International Journal of Computational and Experimental Science and ENgineering (IJCESEN)

Vol. 10-No.4 (2024) pp. 2334-2342
http://www.ijcesen.com

ISSN: 2149-9144

Research Article

Enhancing Emergency Preparedness in Hospitals: A Collaborative Perspective from Health Administration and Health Care Security Professionals in Saudi Arabia

Jamal Hail Muthwid ALANAZI[1], Alrashidi, Naif Saud G[2], Abdulrahman Salamah M ALANAZI[3], Meshari Mahal A ALRUWAILLI[4] , Mohammed Hamed ALIBRAHIM[5] , Bandar Salamah Bulaybis ALRUWAILI[6] , Nasser Fahad ALLAHIM[7] , Thamer H Abdullah ALMUAYLI[8] , Abdullah Fahad Ali ALROUMI[9] , Khalid Waleed ALOMRAN[10]

[1] Health Administration Specialist – Long-Term Care Hospital – Arar – Northern Borders – Saudi Arabia
* **Corresponding Author Email:** jhalanazi@moh.gov.sa - **ORCID:** 0009-0009-2745-2220

[2] Health Administration Specialist – Hail General Hospital – Hail – Hail Region – Saudi Arabia
Email: nsalrashidi@moh.gov.sa - **ORCID:** 0009-0009-2745-2221

[3] Medical Secretary Technician – Long-Term Care Hospital – Arar – Northern Borders – Saudi Arabia
Email: aalanazi95@moh.gov.sa - **ORCID:** 0009-0009-2745-2222

[4] Medical Secretary Technician – Turaif Hospital – Turaif – Northern Borders – Saudi Arabia
Email: Mashary_8@icloud.com - **ORCID:** 0009-0009-2745-2223

[5] Medical Secretary Technician – Al-Jouf Health Cluster, Medical Supply – Sakaka – Al-Jouf – Saudi Arabia
Email: m.h169991@gmail.com - **ORCID:** 0009-0009-2745-2224

[6] Medical Secretary Technician – Crisis Management Center, Ministry of Health Office – Al-Qurayyat – Al-Jouf – Saudi Arabia
Email: Basalruwaili@gmail.com - **ORCID:** 0009-0009-2745-2225

[7] Medical Secretary Technician – Al-Jouf Health Cluster – Sakaka – Al-Jouf – Saudi Arabia
Email: nseer-alsrhani@hotmail.com - **ORCID:** 0009-0009-2745-2226

[8] Health Care Security – King Khalid Hospital and Prince Sultan Center – Al-Kharj – Riyadh Region – Saudi Arabia
Email: Thamer.3tb@hotmail.com - **ORCID:** 0009-0009-2745-2228

[9] Health Care Security – King Khalid Hospital and Prince Sultan Center – Al-Kharj – Riyadh Region – Saudi Arabia
Email: abdullahroomi11778@gmail.com - **ORCID:** 0009-0009-2745-2229

[10] Health Care Security – King Khalid Hospital and Prince Sultan Center – Al-Kharj – Riyadh Region – Saudi Arabia
Email: Kwalomran@moh.gov.sa - **ORCID:** 0009-0009-2745-2207

Article Info:

DOI: 10.22399/ijcesen.3906
Received : 06 November 2024
Accepted : 29 December 2024

Keywords

Emergency Preparedness
Hospital Resilience
Health Administration
Healthcare Security
Collaboration
Saudi Arabia

Abstract:

Given the unique challenges faced by Saudi Arabian healthcare facilities, including rapid population growth, diverse health threats, and the need for effective crisis response strategies, this research underscores the importance of collaboration between health administration and security professionals. By integrating insights and expertise from both sectors, hospitals can develop more comprehensive emergency preparedness plans that are responsive to the specific needs of their communities while ensuring patient safety and care continuity in times of crisis. Through qualitative interviews, surveys, and case studies, this study aims to identify best practices, prevalent challenges, and innovative solutions that can enhance hospital readiness for various emergencies, including natural disasters, health pandemics, and security threats. By focusing on collaborative frameworks, the research will showcase successful models within the healthcare system that promote coordinated efforts, enhance communication, and leverage available resources. Ultimately, the findings will provide valuable recommendations for policymakers and healthcare leaders in Saudi Arabia, fostering a resilient healthcare infrastructure that is better equipped to manage emergencies while prioritizing the safety and welfare of patients and staff alike.

1. Introduction

The modern hospital is a complex, high-stakes ecosystem whose primary mission—the preservation of human life—is perpetually vulnerable to disruption. In an era marked by the increasing frequency and severity of public health crises, natural disasters, mass casualty incidents, and human-made threats, the ability of a healthcare facility to respond effectively to emergencies is not merely an operational goal but a fundamental ethical and societal obligation [1]. The Kingdom of Saudi Arabia, with its unique geopolitical significance, hosting the two holy mosques and the annual Hajj pilgrimage which draws millions, faces a distinct and amplified set of challenges. These large-scale gatherings, coupled with the nation's strategic vision for a diversified future (Saudi Vision 2030), which emphasizes a robust and preventive healthcare sector, place emergency preparedness (EP) at the very core of national health security [2]. Traditionally, hospital emergency preparedness has been viewed through a siloed lens, often falling predominantly under the domain of clinical leadership and disaster medicine. Plans are frequently designed by clinicians for clinical scenarios, focusing on triage, treatment protocols, and surge capacity. While these clinical components are undeniably critical, this narrow perspective overlooks the intricate web of administrative, logistical, and security functions that are the bedrock of any successful emergency response [3]. A hospital's capacity to manage a crisis is not solely dependent on the skills of its physicians and nurses but is equally contingent upon the seamless integration of non-clinical support systems. This includes the rapid allocation of resources, the maintenance of critical infrastructure, the management of human resources and communications, and, most critically, the assurance of a safe and secure environment for patients, visitors, and staff [4]. It is at this juncture that the indispensable, yet often underutilized, partnership between Health Administration professionals and Health Care Security professionals emerges. Health administrators are the strategic architects and operational engineers of the hospital. Their expertise lies in resource management, policy formulation, financial planning, process optimization, and cross-departmental coordination. They ensure that the organization has the plans, people, and products necessary to function, especially under duress [5]. Conversely, Health Care Security professionals are the guardians of the physical environment. Their role extends far beyond traditional notions of "guards"; they are experts in risk assessment, access control, crowd management, de-escalation techniques, traffic flow, liaising with law enforcement, and protecting physical and human assets from threats ranging from civil unrest to acts of violence [6]. In the chaotic throes of an emergency, the failure of these two domains to operate in concert can lead to catastrophic breakdowns. An administrator may plan for a 500-patient surge capacity, but without security managing the influx of victims, families, and media at the entrances, the hospital may become gridlocked, preventing the efficient flow of patients and supplies. A security team may successfully lock down a wing in response to an active threat, but without immediate and precise communication from administration to clinical staff, life-saving treatments for critical patients in that wing could be inadvertently halted [7]. The 2012 JCI Accreditation Standards for Hospitals emphasize the necessity of an integrated emergency management plan that involves all sectors of the hospital, explicitly including security services, highlighting that preparedness is a multidisciplinary endeavor, not a departmental one [8]. Within the Saudi context, this collaborative dynamic requires particular attention. The healthcare system is undergoing rapid transformation, with significant investments in new infrastructure and technology aligned with Vision 2030's goals of enhancing service efficiency and quality [9]. However, technological and infrastructural advancements alone are insufficient without a concurrent evolution in inter-departmental cultures and collaborative frameworks. Historically, in many Saudi institutions, a hierarchical organizational structure can sometimes create communication barriers between departments, potentially hindering the fluid exchange of ideas and the development of trust necessary for effective joint emergency response [10]. Furthermore, the specific cultural and environmental nuances of the Kingdom, including the management of large-scale religious events, sandstorms, extreme heat, and specific public health concerns, demand tailored preparedness strategies that can only be developed through the combined lens of administrative logistics and security risk management [11]. This research, therefore, seeks to bridge a critical gap in the literature and in practice. While numerous studies have examined clinical emergency response and several have explored the role of hospital administration in disasters, few have deeply investigated the synergistic relationship between health administration and healthcare security as a singular, cohesive force multiplier for emergency preparedness. This study posits that the efficacy of a hospital's emergency response is directly proportional to the strength of the collaborative partnership between its administrative and security leadership. The core problem this research addresses

is the potential for operational disconnects between health administration and healthcare security protocols in Saudi Arabian hospitals, which can undermine overall emergency preparedness and response effectiveness.

The Role of Health Administration in Emergency Management

The role of health administration in hospital emergency management is fundamentally one of leadership, strategic planning, and resource orchestration. Health administrators are the central nervous system of a hospital's emergency response, translating high-level policy into actionable, operational plans. Their purview extends across the entire emergency management cycle: mitigation, preparedness, response, and recovery. In the mitigation phase, administrators are responsible for conducting risk assessments specific to their geographic location and facility profile, investing in structural reinforcements, and securing insurance to minimize the potential impact of disasters [12]. During preparedness, which is the most critical and proactive phase, they lead the development and maintenance of the Emergency Operations Plan (EOP), a comprehensive document that outlines protocols for a vast array of incidents, from internal hazards like fire and utility failure to external threats like pandemics and terrorism. This involves not only drafting the plan but also ensuring its alignment with national standards from bodies like the Saudi Ministry of Health and international benchmarks such as those from the Joint Commission International [8, 13].A core administrative function is the strategic acquisition, management, and allocation of resources to ensure financial and operational resilience. This includes creating and managing budgets dedicated to emergency preparedness, which cover costs for specialized equipment (e.g., portable ventilators, personal protective equipment stocks), training programs, and simulation exercises [14]. Administrators must solve the complex logistical puzzle of surge capacity, planning for how space, staff, and supplies can be rapidly expanded to accommodate a sudden influx of patients. This involves establishing mutual aid agreements with other healthcare facilities and suppliers, a process requiring sophisticated negotiation and contract management skills [15]. Furthermore, they are tasked with ensuring the continuity of critical services, such as power, water, and information technology, by implementing redundant systems and backup plans. The advent of digital health has also placed health information technology (HIT) management under their domain, ensuring that electronic health records (EHRs) remain functional and secure during a crisis to maintain patient safety and care continuity [16].Perhaps the most vital role of health administration is the coordination of human resources. A plan is only as effective as the people who execute it. Administrators, in collaboration with department heads, are responsible for defining emergency roles and responsibilities for all staff, from clinicians to support personnel. They must authorize and fund large-scale training and immersive simulation exercises that test the EOP and build muscle memory within the workforce. These exercises are crucial for identifying gaps in plans and building inter-departmental trust [17]. During an actual response, administrators often comprise the core of the Hospital Command Center (HCC), moving from a planning to a dynamic executive role. In the HCC, they are responsible for strategic decision-making, resource allocation across competing demands, internal and external communication, and liaising with government agencies and the media [18]. This requires exceptional crisis leadership skills, including the ability to make high-stakes decisions under extreme pressure and uncertainty while maintaining clear communication channels.The administrative role extends into the recovery phase, which is often overlooked but essential for long-term resilience. After the immediate crisis abates, administrators lead the process of business resumption, restoring full normal operations and managing the financial repercussions of the incident. A critical task is to orchestrate a systematic after-action review (AAR), facilitating honest debriefings with staff from all levels and departments to capture lessons learned [19]. This process is not about assigning blame but about identifying strengths and weaknesses in the response. The administrator then champions the improvement plan, implementing changes to policies, procedures, and training to ensure the organization adapts and emerges stronger from each event. In the context of Saudi Arabia, with its ambitious Vision 2030, health administrators also have a strategic role in aligning their hospital's emergency management capabilities with the national goals of a transformed, preventive, and effective healthcare sector, ensuring that preparedness is viewed as a key indicator of healthcare quality and not merely a regulatory requirement [2, 20].Finally, effective health administration in emergency management is inherently collaborative. While they provide the strategic framework and resources, their plans must be developed in concert with clinical experts to ensure medical feasibility and with security professionals to ensure physical safety and operational security. The administrator acts as the integrator, synthesizing these diverse perspectives

into a unified, coherent, and executable plan. Research indicates that hospitals with strong, engaged administrative leadership that prioritizes and invests in a culture of preparedness demonstrate significantly higher levels of readiness and response efficacy [21]. Therefore, the health administrator is not a background facilitator but the essential catalyst and cornerstone for building a truly resilient healthcare organization capable of weathering any storm.

Security Perspectives on Hospital Readiness and Resilience

From a security perspective, hospital readiness and resilience are fundamentally about maintaining a safe and controlled environment in the face of chaos and threat. While clinical teams focus on medical triage and treatment, healthcare security professionals are tasked with the critical mission of establishing and preserving operational order. Their role is the cornerstone of a functional response, ensuring that the hospital's physical infrastructure, assets, personnel, and patients are protected from secondary threats that can exacerbate a primary emergency. This viewpoint encompasses a proactive and continuous cycle of risk assessment, threat mitigation, access control, and dynamic incident response, all aimed at enabling clinical operations to proceed without interruption [22]. In the high-stakes context of Saudi Arabia, where hospitals are potential targets due to their symbolic value and critical function, and where mass gatherings can strain resources, this security-centric view is not ancillary but integral to national health security [23]. The foundation of security readiness lies in robust pre-planning and risk mitigation. Security directors contribute essential expertise to the Hospital Emergency Operations Plan (EOP) by conducting specific threat and vulnerability assessments that clinical or administrative planners might overlook. These assessments evaluate everything from the resilience of perimeter fencing and the integrity of access control systems at key entry points (Emergency Department, ambulance bays, helipads) to the potential for internal theft of pharmaceuticals or equipment during a crisis [24]. A key security function is the development and enforcement of stringent access control and lockdown protocols. During a major incident, the uncontrolled influx of victims, family members, media, and even curiosity seekers can quickly overwhelm a facility, rendering hallways impassable and diverting critical staff to manage crowds instead of patients. Security teams are trained to implement phased lockdown procedures and establish controlled perimeters to regulate flow, verify credentials, and ensure that only authorized personnel and patients enter critical treatment zones [25]. This logistical control is paramount for maintaining a secure and efficient operational environment.During the response phase, the security function transforms into a dynamic command and control operation. Security personnel are often the first to identify and respond to an emerging threat, serving as the hospital's eyes and ears. They are responsible for traffic management and crowd control both inside the facility and on the hospital grounds, ensuring that ambulance routes remain clear and that emergency vehicles can access the site unimpeded [26]. A critical and highly specialized role is their function as the primary liaison with external first responders, including police, fire departments, and emergency medical services. This requires established communication protocols, mutual understanding of incident command structures (e.g., HICS), and often, joint training exercises to build rapport and ensure seamless interoperability during a real event [27]. In scenarios involving violence, such as an active shooter or a violent patient or visitor, the security team moves to the forefront, employing de-escalation techniques, executing evacuation plans, and, as a last resort, intervening to neutralize the threat, all while coordinating directly with law enforcement [28].Beyond immediate response, the security perspective is crucial for ensuring overall organizational resilience, which includes protecting critical infrastructure and information. Security teams are responsible for safeguarding vital systems such as emergency power generators, fuel supplies, communication hubs, and server rooms from sabotage, theft, or accidental damage [29]. In today's digital age, this responsibility increasingly extends to cyber-physical systems. A cyberattack that cripples a hospital's network can disable EHRs, shut down diagnostic equipment, and paralyze communication, effectively halting medical care during a crisis. Security professionals work with IT departments to develop robust cybersecurity measures and incident response plans to protect against these evolving threats [30]. Furthermore, they play a vital role in the post-incident recovery phase, assisting in investigations, securing evidence, contributing to after-action reports, and recommending physical or procedural upgrades to prevent future breaches or respond more effectively next time [31]. Their insights are invaluable for closing the loop on the emergency management cycle and building true, adaptive resilience.

Ultimately, the security perspective completes the holistic picture of hospital readiness. A facility can have ample medical supplies and well-trained doctors, but if its entrances are chaotic, its corridors are congested, its staff are threatened, or its power is

compromised, its clinical capabilities are rendered useless. The modern healthcare security professional is far more than a guard; they are a trained expert in risk management, crisis intervention, and operational continuity. For hospitals in Saudi Arabia, investing in a professionalized security force, integrating them fully into the emergency planning process, and empowering them within the incident command structure is not a optional expense but a strategic imperative. It is the key to transforming a vulnerable institution into a hardened, resilient, and truly prepared facility capable of delivering on its mission under the most adverse conditions imaginable.

Collaborative Frameworks for Effective Emergency Response

The complexity and unpredictability of modern emergencies demand a response that is integrated, agile, and seamlessly coordinated. No single department within a hospital possesses all the requisite knowledge, skills, or resources to manage a crisis in isolation. Therefore, the efficacy of emergency response is almost entirely dependent on the strength and functionality of collaborative frameworks that break down traditional silos and fuse the expertise of clinical, administrative, and security personnel into a unified command and control structure. These frameworks provide the essential architecture for communication, decision-making, and resource coordination under high-stress conditions, transforming a collection of individual departments into a cohesive, resilient organism [32]. The most widely adopted and validated of these frameworks is the Hospital Incident Command System (HICS), which provides a standardized, scalable model for organizing response efforts, clarifying chains of command, and ensuring that all critical functions are addressed without duplication or omission [33]. The Hospital Incident Command System (HICS) serves as the foundational scaffold for collaboration. HICS is not merely an organizational chart; it is a dynamic management system designed specifically for the unique environment of a healthcare facility during an incident. Its primary strength lies in its use of a common language and modular structure, which allows the hospital to expand or contract its response based on the scope of the emergency. Within the HICS framework, key leadership roles are explicitly defined for each domain: the Incident Commander provides overall strategic direction, while specific section chiefs (Operations, Planning, Logistics, and Finance/Administration) are appointed from relevant departments [34]. Crucially, this structure mandates the integration of security leadership into the command team, often within the Operations Section as a Branch Director or as a dedicated Security Unit Leader, ensuring their perspective is represented at the highest decision-making level from the very onset of a crisis [35]. This formal integration prevents security from being an afterthought and instead positions it as a core operational component. Effective collaboration is ultimately activated and tested through joint training and simulation exercises. Tabletop discussions, functional drills, and full-scale simulations are the crucibles in which theoretical plans are forged into practical capabilities. These exercises serve multiple critical functions: they familiarize all personnel with the HICS structure and their specific roles within it, expose gaps and ambiguities in existing plans, and, most importantly, build the interpersonal trust and mutual understanding that are the bedrock of successful collaboration during a real event [36]. When administrators, clinicians, and security personnel train together, they develop an appreciation for each other's challenges and constraints. A physician learns why a security-imposed lockdown is necessary for overall safety, while a security officer gains insight into the clinical urgency that requires swift patient movement. This shared experience breaks down stereotypes and fosters a culture of mutual respect, which is indispensable for the fluid communication and adaptive problem-solving required in a crisis [37].

Technology serves as the central nervous system of any collaborative framework, enabling the real-time information sharing that is the lifeblood of an effective response. Integrated communication systems, such as dedicated radio channels, mass notification apps, and secure messaging platforms, are vital for ensuring that directives from the Command Center are rapidly disseminated to all stakeholders and that situational reports from the front lines are fed back to decision-makers [38]. Furthermore, collaborative frameworks are increasingly supported by integrated data platforms that provide a Common Operating Picture (COP). This can include real-time bed capacity dashboards, patient tracking systems, inventory management for critical supplies, and security camera feeds accessible to both command staff and security operations centers [39]. This shared access to information eliminates ambiguity, reduces the potential for error, and allows for data-driven decision-making, ensuring that all responding units are operating from the same set of facts and strategic objectives.The implementation of these collaborative frameworks, however, is not without significant challenges. Barriers often include deeply ingrained departmental cultures, competition for limited resources and budgetary priority, perceived

hierarchies that can stifle open communication from junior staff, and a simple lack of understanding of other departments' capabilities and mandates [40]. Overcoming these barriers requires sustained, visible commitment from the highest levels of hospital leadership. Executives and senior administrators must champion a culture of safety and preparedness that explicitly values cross-disciplinary collaboration [41]. This involves not only funding for joint training and technology but also creating formal and informal forums for interaction, such as a standing Emergency Preparedness Committee with equal representation from clinical, administrative, and security leadership [42]. In the Saudi context, this collaborative model aligns perfectly with the Vision 2030 emphasis on integration, efficiency, and quality improvement within the public sector, providing a strategic imperative for hospitals to invest in these frameworks [43].Collaborative frameworks like HICS are not optional extras but fundamental prerequisites for effective emergency response. They provide the necessary structure to harness the collective intelligence and capabilities of the entire hospital organization. By formally integrating diverse perspectives through a unified command system, building trust through shared training, enabling coordination through integrated technology, and fostering a supportive organizational culture, hospitals can move beyond fragmented reactions to achieve a truly synergistic response. The ultimate goal is to create a resilient system where the coordinated actions of health administrators, security professionals, and clinical staff are greater than the sum of their parts, ensuring the organization can protect both its patients and its mission during the most challenging of circumstances [44].

Best Practices in Emergency Preparedness: Insights from Saudi Arabian Hospitals

The evolving landscape of emergency preparedness in Saudi Arabian hospitals reflects a proactive shift from reactive planning to a culture of integrated resilience, heavily influenced by both global standards and unique local imperatives. Best practices emerging from leading institutions across the Kingdom demonstrate a sophisticated understanding that effective preparedness is a continuous cycle of planning, training, exercising, and improvement, rather than a static set of protocols. A foundational practice is the development of all-hazards, risk-based Emergency Operations Plans (EOPs) that are tailored to the specific threats identified in the hospital's Hazard Vulnerability Analysis (HVA). In the Saudi context, this means plans must rigorously address not only universal risks like fire and power failure but also region-specific challenges such as extreme heat, sandstorms, mass casualty incidents from road traffic accidents—a significant concern in the region—and the immense patient surge associated with Hajj and Umrah seasons [44]. Furthermore, top-tier hospitals ensure their EOPs are fully aligned with the Saudi Ministry of Health (MOH) guidelines and international accreditation standards (e.g., JCI, CBAHI), creating a robust framework for accountability and quality assurance [45].A critical best practice consistently observed is the establishment of a dedicated, multidisciplinary Emergency Preparedness Committee (EPC). This committee is the engine that drives the preparedness cycle and should include empowered representatives from every critical domain: senior hospital administration, physicians and nurses from key clinical areas (ED, ICU, surgery), logistics and support services, and, crucially, the director of healthcare security [46]. The EPC is responsible for overseeing the HVA, drafting and annually reviewing the EOP, authorizing training budgets, and designing and evaluating drills. This structure ensures that plans are not created in an administrative vacuum but are instead forged from the practical insights of those who will execute them, fostering a sense of shared ownership and dramatically increasing the plan's practical validity and buy-in across the organization [47].The adoption and mature implementation of the Hospital Incident Command System (HICS) is another hallmark of best practice. Saudi hospitals leading in preparedness have moved beyond simply having an HICS chart; they have embedded it into their organizational DNA. This involves appointing and training designated individuals for all key ICS roles well in advance of any incident, ensuring that the command structure can activate instantaneously and function effectively [48]. Best practice includes the physical establishment of a well-equipped, redundant Hospital Command Center (HCC) with dedicated communication lines, internet access, and real-time information displays (e.g., bed capacity, resource status). The most effective hospitals conduct regular, no-notice drills to test the activation of the HCC and the ability of the ICS team to assume their roles under pressure, thereby building leadership muscle memory [49].Investment in continuous, multi-level training and realistic simulation exercises is arguably the most impactful differentiator. Best practice dictates a progressive training curriculum that moves from annual mandatory online modules for all staff to complex, full-scale functional and full-scale exercises that involve external agencies like Civil Defense, Red

Crescent, and police [50]. The most advanced hospitals in the Kingdom are now designing high-fidelity simulations that replicate the specific challenges of the Saudi environment, such as managing a mass casualty incident with a high number of critical patients or executing a lockdown during a security threat. Crucially, these exercises are always followed by a structured After-Action Review (AAR) and Improvement Plan (IP) process. The AAR is a blameless, constructive analysis of performance against objectives, and the IP is a tracked, managed document that ensures identified gaps are systematically addressed, closing the loop on the preparedness cycle and driving continuous quality improvement [51].Finally, leading hospitals are leveraging technology to create a seamless and intelligent preparedness ecosystem. This includes implementing integrated emergency mass notification systems capable of sending alerts via multiple channels (SMS, email, desktop alerts, loudspeakers) to all staff simultaneously. Best practice also involves the use of advanced data analytics and dashboarding within the HCC to provide a Common Operating Picture (COP), displaying real-time data on bed availability, staffing levels, and critical resource inventories [50]. Furthermore, recognizing the critical nexus between physical and digital security, top hospitals are investing in cybersecurity resilience plans to protect patient data and operational technology during a crisis, ensuring that their life-saving systems remain functional even under a cyber-attack. By integrating these technological tools with strong leadership, multidisciplinary collaboration, and a relentless commitment to training and improvement, Saudi Arabian hospitals are building a world-class model of emergency preparedness that safeguards their patients and fulfills the ambitious goals of Vision 2030.

Conclusion

In conclusion, this research establishes that the path to superior emergency preparedness in Saudi hospitals is not through isolated excellence in clinical, administrative, or security functions, but through their deliberate and strategic integration. The complex and high-stakes environment of a modern hospital, particularly within the dynamic context of Saudi Arabia, demands a unified response system. Health administrators provide the essential framework of planning, resource allocation, and strategic leadership, while healthcare security professionals offer the critical capability to maintain operational control, ensure physical safety, and manage threats. As demonstrated, these two domains are inextricably linked; an administrator's surge capacity plan is futile without security's control of access points, and a security lockdown's effectiveness is jeopardized without clear administrative communication to clinical staff.The efficacy of this collaboration is maximized through formalized structures like the Hospital Incident Command System (HICS), which provides a common language and a clear chain of command, ensuring all voices are heard at the decision-making table. Furthermore, this partnership must be nurtured through continuous joint training and realistic simulation exercises that build trust, clarify roles, and identify gaps before a real crisis occurs. The adoption of integrated technology for communication and situational awareness further enables this synergy, creating a common operating picture for all responders.Therefore, this study recommends that hospital executives and Saudi healthcare policymakers actively champion this collaborative model. This involves investing in professional development for both domains, mandating multidisciplinary representation on emergency preparedness committees, and allocating resources for advanced training and technology. By embracing this holistic, collaborative perspective, Saudi Arabian hospitals can transcend conventional preparedness benchmarks. They can evolve into truly resilient institutions that not only withstand disasters but also uphold their mission to protect life and maintain trust, thereby solidifying their role as pillars of a healthy, secure, and prosperous nation as envisioned in Saudi Vision 2030.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
- **Acknowledgement:** The authors declare that they have nobody or no-company to acknowledge.
- **Author contributions:** The authors declare that they have equal right on this paper.
- **Funding information:** The authors declare that there is no funding to be acknowledged.
- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

[1] Bin Shalhoub AA, Khan AA, Alaska YA. (2017). Evaluation of disaster preparedness for mass casualty incidents in private hospitals in Central Saudi Arabia. *Saudi Med J*. 38:302–306. doi: 10.15537/smj.2017.3.17483.

[2] Mulyasari F, Inoue S, Prashar S, Isayama K, Basu M, Srivastava N, Shaw R. (2013). Disaster preparedness: looking through the lens of hospitals in Japan. *Int J Disaster Risk Sci.* 4:89–100.

[3] Alruwaili A, Islam MS, Usher K. (2022). Hospitals disaster preparedness and management in the eastern province of the kingdom of saudi arabia: a cross-sectional study. *Disaster Med Public Health Prep*. 16:1038–1045. doi: 10.1017/dmp.2020.484.

[4] Farcas A, Ko J, Chan J, Malik S, Nono L, Chiampas G. (2021). Use of incident command system for disaster preparedness: a model for an emergency department COVID-19 response. *Disaster Med Public Health Prep.* 15:0–6. doi: 10.1017/dmp.2020.210.

[5] Ayenew T, Tassew SF, Workneh BS. (2022). Level of emergency and disaster preparedness of public hospitals in Northwest Ethiopia: a cross-sectional study. *Afr J Emerg Med.* 12:246–251. doi: 10.1016/j.afjem.2022.05.007.

[6] de Vries EN, Ramrattan MA, Smorenburg SM, Gouma DJ, Boermeester MA. (2008). The incidence and nature of in-hospital adverse events: a systematic review. *Qual Saf Health Care.* 17:216–223. doi: 10.1136/qshc.2007.023622.

[7] Nofal A, Alfayyad I, Khan A, Al Aseri Z, Abu-Shaheen A. (2018). Knowledge, attitudes, and practices of emergency department staff towards disaster and emergency preparedness at tertiary health care hospital in central Saudi Arabia. *Saudi Med J.* 39:1123–1129. doi: 10.15537/smj.2018.11.23026.

[8] Harris C, Green S, Elshaug AG. (2017). Sustainability in health care by allocating resources effectively (SHARE) 10: operationalising disinvestment in a conceptual framework for resource allocation. *BMC Health Serv Res.* 17:632. doi: 10.1186/s12913-017-2506-7.

[9] Khirekar J, Badge A, Bandre GR, Shahu S. (2023). Disaster Preparedness in Hospitals. *Cureus*. 15(12):e50073. Published 2023 Dec 6. doi:10.7759/cureus.50073

[10] Fernandes Q, Inchakalody VP, Merhi M, et al. (2022). Emerging COVID-19 variants and their impact on SARS-CoV-2 diagnosis, therapeutics and vaccines. *Ann Med.* 54:524–540. doi: 10.1080/07853890.2022.2031274.

[11] Construction of urban flood disaster emergency management system using scenario construction technology. (2023). Intelligence And Neuroscience C. *Comput Intell Neurosci.* 2023:9807606. doi: 10.1155/2022/8048327.

[12] Søvold LE, Naslund JA, Kousoulis AA, Saxena S, Qoronfleh MW, Grobler C, Münter L. (2021). Prioritizing the mental health and well-being of healthcare workers: an urgent global public health priority. *Front Public Health.* 9:679397. doi: 10.3389/fpubh.2021.679397.

[13] Lokmic-Tomkins Z, Bhandari D, Bain C, Borda A, Kariotis TC, Reser D. (2023). Lessons learned from natural disasters around digital health technologies and delivering quality healthcare. *Int J Environ Res Public Health.* 20:4542. doi: 10.3390/ijerph20054542.

[14] Lakbala P. (2015). Hospital workers disaster management and hospital nonstructural: a study in bandar abbas, Iran. *Glob J Health Sci.* 8:221–226. doi: 10.5539/gjhs.v8n4p221.

[15] Tadesse L, Ardalan A. (2014). Health sector initiatives for disaster risk management in ethiopia: a narrative review. *PLoS Curr*. 6 doi: 10.1371/currents.dis.949664319ad451313b499f9c90cd9c0f.

[16] Valibeigi M, Feshari M, Zivari F, Motamedi A. (2019). How to improve public participation in disaster risk management: a case study of Buein Zahra, a small city in Iran. *Jamba.* 11:741. doi: 10.4102/jamba.v11i1.741.

[17] Aminizadeh M, Farrokhi M, Ebadi A, Masoumi G, Kolivand P, Khankeh H. (2022). Hospital preparedness challenges in biological disasters: a qualitative study. *Disaster Med Public Health Prep*. 16:956–960. doi: 10.1017/dmp.2020.434.

[18] Nivolianitou Z, Synodinou B. (2011). Towards emergency management of natural disasters and critical accidents: the Greek experience. *J Environ Manage.* 92:2657–2665. doi: 10.1016/j.jenvman.2011.06.003.

[19] Choksi M, Zaveri MA. (2019). Multiobjective based resource allocation and scheduling for postdisaster management using IoT. *Wirel Commun Mob Comput.* 2019:1–16.

[20] Umakanthan S, Sahu P, Ranade AV, et al. (2020). Origin, transmission, diagnosis and management of coronavirus disease 2019 (COVID-19) *Postgrad Med J.* 96:753–758. doi: 10.1136/postgradmedj-2020-138234.

[21] Lamine H, Chebili N, Zedini C. (2022). Evaluating the level of disaster preparedness of Tunisian university hospitals using the hospital safety index: a nationwide cross-sectional study. *Afr Health Sci*. 22:666–673. doi: 10.4314/ahs.v22i3.71.

[22] Khankeh HR, Mohammadi R, Ahmadi F. (2007). Health care services at time of natural disasters: a qualitative study. *Iran Journal of Nursing.* 20:85–96.

[23] The role of hospitals in disaster. (2006). Chaffee MW, Oster NS. *Disaster Medicine*. 34–42.

[24] Van der Wulp I, van Baar ME, Schrijvers AJ. (2008). Reliability and validity of the Manchester triage system in a general emergency department patient population in the Netherlands: results of a simulation study. *Emerg Med J*. 25:431–434. doi: 10.1136/emj.2007.055228.

[25] Farhud DD, Zokaei S. (2021). Ethical issues of artificial intelligence in medicine and healthcare. *Iran J Public Health.* 50:0. doi: 10.18502/ijph.v50i11.7600.

[26] Torab-Miandoab A, Samad-Soltani T, Jodati A, Rezaei-Hachesu P. (2023). Interoperability of heterogeneous health information systems: a systematic literature review. *BMC Med Inform Decis Mak.* 23:18. doi: 10.1186/s12911-023-02115-5.

[27] Reay G, Norris JM, Nowell L, et al. (2020). Transition in care from EMS providers to emergency department nurses: a systematic review. *Prehosp Emerg Care*. 24:421–433. doi: 10.1080/10903127.2019.1632999.

[28] Harris C, Green S, Elshaug AG. (2017). Sustainability in health care by allocating resources effectively (SHARE) 10: operationalising disinvestment in a conceptual framework for resource allocation. *BMC Health Serv Res*. 17:632. doi: 10.1186/s12913-017-2506-7.

[29] Alpert EA, Weiser G, Kobliner D, Mashiach E, Bader T, Tal-Or E, Merin O. (2018). Challenges in implementing international standards for the field hospital emergency department in a disaster zone: The Israeli experience. *J Emerg Med.* 55:682–687. doi: 10.1016/j.jemermed.2018.07.019.

[30] Bullock JA, Haddow GD, Coppola DP. (2012). Mitigation, prevention, and preparedness. *Introduction to Homeland Security*. 435–494.

[31] Colling RL, York TW. (2012). Emergency preparedness - planning and management. *Hospital and Healthcare Security*. 591–619.

[32] Zibulewsky J. Proc (Bayl Univ Med Cent). (2001). Defining disaster: the emergency department perspective. 14:144–149. doi: 10.1080/08998280.2001.11927751.

[33] El Sayed MJ. (2022). Beirut ammonium nitrate explosion: a man-made disaster in times of the covid-19 pandemic. *Disaster Med Public Health Prep*. 16:1203–1207. doi: 10.1017/dmp.2020.451.

[34] Zikargae MH, Woldearegay AG, Skjerdal T. (2022). Assessing the roles of stakeholders in community projects on environmental security and livelihood of impoverished rural society: a nongovernmental organization implementation strategy in focus. *Heliyon.* 8:0. doi: 10.1016/j.heliyon.2022.e10987.

[35] Gooding K, Bertone MP, Loffreda G, Witter S. (2022). How can we strengthen partnership and coordination for health system emergency preparedness and response? Findings from a synthesis of experience across countries facing shocks. *BMC Health Serv Res*. 22:1441. doi: 10.1186/s12913-022-08859-6.

[36] Ortiz-Barrios M, Gul M, Yucesan M, Alfaro-Sarmiento I, Navarro-Jiménez E, Jiménez-Delgado G. (2022). A fuzzy hybrid decision-making framework for increasing the hospital disaster preparedness: the colombian case. *Int J Disaster* meeting. *Int J Environ Res Public Health*. 16:770. doi: 10.3390/ijerph16050770.

[49] Tam G, Chan EY, Liu S. (2019). Planning of a health emergency disaster risk management programme for a chinese ethnic minority community. *Int J Environ Res Public Health.* 16:1046. doi: 10.3390/ijerph16061046.

[50] Chan EY, Man AY, Lam HC. (2019). Scientific evidence on natural disasters and health emergency *Risk Reduct.* 72:102831. doi: 10.1016/j.ijdrr.2022.102831.

[37] Schultz CH, Koenig KL, Lewis RJ. (2003). Implications of hospital evacuation after the Northridge, California, earthquake. *N Engl J Med*. 348:1349–1355. doi: 10.1056/NEJMsa021807.

[38] Jensen J, Thompson S. (2016). The incident command system: a literature review. *Disasters.* 40:158–182. doi: 10.1111/disa.12135.

[39] Gencer EA. (2013). Natural disasters, urban vulnerability, and risk management: a theoretical overview. The Interplay between Urban Development, Vulnerability, and Risk Management. Vol. (7). Berlin Heidelberg: *Springer.*

[40] Azizpour I, Mehri S, Soola AH. (2022). Disaster preparedness knowledge and its relationship with triage decision-making among hospital and pre-hospital emergency nurses - Ardabil, Iran. *BMC Health Serv Res*. 22:934. doi: 10.1186/s12913-022-08311-9.

[41] Nick GA, Savoia E, Elqura L, et al. (2009). Emergency preparedness for vulnerable populations: people with special health-care needs. *Public Health Rep.* 124:338–343. doi: 10.1177/003335490912400225.

[42] Gougelet RM. (2015). Disaster mitigation. *Ciottone's Disaster Medicine.* 160–166.

[43] Rambhia KJ, Waldhorn RE, Selck F, Mehta AK, Franco C, Toner ES. (2012). A survey of hospitals to determine the prevalence and characteristics of healthcare coalitions for emergency preparedness and response. *Biosecur Bioterror*. 10:304–313. doi: 10.1089/bsp.2012.0022.

[44] Parrott ML, Wicker LV, Lamont A, et al. (2021). Emergency response to Australia's black summer 2019-2020: the role of a zoo-based conservation organisation in wildlife triage, rescue, and resilience for the future. *Animals (Basel)* 11:1515. doi: 10.3390/ani11061515.

[45] Sutcliffe KM, Lewton E, Rosenthal MM. (2004). Communication failures: an insidious contributor to medical mishaps. *Acad Med.* 79:186–194. doi: 10.1097/00001888-200402000-00019.

[46] Gesme DH, Towle EL, Wiseman M. (2010). Essentials of staff development and why you should care. *J Oncol Pract*. 6:104–106. doi: 10.1200/JOP.091089.

[47] Kim DH. (2016). Emergency preparedness and the development of health care coalitions: a dynamic process. *Nurs Clin North Am.* 51:545–554. doi: 10.1016/j.cnur.2016.07.013.

[48] Aung MN, Murray V, Kayano R. (2019). Research methods and ethics in health emergency and disaster risk management: the result of the kobe expert and disaster risk management in Asian rural-based area. *Br Med Bull.* 129:91–105. doi: 10.1093/bmb/ldz002.

[51] El Sayed MJ. (2022). Beirut ammonium nitrate explosion: a man-made disaster in times of the covid-19 pandemic. *Disaster Med Public Health Prep.* 16:1203–1207. doi: 10.1017/dmp.2020.451.