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Application of the Sterling-Darling Technique in Designing an Organizational Whistleblowing Model (Systematic Disclosure) in the Administrative System

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A B S T R A C T

The present study was conducted with the aim of designing a model of organizational whistleblowing (systematic disclosure) within the administrative system. Participants in this research included university professors and management experts in the municipality who had at least ten years of teaching experience and held a master's degree or higher. The participants were selected using purposive sampling, based on the criterion of having teaching experience at the elementary education level. A total of 22 experts and specialists took part in the sampling process. The data collection tool in the field section was a semi-structured interview, which continued with participants until theoretical saturation was achieved. For the analysis of qualitative data, thematic analysis was employed based on the Attride-Stirling framework. To assess reliability, Holsti's coefficient, Scott's Pi coefficient, Cohen's Kappa index, and Krippendorff's Alpha were utilized, all of which were confirmed. The software ATLAS.ti was used for the thematic analysis section. The results of the factor analysis show that among the 108 existing indicators (items), 32 basic themes were identifiable, which were organized into five organizing themes. Based on the findings, the basic, organizing, and ultimately global themes were identified. The identified organizing themes included individual components (psychological, cognitive, personality, behavioral, emotional, motivational, ethical, and experiential dimensions), organizational components (cultural, structural, managerial, human resources, and executive dimensions), legal and institutional components (legal, institutional, supportive, transparency and accountability, and preventive dimensions), cultural and social components (social, educational and promotional, communicative, psychosocial, normative and social valuation, and external impact dimensions), and technological components (information technology infrastructure, data analysis systems, cybersecurity, advanced reporting tools, traceability and tracking of reports, blockchain technologies, process automation, and system management and support).

Keywords: *Organizational Whistleblowing, Systematic Disclosure, Administrative System.*

1. Introduction

In an era marked by increasing frequency, intensity, and complexity of disasters—both natural and man-made—the capacity of healthcare systems to respond effectively has emerged as a vital concern in public health and emergency management. Hospitals, as critical infrastructures, are not only central to managing mass casualties but also highly vulnerable entities themselves. In crisis situations such as earthquakes, floods, pandemics, fires, or acts of terrorism, hospitals must make rapid, evidence-informed decisions regarding evacuation, resource allocation, and continuity of care. The success or failure of these decisions can determine the survival of both patients and personnel, underscoring the urgent need for structured, context-sensitive evacuation models that integrate hospital-specific, environmental, and incident-based variables (Boin & McConnell, 2007; Yaghoubi et al., 2017).

Despite significant global attention to hospital preparedness, the lack of a coherent decision-making framework for hospital evacuation remains a serious gap, particularly in developing countries with complex health governance structures. The COVID-19 pandemic starkly highlighted these deficiencies, exposing how uncoordinated responses and weak institutional resilience can exacerbate risks to both healthcare workers and patients (Afulani et al., 2021; Ahmady et al., 2020). A robust decision-making model must account not only for physical and infrastructural considerations but also for procedural clarity, external coordination, and the dynamic nature of disaster scenarios. In this context, disaster preparedness must shift from passive contingency planning to active decision architecture built on systematic data and scenario-based projections (Nguyen et al., 2022; Velner et al., 2023).

The decision to evacuate a hospital is inherently multidimensional and involves weighing the severity of the threat, internal hospital resilience, external environmental conditions, and the capabilities of local emergency systems. However, decision-making during crises often unfolds in high-pressure, time-sensitive conditions, where ambiguity and risk amplify the likelihood of error. This calls for a systemic model that facilitates rapid, yet informed, judgments rooted in both qualitative judgment and quantitative data (Cuthbertson, 2023; Ortíz-Barrios et al., 2020). The process must also integrate ethical imperatives—ensuring that patient safety, dignity, and continuity of care remain uncompromised even in the most volatile circumstances (Cuthbertson, 2023).

One of the critical limitations in current hospital evacuation frameworks is the lack of interoperability between internal hospital protocols and the broader urban crisis management systems. When these systems fail to communicate effectively, logistical bottlenecks, redundancy of roles, and information asymmetries can arise, reducing the effectiveness of emergency response (Pudineh et al., 2022; Un et al., 2023). Moreover, empirical evidence indicates that hospitals often lack the analytical tools to prioritize actions based on severity, proximity, and cascading impacts of threats (Essien & Petrounias, 2022; Ghandi & Roozbahani, 2019). As such, decision models must also incorporate geospatial data, critical infrastructure interdependencies, and social variables that influence access, evacuation, and post-disaster recovery (Nguyen et al., 2022; Siddiqi et al., 2023).

In the Iranian context, studies have documented a notable gap between policy formulation and operational readiness in hospital-based disaster response (Hossein-Sadrabadi, 2023; Jannat et al., 2022). While strategic documents may outline evacuation protocols, practical implementation often suffers from unclear delegation of authority, inadequate training, and outdated infrastructure. In this regard, modeling decision-making as a function of hospital capacity, environmental constraints, and incident typology becomes not just an academic exercise but a policy imperative (Amjadi & Rahmani, 2014; Rad & Kojouri, 2021). The current study addresses this gap by designing an integrated decision-making model tailored to the structural realities and operational dynamics of hospitals in crisis-prone regions.

Hospital evacuation planning also involves psychological, cultural, and professional dimensions. The stress on healthcare staff, moral dilemmas in prioritizing patients, and disruptions in communication channels all contribute to decision fatigue and reduced situational awareness (Afulani et al., 2021; Argyriadis et al., 2023). Organizational culture, leadership style, and institutional memory from previous incidents significantly influence the effectiveness of real-time decisions. Transformational leadership, for example, has been shown to improve organizational resilience and team cohesion in disaster settings by promoting adaptive thinking and decentralized problem-solving (Mohtady Ali et al., 2023; Velner et al., 2023).

At the same time, models for decision-making in hospital evacuations must be scalable and modular, able to accommodate various scenarios ranging from partial to full evacuations and from isolated incidents to large-scale systemic crises. Tools such as the Analytical Hierarchy

Process (AHP), when applied in emergency management, have proven effective in evaluating multiple criteria and selecting the most appropriate response pathways (Maksimović, 2024). Multi-criteria decision-making (MCDM) approaches are especially relevant in dynamic environments where resources are constrained, and trade-offs are inevitable (Ortíz-Barrios et al., 2020). Incorporating such tools within the proposed model strengthens its practical utility and facilitates its implementation across diverse hospital settings.

In designing a comprehensive model, this study also draws from interdisciplinary insights on resilience theory, health governance, and public policy. For instance, studies have emphasized that the resilience of a health organization depends not only on its technical capabilities but also on legal frameworks, community trust, and continuous staff training (Boin & McConnell, 2007; Hossein-Sadrabadi, 2023). Resilient systems are characterized by their ability to anticipate, absorb, and adapt to shocks, which in the case of hospitals, includes having well-trained personnel, robust communication systems, and predefined evacuation pathways (Fühner et al., 2021; Velner et al., 2023). The integration of such resilience-building components within the decision-making model ensures that the response to crises is not merely reactive but strategically proactive.

Moreover, the study is informed by the lessons of real-world hospital evacuations, both successful and failed, to ensure that the proposed model is grounded in empirical realities. Case studies show that failures in decision-making are often due to over-centralization, delayed information flows, and fragmented command structures (Ahmady et al., 2020; Nguyen et al., 2022). Conversely, hospitals that fared better during disasters often had flexible structures, predefined command hierarchies, and strong inter-institutional collaboration (Afulani et al., 2021; Un et al., 2023). The model thus emphasizes role clarity, information transparency, and cross-sectoral coordination as essential design principles.

Additionally, ethical considerations cannot be sidelined in hospital evacuation planning. Decisions about who should be evacuated first, how resources should be distributed, and what constitutes acceptable risk must align with ethical frameworks that respect human rights and uphold professional obligations (Argyriadis et al., 2023; Cuthbertson, 2023). This study incorporates ethical decision-making as a component of the model, recognizing that crisis situations often present difficult trade-offs that require transparent and principled resolution mechanisms.

Finally, this research contributes to both theory and practice by offering a validated model that bridges strategic preparedness with operational decision-making in hospital evacuation. Drawing on a mixed-methods approach—including qualitative interviews with crisis experts and quantitative validation through structural equation modeling—the study integrates evidence from diverse fields to build a comprehensive, adaptable, and context-relevant decision framework. In doing so, it aims to enhance institutional readiness and reduce uncertainty in one of the most critical domains of disaster response: the emergency evacuation of healthcare facilities (Essien & Petrounias, 2022; Fazeli Veisari et al., 2021; Rad & Kojouri, 2021; Siddiqi et al., 2023).

In sum, hospital evacuation is a multidimensional challenge that requires integrative thinking, technical precision, and ethical clarity. This study addresses the pressing need for an empirically grounded, theoretically informed, and operationally viable model for decision-making under crisis conditions.

2. Methods and Materials

The present study is qualitative in nature and employs thematic analysis as its research method. In the qualitative section of the study, the views of experts and specialists directly engaged with the subject matter were utilized, ultimately leading to the identification and extraction of relevant variables. These experts possessed the necessary expertise, experience, and professional backgrounds aligned with the research topic. The characteristics of the selected experts include the following: relevant professional experience in organizational whistleblowing and organizational health; representation of senior management officials from the Tehran Municipality; and the presence of both academic experts with related academic qualifications and professional practitioners.

The sampling process was conducted using purposive criterion-based sampling and continued until theoretical saturation of data was achieved. Accordingly, the participants consisted of 22 experts and managers. The data collection tool used in this study was the semi-structured interview. The process of analyzing the interview texts was carried out simultaneously with data collection, in accordance with the significance of the Attride-Stirling approach to thematic analysis. The coding process was conducted in three phases of open coding, and the data were categorized into themes and subcategories. The ATLAS.ti

software was employed to facilitate the thematic analysis process.

Table 1 presents the demographic characteristics of the interviewees. In the thematic analysis approach, coding and analysis are conducted concurrently with the information gathering. Through open coding, numerous initial themes were identified, which were then gradually reduced to fewer, more concise categories through an iterative process of data comparison and refinement. At this stage, using raw data, preliminary categories associated with the indicators of the organizational whistleblowing (systematic disclosure) model in the administrative system were extracted through the comparison and examination of phenomena.

The qualitative section of this study was based on the perspectives of 22 experts familiar with the relevant concepts. Of these, 14 were male and 8 were female. Ultimately, 5 participants had less than 10 years of work experience, while 17 participants had more than 11 years of professional experience, as presented in Table 1.

Table 1. Demographic Characteristics

Demographic Characteristics	Frequency	Percentage
Gender		
Male	14	64%
Female	8	36%
Work Experience		
Less than 10 years	5	23%
More than 11 years	17	77%
Total	22	100%

3. Findings and Results

In the present study, thematic analysis was used to analyze the qualitative data. This method was applied to identify the indicators for designing an organizational whistleblowing (systematic disclosure) model in the administrative system. The process of analyzing qualitative data begins when the researcher identifies and focuses on meaningful statements and phrases related to the research topic. This analysis starts with repeated reading and examination of the data, followed by coding the meaningful expressions associated with the study's subject. The practical process of data analysis involves four stages: preparation, familiarization, coding, and identification of core categories.

To become familiar with the depth and breadth of the data content, the researcher must immerse themselves to some extent in the data. Immersion usually includes “repeated reading of the data” and actively engaging with it—seeking out meanings and patterns. In this study, coding was conducted using specialized software. The following table presents excerpts from selected interviews and corresponding extracted codes.

Table 1

Selected Interview Excerpts and Initial Codes

Interview Excerpt	Initial Code
When you encounter a situation or decision at work that might not be ethically right, you feel internally that something needs to be corrected. For example, when you see someone doing something illegal or unethical, your conscience tells you to speak up or take action to change the situation. This inner voice tells you what is right and wrong.	Moral Conscience
Moral courage means that when you realize something is ethically wrong or illegal, you’re willing to raise it without fear of consequences. For instance, if someone is committing misconduct at work, you should be able to report it without worrying about it backfiring on you.	Moral Courage
You trust yourself and your abilities enough to make the right decisions when facing an ethical problem. You know you can handle moral challenges and act based on your principles. This self-confidence in your ability to deal with ethical dilemmas is essential.	Ethical Self-Efficacy
When you feel under pressure, you can control yourself in order to make sound ethical decisions. For example, when everyone is pressuring you to make the wrong choice, you hold firm and don’t let external emotions or pressures affect your decisions.	Internal Control
You need to be familiar with organizational rules and regulations and be aware of your rights in the workplace. This means you not only understand what is ethical but also know what the law says and how to defend your rights. This awareness helps you act appropriately in complex situations.	Legal and Organizational Awareness

When you face a problem or issue, you can analyze it and understand the situation clearly. For instance, when you see that a decision or action in the organization isn't working well, you should be able to examine it from different angles and identify the reasons behind it.	Analytical and Evaluation Ability
You look at a problem or situation not just in parts, but also in terms of the whole and the connections between different components. For example, when a problem arises in one part of the organization, you realize how it might affect other parts. You view the organization as an interconnected system.	Systems Thinking
You can make your own decisions without being influenced by others. In organizational whistleblowing, this means that when you realize something is wrong or unethical, you can act independently without relying on others' opinions.	Autonomy
When you want to take action or speak up, you trust your decisions and capabilities. In whistleblowing, self-confidence means you act assertively and without fear of negative consequences when you see something that should be revealed.	Self-Confidence
When something goes wrong or you take an action, you accept responsibility for it instead of blaming others. In whistleblowing, this means that when you see a problem in the organization, you take ownership to talk about it and help resolve it, rather than ignoring it.	Responsibility
When something unethical or illegal is happening, you take brave action without fearing the consequences. For instance, even if you fear retaliation or job risk, you act anyway because you believe it's the right thing to do.	Risk-Taking
Instead of waiting for someone else to act, you take the initiative and find a solution. In whistleblowing, you respond immediately when something requires attention, rather than waiting for someone else to intervene.	Initiative
You can adapt easily to changes and new situations. When environmental or organizational conditions shift, you adjust accordingly while maintaining your ethical standards. This adaptability helps you manage unexpected or difficult conditions effectively.	Flexibility
You interact with others in ways that foster constructive and positive relationships. When discussing sensitive issues with colleagues or managers, you maintain a respectful and professional relationship, making it easier to raise concerns and facilitate positive change.	Positive Social Interaction
You can easily recognize whether a decision or action in the organization is ethically right or wrong. You are sensitive to unethical behavior and act accordingly when something seems off. This awareness helps you stay on the right path and express concerns when necessary.	Ethical Sensitivity
When under pressure or stress, you can maintain your composure and make sound decisions. In critical or sensitive situations, instead of reacting emotionally, you think logically and act appropriately. This helps you stay calm even during crises.	Stress Management
You can put yourself in others' shoes and understand their emotions and needs. For example, when someone in the organization is facing a difficult situation, you empathize with them. Empathy is vital in whistleblowing, as supporting others creates a positive work environment and helps solve problems more effectively.	Empathy

The results derived from factor analysis indicate that out of 108 existing indicators (items), 32 basic themes were identifiable and grouped into 5 organizing themes. Based on the literature, previous research, and existing theories, these components were categorized and labeled as shown in the table below.

The demographic profile of the respondents in this study reflects a balanced yet diverse representation of professionals involved in hospital crisis management and healthcare decision-making. Out of a total of 440 participants, 256 individuals (58%) were male, and 184 (42%) were female, indicating a moderate gender imbalance in favor of male respondents. The age distribution shows that a significant portion of the sample was middle-aged, with the highest concentration (22%) in the 52–57 age group, followed closely by those over 57 years (21%) and those aged 47–52 (18%). Only 9% of the respondents were within the youngest age bracket of 32–37 years. In terms of work experience, the majority had substantial professional tenure, with 24% having between 21–24 years of experience, and 23% between 18–21 years. Notably, even those with over 24 years of experience comprised 16% of the sample, highlighting the inclusion of seasoned experts. Regarding educational attainment, most respondents held postgraduate qualifications, with 47% having a master's degree and 13% holding a doctorate. Meanwhile, 40% possessed a bachelor's degree. This demographic composition suggests that the study's findings are based on insights from a highly experienced and academically qualified group of decision-makers in the healthcare crisis response sector.

Table 2

Identification of Organizing Themes, Initial Themes, and Basic Codes for the Organizational Whistleblowing Model

Organizing Theme	Initial Theme	Basic Code
Individual Components	Psychological Dimensions	Moral Conscience, Moral Courage, Ethical Self-Efficacy, Internal Control
	Cognitive Dimensions	Legal and Organizational Awareness, Analytical and Evaluation Ability, Systems Thinking
	Personality Dimensions	Autonomy, Self-Confidence, Responsibility, Risk-Taking
	Behavioral Dimensions	Initiative, Flexibility, Positive Social Interaction
	Emotional Dimensions	Ethical Sensitivity, Stress Management, Empathy
	Motivational Dimensions	Intrinsic Motivation, Extrinsic Motivation, Organizational Commitment

	Ethical Dimensions	Adherence to Ethical Principles, Pursuit of Justice, Honesty
	Experiential Dimensions	Prior Whistleblowing Experience, Learning from Others, Education Level
Organizational Components	Cultural Dimensions	Transparency Culture, Accountability Culture, Psychological Safety Culture, Culture of Ethical Support
	Structural Dimensions	Formal Reporting Channels, Structural Flexibility, Centralization/Decentralization, Standard Disclosure Procedures
	Managerial Dimensions	Senior Management Commitment, Ethical Leadership, Whistleblower Support, Effective Managerial Supervision
	Human Resource Dimensions	Employee Training and Development, Ethics-Based Performance Appraisal, Psychological Support, Rewards and Incentives
	Executive Dimensions	Timeliness, Effective Follow-Up, Results Evaluation, Feedback Mechanism
Legal and Institutional Components	Legal Dimensions	Whistleblower Protection Laws, Confidentiality Commitment, Compensation Rights, Legal Sanctions
	Institutional Dimensions	Independent Oversight Bodies, Institutional Transparency, Judicial Coordination, Standard Reporting Mechanisms
	Supportive Dimensions	Psychological and Social Support Programs, Job Security, Financial and Non-Financial Support
	Transparency and Accountability	Periodic Oversight Reports, Accountability to Whistleblowers, Feedback Systems
	Preventive Dimensions	Retaliation Deterrent Penalties, Misconduct Prevention Policies, Early Warning Systems
Cultural and Social Components	Social Dimensions	Social Support, Social Solidarity, Norm Influence, Public Awareness
	Educational/Promotional Dimensions	Employee Cultural Training, Positive Value Promotion, Public Awareness Campaigns, Ethical Literacy
	Communicative Dimensions	Open Communication, Organizational Belonging, Informal Support Networks
	Psychosocial Dimensions	Social Responsibility, Psychosocial Security, Justice-Oriented Attitudes
	Normative/Value Dimensions	Positive Norm Adoption, Transparency Valuation, Corruption Condemnation
	External Influence Dimensions	Media Role, Macro-Cultural Policy Influence, Positive Role Models
Technological Components	IT Infrastructure	Digital Reporting Systems, Encrypted Platforms, Secure Networks, Data Integration
	Data Analytics Systems	Artificial Intelligence, Big Data Analysis, Smart Alert Systems
	Cybersecurity	Data Protection, Penetration Testing, Digital Identity Management
	Advanced Reporting Tools	Mobile Apps, Anonymous Tools, Secure Feedback Methods, Multichannel Platforms, Audio-Visual Systems
	Traceability & Monitoring	Confidential Tracking Codes, Dashboards, Feedback Mechanisms
	Blockchain Technologies	Immutable Reporting, Blockchain-Based Confidentiality
	Process Automation	Automated Workflows, Violation Ranking Systems
	System Support & Management	24/7 Support, Monitoring & Maintenance, System Updates

Four quantitative criteria were used to assess credibility, transferability, confirmability, and dependability: Holsti's coefficient, Scott's Pi coefficient, Cohen's Kappa index, and Krippendorff's Alpha.

The correlation of expert viewpoints, calculated using Holsti's coefficient or the "observed agreement percentage," was found to be 0.877, which indicates a significant level of agreement.

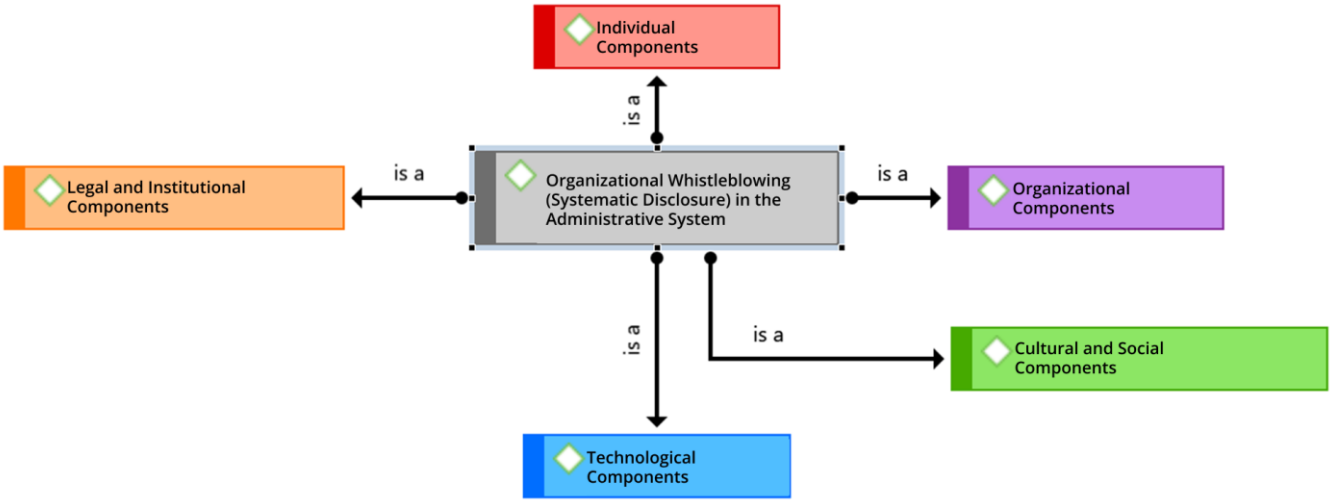
Given the methodological criticisms of Holsti's approach, Scott's Pi coefficient was also computed, yielding a value of 0.845.

Cohen's Kappa index in this study was calculated at 0.824.

Finally, Krippendorff's Alpha was employed, resulting in a value of 0.767 in this study.

Figure 1

Conceptual Model



The coefficient of determination (R^2) values indicate the explanatory power of each main factor in predicting emergency evacuation decision-making. Both the External Environment and Hospital dimensions demonstrated high R^2 values of 0.90, reflecting a very strong influence on the dependent variable. This suggests that these two domains are key predictors of evacuation decisions under crisis conditions. In contrast, the Threats, Accidents, Disasters, and Crises factor had a moderate R^2 value of 0.45, indicating a weaker yet still meaningful explanatory role in the model. Collectively, these results affirm the model's capacity to explain substantial variance in decision-making processes.

4. Discussion and Conclusion

The findings of this study provide compelling evidence in support of a structured and multi-dimensional model for decision-making in the emergency evacuation of hospitals during crises. The model incorporates three major dimensions—*external environment*, *hospital-related factors*, and *threats and crises*—each of which demonstrated significant predictive power in influencing evacuation decisions. Quantitative analysis confirmed the strength of these relationships, with the *external environment* and *hospital factors* each yielding a coefficient of determination (R^2) of 0.90, indicating very strong explanatory power. The dimension of *threats, accidents, and crises* exhibited a moderate R^2 value of 0.45, underscoring its relevance but also pointing to its dependence on contextual variables. Furthermore, the validity and reliability of the instrument were strongly confirmed, as evidenced by high Cronbach's alpha values across all subscales and the full scale, with values exceeding 0.94.

These findings reinforce previous literature that underscores the importance of external environmental factors in emergency response planning. For instance, Siddiqi et al. (2023) highlighted that robust community-based emergency preparedness and external communication channels significantly enhance hospital response efficiency during crises (Siddiqi et al., 2023). Similarly, Velner et al. (2023) emphasized the role of organizational resilience within health institutions, suggesting that external environmental stability—ranging from infrastructure to reliable early-warning systems—acts as a critical enabler for informed decision-making under duress (Velner et al., 2023). In this study, components such as alert systems, transport networks, and external transfer logistics were among the highest loading variables, indicating their perceived importance among crisis managers and hospital administrators.

Hospital-related factors also emerged as key drivers of evacuation decision-making. This finding is consistent with prior research showing that internal preparedness, infrastructure resilience, and human resource readiness form the backbone of effective hospital evacuation systems (Ortíz-Barrios et al., 2020; Rad & Kojouri, 2021). Ahmady et al. (2020) have noted that transitions in hospital operational modes, especially during pandemic emergencies, are often hindered by unclear structural roles and outdated communication systems (Ahmady et al., 2020). Our study echoes this by highlighting the relevance of internal components such as backup power supplies,

scenario-based training drills, clear decision-making hierarchies, and defined evacuation protocols. The significant path coefficient for this dimension (β = 0.55, t = 31.03) further validates its role in effective decision-making.

Although the *threats and crises* dimension had a comparatively lower R^2 value, its influence was still statistically significant. The factor loading analysis showed that subthemes such as the type of hazard, time of occurrence, and intensity still played a critical role in shaping evacuation strategy. However, these factors alone were not sufficient predictors of evacuation decision-making unless mediated by hospital readiness and external coordination mechanisms. This finding aligns with research by Boin and McConnell (2007), who argued that understanding the nature of the threat is necessary but insufficient without an accompanying assessment of institutional capacity and decision-making agility (Boin & McConnell, 2007). In the context of this study, the moderate explanatory power of the threat-related factors suggests that response decisions are not solely reactive to the nature of the crisis but are more influenced by the system's readiness to absorb and adapt to the shock.

From a methodological standpoint, the triangulation of qualitative and quantitative methods provided a rich basis for model development. Interviews with experts allowed for deep exploration of hospital evacuation dynamics, while structural equation modeling helped validate the proposed model empirically. The high factor loadings across all 59 questionnaire items support the robustness of the constructs. These findings reflect the growing consensus in the literature that mixed-method designs offer superior insights in complex crisis research (Cuthbertson, 2023; Fazeli Veisari et al., 2021). The convergence of qualitative themes with quantitative validation provides both theoretical coherence and operational utility to the developed model.

Moreover, the results align with calls in the literature for decision-making models that integrate technical, organizational, and ethical dimensions. Argyriadis et al. (2023) emphasized the psychological burden and moral complexity faced by healthcare workers during evacuation scenarios, which must be factored into any model of decision-making (Argyriadis et al., 2023). Our model addressed this by including variables related to role definition, communication, and preparedness, thus enabling faster and more ethical decision-making. Similarly, Mohtady Ali et al. (2023) emphasized the role of transformational leadership in enhancing hospital resilience—a principle reflected in our emphasis on clear decision hierarchies and distributed authority (Mohtady Ali et al., 2023).

The confirmed hypotheses further consolidate the multidimensionality of evacuation decision-making. The direct and significant effect of external environmental conditions (β = 0.59, t = 26.47) and hospital factors (β = 0.55, t = 31.03) on decision-making confirms the interdependence between these domains. Essien and Petrounias (2022) have advocated for artificial intelligence–based frameworks that integrate environmental data and hospital metrics to facilitate faster decisions in crises (Essien & Petrounias, 2022). Although the current model does not yet include AI components, its structural flexibility allows for the integration of decision-support systems in future iterations.

The validity of the measurement model was supported not only by statistical indices but also by the conceptual clarity provided by the thematic analysis. The framework adopted from Braun and Clarke enabled the identification of deeply embedded themes, some of which—such as ethical clarity and decision speed—are often overlooked in conventional evacuation planning. This attention to latent dimensions aligns with Un et al. (2023), who emphasized that perceptual performance metrics—how people interpret and act under stress—are just as important as procedural compliance in emergencies (Un et al., 2023).

Despite its contributions, the study is not without limitations. First, although the sample size was expanded through bootstrapping to 440, the study was primarily focused on hospitals affiliated with the Social Security Organization in Iran, potentially limiting generalizability to other healthcare systems with different organizational cultures or infrastructure capabilities. Second, while the mixed-method approach enriched the model, qualitative data were primarily collected from expert interviews, excluding the perspectives of frontline healthcare staff such as nurses and paramedics who often play crucial roles in evacuation. Finally, the quantitative model, though robust, does not yet account for the dynamic evolution of crises over time or the influence of real-time data, which could enhance the model's predictive capacity in rapidly changing scenarios.

Future research could expand the scope of the model by including different types of hospitals (private, rural, military) and conducting cross-national comparisons to assess its adaptability in diverse contexts. Longitudinal studies could also be conducted to examine how decision-making evolves across different stages of a disaster—from onset through peak to recovery—and how institutional learning shapes future responses. Incorporating AI-driven

decision-support systems, real-time geospatial analytics, and digital simulations could enhance the operational relevance of the model. Additionally, the perspectives of patients, families, and low-level staff could be integrated to add ethical and emotional dimensions to the understanding of evacuation processes.

To enhance emergency preparedness, healthcare institutions should implement the proposed decision-making model as a standardized component of their disaster management protocols. Scenario-based training, interdisciplinary drills, and multi-agency coordination exercises should be regularly conducted to reinforce the model's operational principles. Hospitals should also establish dynamic communication systems that link internal units with external agencies, ensuring seamless information flow during crises. Most importantly, decision-making protocols should be integrated into legal and policy frameworks to ensure accountability, clarity, and institutional alignment in times of crisis.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

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