challenges include code blue activation errors (activated by first responders in the inpatient ward), team response time, and communication issues between leaders and team members (Kuday Kaykisiz et al., 2017; Spitzer et al., 2019).

As a system that requires teamwork, each team member must possess unique skills, expertise, and dedication to ensure swift and effective care for patients in need (McWhirter et al., 2022). Nurses, as part of the medical team in Code Blue, play a crucial role and are expected to respond quickly, accurately, and effectively to improve patients' chances of survival (Tezcan Keleş et al., 2021). Anderson (2019) demonstrated that one effective way to enhance nurses' skills and confidence in handling emergency situations is through medical training and simulations (Anderson et al., 2021). However, these studies still focus on technical aspects and practical skills, without exploring in depth the psychological factors, organizational culture, and management support that can influence nurses' readiness to respond to code blue calls. In Indonesia, research related to code blue more often discusses the implementation of protocols without looking at individual readiness and support systems holistically (Basuni et al., 2024).

The concept of “readiness” in this context refers to a nurse’s multidimensional state of preparedness – encompassing cognitive, affective, and behavioral readiness – to act effectively under emergency conditions. Unlike competence, which emphasizes the possession of knowledge and skills, or confidence, which reflect belief in one’s abilities, readiness represents a dynamic integration of motivation, capability, and situational adaptability (Khosravi et al., 2022).

In this study, nurses’ readiness is conceptualized as an outcome influenced by four interrelated domains: organizational, psychological, training, and practical skill factors. Drawing on the framework of organizational readiness for change (Weiner, 2020), and Bandura’s social cognitive theory (Bandura, 1997), these dimensions interact to determine how nurses translate capability and confidence into real performance during emergency response.

Specifically, organizational readiness provides the structural and leadership support necessary for effective coordination; psychological readiness shapes emotional resilience and self-efficacy; training readiness strengthens learned response patterns through repetition; and practical readiness ensures the mastery of clinical skills required during code blue activation. This integrative framework allows the current study to examine how these determinants collectively influence nurses’ readiness in hospitals with limited resources.

A lack of in-depth understanding of non-technical factors can affect nurses' readiness to respond to code blue calls, especially in hospitals with limited resources. Therefore, this study seeks to bridge that gap by articulating a clearer conceptual model of readiness and by identifying key determinants that shape nurses’ preparedness in resource-constrained hospital environments.

While previous studies have predominantly focused on clinical timelines, procedural compliance, and simulation-based technical training, there remains a notable lack of empirical investigation into the non-technical dimensions of readiness, particularly psychological and organizational factors that shape real-world performance during Code Blue events. By explicitly addressing this understudied area, the present study contributes new insight into how system-level and human factors interact to influence nurses’ readiness within resource-limited hospital settings.

2. METHODS

This study employed a quantitative analytic design rather than purely descriptive, as it aimed not only to describe but also to examine relationship between predictor variables and the outcome variable – nurses’ readiness in responding to code blue calls. Data were collected using a structured questionnaire and analyzed with binary logistic regression to determine the relationship between independent variables and nurses’ readiness. Accordingly, the study followed a predictive-explanatory approach, design to identify key determinants and estimated the likelihood of readiness based on measurable organizational, psychological, and skill-related factors.

The sampling process involved a total of 60 eligible nurses who were members of or assigned to the hospital code blue response team. After screening for inclusion and exclusion criteria, 30 respondents met the final eligibility requirements and completed the questionnaire. Inclusion criteria consisted of: (1) registered nurses working in inpatient wards or emergency units, (2) active involvement or assignment in code blue response duties, and (3) willingness to participate voluntarily. Exclusion criteria included nurses currently on leave or those who had participated in less than one code blue activation during the past year. The reduction from 60 to 30 respondents reflected the application of these criteria and ensured data integrity.

Research Design

This study adopted a quantitative analytic cross sectional design was chosen because it allows for the identification of associations between selected independent variables (organizational, psychological, training, and practical skill factors) and the dependent variable (nurse readiness). This design support explanatory interpretation while maintaining transparency in data representation.

Population and Sample

The final study sample consisted of 30 respondents, selected through purposive sampling based on the above inclusion criteria. While relatively small, this sample size was adequate for preliminary logistic regression analysis, which typically requires a minimum of 10 events per variable to ensure model stability. The focus on code blue-assigned nurses enabled targeted insight into readiness-related determinants in resources-limited hospital context. Although the final sample (n=30) met the minimum statistical recommendation for logistic regression, it remains relatively small and may limit model generalizability. The study mitigated this by maintaining strict inclusion criteria and model parsimony to reduce overfitting risk.

Instrument

Data were collected using a structured questionnaire that had been developed and refined to ensure clarity, reliability and relevance. The instrument comprised four sections aligned with the conceptual framework: (1) organizational support, (2) psychological readiness, (3) training and simulation exposure, and (4) practical skill self-assessment. Each item was measured on an ordinal Likert-type scale. Prior to data collection, the instrument underwent expert validation for content and face validity. Internal consistency reliability was examined using Cronbach's alpha, yielding coefficients above 0.70 for all subscales, indicating acceptable reliability.

Research Procedure

Respondents completed the questionnaire individually, with the process standardized across all participants to minimize bias. Ethical considerations, including voluntary participation, informed consent, and confidentiality of response, were strictly observed throughout the study.

Data Analysis

All responses were coded and entered into Jamovi ver 2.3.28 for analysis. **Binary** logistic regression was applied to identify significant predictors of nurses readiness. Multicollinearity among independent variables was examined using the Variance Inflation Factor (VIF), and all values were within acceptable thresholds (<5), indicating no multicollinearity issues. Goodness-of-fit was evaluated using Hosmer-Lemeshow test and Nagelkerke R^2 to assess model performance, which provided a more appropriate assessment than normality testing, as logistic regression does not assume normal distribution of residuals (Tavakol & Dennick, 2011). The final model provided odds ratios (OR), confidence intervals (CI), and p-values for each predictor, ensuring interpretability and transparency of results. Future studies should expand sample size, incorporate longitudinal data, and employ broader data management strategies to strengthen the predictive robustness and reproducibility of findings.

Ethical Clearance

This study was conducted in accordance with established ethical principles for research involving human participants. Prior to data collection, the research protocol was reviewed and approved by the Research Ethics Committee University of 'Aisyiyah Bandung, under approval number 1197/KEP. 01/UNISA-BANDUNG/IV/2025.

All participants were provided with clear information regarding the study objectives, procedures, and their rights as respondents. Informed consent was obtained from each participant before data collection, and participation was entirely voluntary. Respondent were assured that their identities would remain confidential and that the data collected would be used solely for research purposes. To ensure anonymity, no personal identifiable information was recorded.

3. RESULT

This study analyzed the relationship between organizational, psychological, training, and practical skill factors with nurses' readiness in responding to code blue calls. Descriptive statistics indicated that most respondents had attended resuscitation training within the past year and had prior involvement in at least one code blue event.

The binary logistic regression analysis revealed that the overall model demonstrated a good fit, as indicated by the Hosmer-Lemeshow goodness-of-fit test ($p=0.42$) and a Nagelkerke pseudo- $R^2 = 0.776$, suggesting that approximately 77.6% of the variance in readiness could be explained by the independent variables. All the predictor variables were entered simultaneously into the model, and no multicollinearity issues were detected ($VIF < 5$ for all predictors).

Table 1 presents the logistic regression results, including regression coefficients (B), standard error, Wald statistics, significance values (p-value), and odds ratios (Exp(B)) for each independent variable.

Table 1. Binary Logistic Regression Analysis of Factors Influencing Nurses' Readiness in Code Blue Response

| Variable | B | SE | Wald | Sig. (p) | Exp(B) |
|------------------------|-------|-------|-------|----------|--------|
| Organizational Factors | 0.842 | 0.275 | 9.388 | 0.003* | 2.321 |
| Psychological Factors | 0.317 | 0.334 | 0.867 | 0.352 | 1.373 |
| Training & Simulation | 0.056 | 0.389 | 0.022 | 0.881 | 1.057 |
| Practical Skills | 0.641 | 0.351 | 3.272 | 0.070 | 1.898 |

* $p < 0.05$ indicates statistical significance

As shown in Table 1, organizational factors had a statistically significant effect on nurses' readiness ($p = 0.003$), with an odds ratio of 2.321. This indicates that nurses with strong organizational support were more than twice as likely to be ready during code blue events. Although Practical skills exhibit a positive coefficient ($B=0.641$), the value ($p = 0.070$) exceeds the conventional 0.05 significant threshold. Therefore, while the direction of association is suggestive, this should not be interpreted as statistically significant evidence of an effect. Psychological factors ($p=0.352$) and training/simulation ($p=0.881$) were not significant predictors of readiness, indicating that these variables did not independently influence the likelihood of readiness in this model.

These findings highlight the crucial role of organizational support in enhancing nurse preparedness for emergency code blue responses, while practical skills remain an important secondary factor.

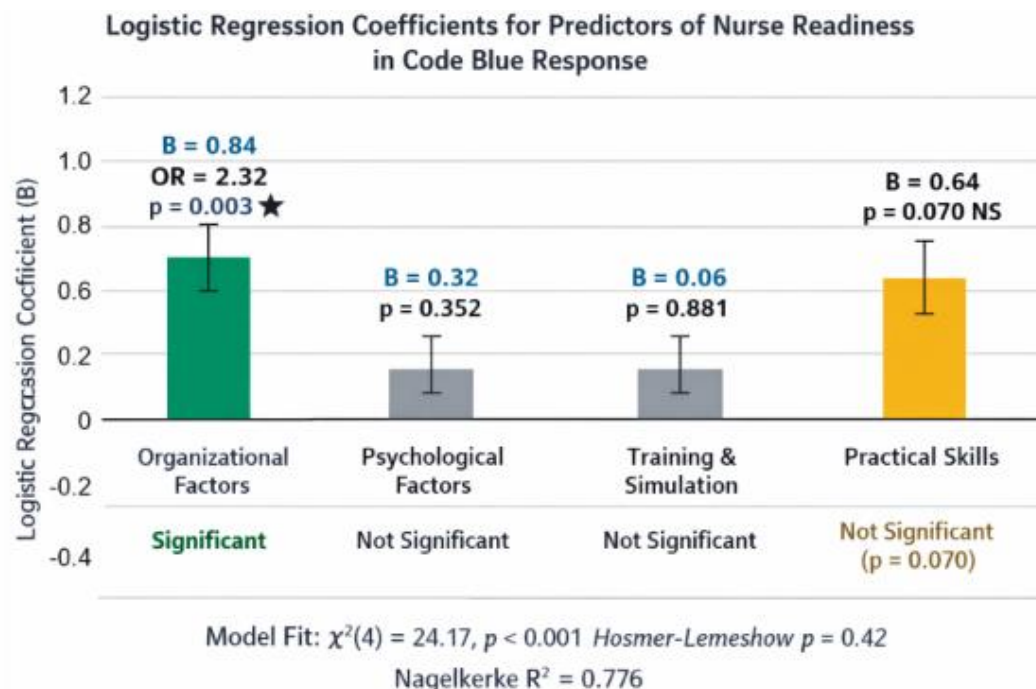


Figure 1. Binary Logistic Regression Coefficients of The Predictors of Readiness

This figure presents the logistic regression coefficients (B) and corresponding odds ratios (OR) for each independent variable predicting nurses' readiness during Code Blue events. Positive coefficients indicate a higher likelihood of readiness, while negative or near zero coefficients indicate minimal effect. The figure confirms that organizational factors were the only statistically significant predictor ($p=0.003$) with an OR of 2.32. Practical skills showed a positive but non-significant trend ($p=0.070$), while psychological factors ($p=0.352$) and training/simulation ($p=0.881$) were not significant.

4. DISCUSSION

Taken together, this study highlights the organizational dimension as the most significant factor in determining readiness, while other dimensions—psychological, training, practical skills—though theoretically relevant, were not statistically significant here. The literature comparison underscores a shift from individual-centered explanations toward systemic, organizational determinants of readiness.

Organizational Factors

This study found that organizational factors significantly influenced nurses' readiness in responding to code blue events. Hospitals with strong organizational support, such as clear standard operating procedures (SOP), effective team communication, and adequate resources, showed higher preparedness levels among nurses. Previous research supports this, highlighting

that a positive organizational climate enhances nurse performance and innovation, thereby improving emergency response outcomes (Sun et al., 2024). Furthermore, organizational culture and leadership are recognized as key predictors of evidence-based nursing practices, which indirectly strengthen readiness during critical situations (Hu et al., 2024).

These findings are consistent with the concept of organizational readiness proposed by Weiner (2009), which posits that collective efficacy and commitment within organizations determine how effectively teams mobilize during emergencies. In the context of resources-limited hospitals, managerial support and efficient coordination may serve as compensatory mechanisms for limited material or human resources.

Psychological Factors

Although psychological factors were not statistically significant in this study, they remain important for overall preparedness. Stress, anxiety, and fear of failure can impair decision-making and delay interventions during code blue situations. Literature suggests that psychological resilience and confidence in skills contribute to better performance during emergencies (Kim, 2024). The absence of statistically significant in this dimensions should be interpreted as inconclusive rather than indicative of irrelevance. The limited sample size and potential homogeneity among respondents – most of whom had previous Code Blue experience – may have reduced the variability necessary to detect significant effects (Cumming & Calin-Jageman, 2024). Additionally, self-reported measures of psychological readiness may have been influenced by social desirability bias or underreporting of stress levels. Future studies using validated psychological assessment instruments and larger samples are needed to clarify this relationship.

Training and Simulation

Interestingly, training and simulation did not significantly affect nurse readiness in this study. This contrasts with existing literature emphasizes that continuous in-service training and simulation are essential for maintaining clinical competency and emergency responsiveness (Choopani et al., 2024). This non-significant should again be cautiously. It may reflect *measurement saturation* – where most respondents had already received similar training, leading to reduced between – subject variation (Flanagan, 2024). Alternatively, the perceived quality and contextual relevance of training sessions may vary, influencing their impact on readiness. Future research should examine not only the frequency of training but also its pedagogical quality, realism, and integration into routine clinical practice.

Practical Skills

Practical skills were found to have marginal significance, suggesting a possible relationship with readiness. Nurses with stronger clinical competencies, especially in resuscitation and airway management, are more confident and effective during code blue situations. However, given that the observed *p*-value exceeded the standard significance threshold, this should not be interpreted as statistical evidence of an association (Kim, 2024). Instead, practical skill development may operate indirectly through organizational and training pathways, skills are often cultivated in supportive environments that provide access to mentoring and simulation opportunities.

Limitations

Several limitations should be acknowledged to provide balanced interpretation. First, the relatively small sample size ($n=30$) limits generalizability and may have reduced statistical power to detect subtle effects in psychological or training-related variables. Second, the cross-sectional design precludes casual inference; readiness may fluctuate over time or be influenced by unmeasured contextual variables. Third, reliance on self-reported measures may introduce response bias, particularly in domains involving confidence or perceived skill. Finally, the absence of multi-site data restrict external validity, especially for broader application across diverse hospital settings.

Despite these limitations, this study contributes valuable preliminary evidence supporting the primacy of organizational support as a determinant of nurse readiness in Code Blue context, especially within resources-limited hospitals.

Evidence Synthesis

Overall, the findings emphasize that readiness is best understood as a systemic construct, shaped by the organizational environment and supported by individual competencies. While this study underscores the importance of structural and managerial factors, it also highlights the need to explore how psychological readiness and continuous professional development interact with institutional frameworks to enhance real-time response capability.

5. CONCLUSION

This study demonstrated that nurses' readiness in responding to code blue calls is predominantly influenced by organizational factors, highlighting the central role of management structures, communication system, and supportive leadership in shaping effective emergency response. The logistic regression analysis identified organization factors as the only statistically significant predictor of readiness, while practical skills showed a positive but statistically non-significant trend.

Psychological factors and training/simulation were not found to be significant in this dataset. However, these results should be interpreted with caution. The absence of statistical significance does not imply that such factors are unimportant in clinical settings but may reflect sample size limitations, restricted variability, or measurement constraints. Further research with larger and more diverse samples is warranted to explore these associations more comprehensive.

The findings emphasize the need for hospital management to prioritize organizational readiness, including the establishment of clear standard operating procedures (SOP), structured code blue protocols, effective interprofessional communication, and adequate resource allocation. Strengthening these systemic components can indirectly enhance individual competencies and psychological preparedness, fostering a culture a coordinated and confident emergency response. From a practical standpoint, integrating ongoing simulation-based training with organizational policy and performance evaluation system could create sustainable readiness improvements. From a research perspective, future studies should employ mixed-methods or longitudinal designs to capture dynamic aspects of readiness and to investigate mediating relationship between organizational climate, psychological resilience, and skill competence.

Overall, while the current findings provide empirical support for the organizational determinant of nurse readiness in resource-limited hospitals, broader and methodologically diverse investigations are needed to fully understand how individual and institutional factors interact to optimize Code Blue performance and patient outcomes.

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7. CONFLICT OF INTEREST

The authors declare that there are no conflict of interest related to the research, authorship, or publication of this article.

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