JMALS

Journal of Medical and Life Science
https://jmals.journals.ekb.eg/

SPBH

Review

The Role of The Healthcare Practitioner During Natural Disasters, Health Crises, And Wars.

KHALID RUBAYYI MOHAMMED ALSHARARI[1], NAWAF MADALLAH AWADH ALSHARARI[1], Abdulmajeed Mualla Alotaibi[2], Khulud Essa Dalak[3], Malak Abdulaziz Alanazi[3], Amjad Ali Alqahtani[3], and Mona Dullah Yousef Alsomali [3]

[1]Red Crescent Hamad Center, Saudi Arabia

[2] King Fahad Medical City, Saudi Arabia

[3] Prince Sultan Cardiac Center, Saudi Arabia

DOI:10.21608/jmals.2024.419976

Abstract:

Background: Disasters, whether natural or human-induced, have been increasing in frequency and impact, necessitating robust preparedness and response strategies. Healthcare practitioners, particularly general practitioners (GPs), are critical in managing such crises. Since the 2001 terrorist attacks, disaster preparedness has improved, with greater integration of public health and healthcare professionals into planning processes. The COVID-19 pandemic further accelerated the adoption of digital health technologies (DHTs), such as telehealth, electronic health records (EHRs), and mobile health (mHealth), which have become essential tools in disaster response and healthcare delivery. **Aim:** This review examines the role of healthcare practitioners, particularly GPs, in disaster management, focusing on their responsibilities in preparedness, response, and recovery. It also explores the integration of DHTs in disaster scenarios and their potential benefits and limitations. **Methods:** The review synthesizes existing literature on disaster management frameworks, the role of GPs, and the application of DHTs in healthcare during crises. It highlights key components such as the Hospital Incident Command System (HICS), the four phases of emergency management (mitigation, preparedness, response, and recovery), and digital tools like telehealth and AI. **Results:** Healthcare practitioners play a pivotal role in disaster management, from providing immediate care to coordinating long-term recovery efforts. DHTs, including telehealth and EHRs, enhance disaster response by improving communication, data sharing, and patient management. However, challenges such as digital access disparities, e-waste, and the need for standardized frameworks remain.

Keywords: Healthcare practitioners, general practitioners, disaster management, digital health technologies, telehealth, emergency response.

Introduction:

Disasters, whether stemming from natural causes or human actions, can strike unexpectedly and are increasingly occurring with greater frequency and severity. Effective preparedness and training are crucial for an appropriate response. Since the terrorist attacks on the World Trade Center in 2001, there has been significant progress in disaster preparedness, particularly through the integration of public health and healthcare professionals into the planning processes. The involvement of government entities has also broadened across Federal, State, and

Received: September 25, 2024. Accepted: November 20, 2024. Published: December 19, 2024

local levels. Given the varied nature of disasters, healthcare leadership needs to embrace an all-hazards strategy for emergency management. This comprehensive planning not only improves the efficiency of emergency responses but also bolsters overall preparedness [1- 4].

The rapid emergence of the COVID-19 pandemic, along with the implementation of public health measures to curb its spread, significantly accelerated the global adoption of digital health technologies (DHTs) in healthcare environments. This widespread integration facilitated safer patient screening and management, reduced direct contact for both healthcare professionals and the public, enhanced disease transmission modeling, and improved communication between patients, their families, and medical providers [1,5,6]. Telehealth became an essential tool for maintaining connections between isolated patients, critically ill individuals, and healthcare professionals navigating pandemic-related obstacles [2]. Additionally, various DHTs—including artificial intelligence, mobile health applications, big data analytics, 5G connectivity, and the Internet of Things (IoT)—have gained prominence in recent years. The continued utilization of these technologies will remain crucial for healthcare services, particularly in times of crisis. Moreover, digital platforms have played a vital role in enabling public access to health information and offering emotional support via social media during the pandemic [3].

Due to the rapid evolution and widespread adoption of DHTs, alongside the lack of standardized frameworks governing their application in disaster scenarios, accurately predicting their impact on healthcare delivery during emergencies remains a challenge. This uncertainty is particularly pronounced in disasters triggered by extreme weather events, where immediate medical response and acute healthcare management are of utmost priority. Moreover, technologies not originally designed for healthcare purposes may be repurposed as DHTs during disaster responses when conventional healthcare technologies are either unavailable or unsuitable [7]. The resilience of DHT systems against successive or cascading disasters—such as extensive flooding or landslides occurring in the aftermath of a major wildfire—remains insufficiently explored. Additionally, disparities in digital access continue to impede equitable healthcare delivery, influencing how DHTs are utilized in disaster scenarios [6]. Furthermore, limited knowledge exists regarding community-driven digital health initiatives during disasters and the role of digital platforms, including social media, in supporting public health efforts during and after crises. Nonetheless, DHTs have become integral to disaster response efforts worldwide, encompassing crises of human, biological, geophysical, and climatic origin.

Management During Disasters:

The core framework of disaster planning is based on four key phases of comprehensive emergency management: mitigation, preparedness, response, and recovery. Mitigation involves proactive steps to reduce vulnerabilities and risks, which in healthcare can be categorized into structural improvements, such as reinforcing medical facilities, and non-structural strategies, including the establishment of regulations, guidelines, and surveillance systems. Preparedness focuses on strengthening the capacity to handle emergencies through activities like training exercises, educational initiatives, and stockpiling essential resources. The response phase entails immediate actions to lessen the impact of disasters, such as triage, medical interventions, and effective patient flow management. Recovery efforts aim to restore affected areas to their pre-disaster conditions, including resuming surgical procedures and reinstating administrative functions.

Following the September 11, 2001, attacks, deficiencies in disaster response coordination and communication became apparent. In response, President George W. Bush introduced the Homeland Security Presidential Directive-5, mandating the Department of Homeland Security to develop the

National Incident Management System (NIMS) and the National Response Plan (NRP). The NRP unified response strategies across agencies into a comprehensive, all-hazards framework. In 2008, the NRP was replaced by the National Response Framework (NRF), which defines a strategic disaster response approach, while NIMS provides a structured methodology for executing response efforts. NIMS incorporates the establishment of a Unified Command (UC) and the Incident Command System (ICS), initially designed for firefighting operations. Within healthcare, the Hospital Incident Command System (HICS) is implemented to ensure standardized command, communication, and coordination. Compliance with ICS standards and active participation in the national response framework under NIMS is required for healthcare organizations by accrediting bodies such as the Joint Commission [7-10].

HICS builds upon the ICS structure, activating a command center either before or during a disaster response. Its adaptable framework allows customization based on the scale and nature of the incident. By utilizing standardized ICS terminology, HICS facilitates seamless collaboration with external agencies, improving overall coordination. The HICS framework consists of five primary management functions: command, planning, logistics, operations, and finance.

The command team, headed by the Incident Commander, oversees response operations. Key roles include a Public Information Officer managing media communication, a Liaison Officer coordinating with external organizations, a Safety Officer ensuring the well-being of staff, patients, and visitors while assessing risks, and a Medical/Technical Specialist providing expert guidance. The Planning team gathers and organizes critical information, developing the Incident Action Plan. Logistics personnel manage essential resources such as food, medical supplies, and transportation. The Operations team executes tactical objectives and oversees direct response efforts. Meanwhile, the Finance section monitors expenses and manages funding for disaster-related costs and claims. Each division is further structured into branch managers and unit leaders responsible for specific operational areas.

The Joint Commission mandates that healthcare organizations establish an Emergency Management Program, which consists of four core elements: a Hazard Vulnerability Analysis (HVA), an incident management system like HICS, an Emergency Operations Plan (EOP), and an exercise program. HVA identifies potential emergencies that could disrupt operations, forming the foundation for planning efforts. It evaluates both internal and external threats, with external risks assessed based on geographic location. Certain disasters, such as earthquakes and hurricanes, can simultaneously impact internal operations and lead to a surge in external casualties. The HVA ranks these threats based on their likelihood and potential impact [8-10].

The EOP serves as the strategic foundation for HICS, outlining the healthcare facility's approach to emergency response. It comprises a base plan, functional annexes, and incident-specific annexes. The base plan defines roles, responsibilities, authorities, and an all-hazards response framework, including an organizational chart for HICS and an operational concept, which typically includes event recognition, activation, mobilization, response, demobilization, and recovery. Functional annexes provide detailed operational procedures for each section, including job action sheets and required documentation. Incident-specific annexes focus on hazards identified in the HVA, detailing contingency strategies and standard operating procedures tailored to each scenario. Additional policies and protocols are documented in support annexes and appendices as necessary [7].

To maintain effectiveness, an emergency plan must be continuously updated to reflect emerging threats, evolving priorities, and shifting organizational needs. Regular training and simulations are essential to

ensure preparedness, with insights gained from these exercises used to refine the plan, fostering a cycle of continuous improvement. Emergency plans should be reviewed and revised regularly, particularly after major exercises, activations, or significant environmental changes. Ideally, updates should be conducted annually or at least every two years to ensure alignment with best practices and current needs [10,11].

Clinical Relevance:

The principles of disaster planning are only effective when they are actively integrated into education and training programs. Regular exercises and drills are essential to ensure that plans are not only understood but also actionable during real incidents. The significance of preparedness is often highlighted in the aftermath of major disasters, as seen following recent mass-casualty terrorist events. These incidents underscore the critical need for robust disaster planning and the importance of translating theoretical frameworks into practical, executable strategies. However, for disaster plans to be truly effective, they must be grounded in evidence-based research. There is a pressing need for more comprehensive disaster research to either validate or challenge the assumptions that underpin these plans. This is particularly relevant in the context of evolving threats, such as terrorism, which necessitate specialized response strategies for chemical, biological, and radiological incidents, including decontamination protocols. The increasing prevalence of terrorist threats has amplified the demand for well-developed and frequently tested plans to address these specific hazards. For instance, healthcare facilities and emergency response teams must be equipped to handle incidents involving hazardous materials, which require specialized training and equipment. Scheduled large-scale events, such as concerts or sporting events, provide valuable opportunities to test and refine emergency plans. These events can serve as realistic scenarios for staff to practice response protocols, enhancing their familiarity with procedures and improving overall readiness. By incorporating such events into training exercises, organizations can identify gaps in their plans and address them proactively [7].

Frequent drills and exercises are indispensable for evaluating the effectiveness of disaster plans and making necessary revisions before an actual disaster occurs. These activities allow organizations to assess their preparedness, identify weaknesses, and implement improvements in a controlled environment. Moreover, they foster a culture of continuous learning and adaptation, ensuring that plans remain relevant and responsive to emerging threats. The iterative process of testing, evaluating, and refining disaster plans is crucial for building resilience and ensuring that response efforts are efficient and effective when a real incident occurs [12-13]. In essence, the true value of disaster planning lies in its practical application, and ongoing education, training, and research are vital to achieving this goal.

Using Modern Technology:

Digital health, broadly encompassing various technologies designed to manage health information and support patient care [14], has become a fundamental component of modern healthcare. These technologies, collectively referred to as Digital Health Technologies (DHTs), facilitate digital health interventions—health-related services delivered through electronic means, either formally or informally [15]. DHTs cover a diverse range of applications, including communication platforms, data storage solutions, predictive analytics, remote monitoring, and mobile health tools. By leveraging these technologies, both healthcare professionals and patients can enhance care delivery, improve health management, and streamline administrative processes. The successful integration of digital health interventions depends on multiple factors, such as technology type, infrastructure, security protocols, and accessibility. In addition to direct clinical applications, DHTs play a vital role in healthcare operations, including appointment scheduling, which is equally critical for efficient service delivery.

Key DHT systems utilized in healthcare settings include telehealth, electronic medical records (EMRs), electronic prescribing, electronic referrals, and mobile health (mHealth). Additional tools, such as Short Message Service (SMS) platforms, wellness apps, wearable devices, and sensors, further expand the capabilities of digital health solutions [16]. These technologies serve a variety of functions across different settings. For example, telehealth services range from basic phone consultations to sophisticated video conferencing systems that facilitate remote patient interactions [17]. While DHTs are employed in both routine and emergencies, their applications often differ in disaster scenarios, requiring innovative approaches or entirely new technologies. However, despite their growing importance, standardized frameworks or evidence-based guidelines for deploying DHTs in disaster management remain limited. Digital health interventions also contribute to reducing healthcare's environmental impact, given that the healthcare sector accounts for approximately 5% of global greenhouse gas emissions [18]. By integrating climate and health data, DHTs can help create monitoring dashboards, assess climate-related health risks, and provide decision-support tools for events such as extreme heat waves [19]. However, ensuring that these technologies align with environmental sustainability is crucial [20,21]. While DHTs offer substantial benefits, they also generate electronic waste and have an environmental footprint that must be carefully managed [22, 23]. Thus, while DHTs can enhance disaster response, their design must prioritize sustainability to prevent exacerbating climate challenges. The frequent interchangeable use of digital health terminology often leads to confusion regarding implementation and regulatory oversight. To address this, the following discussion clarifies key DHTs and their interconnected roles within a digital healthcare ecosystem that prioritizes safety, quality, and efficiency.

Telehealth refers to the delivery of healthcare services, including medical consultations, education, and self-care, via digital and telecommunications technologies [24]. Although often conflated with telemedicine and virtual care, these concepts differ. Telehealth broadly encompasses all remote healthcare interactions, whereas telemedicine specifically relates to medical consultations conducted remotely [24]. Virtual care extends beyond these definitions, incorporating smartphone applications and connected devices that facilitate real-time data collection and transmission [25]. A notable example of telemedicine in action is the service provided by Médecins Sans Frontières (Doctors Without Borders), which enables field staff to consult specialists for enhanced patient care and medical education in low-resource environments [26].

Electronic health records (EHRs), electronic medical records (EMRs), electronic patient records (EPRs), and personal health records (PHRs) are often used interchangeably but have distinct meanings. An EMR is a digital patient record maintained by a single healthcare provider, whereas an EHR follows national interoperability standards, allowing access across multiple organizations [27]. PHRs, on the other hand, are maintained by individuals and may include information from various sources [27]. In disaster settings, EHRs play a critical role in ensuring continuity of care, as demonstrated during Hurricane Katrina when they facilitated medical management for displaced veterans [28, 29].

Electronic prescribing streamlines the medication prescribing, dispensing, and claims process by replacing paper-based prescriptions with secure digital alternatives [30]. Its adoption surged during the COVID-19 pandemic, driven by the need for safer, contactless healthcare services [30, 31]. Electronic referrals (e-referrals) replace traditional paper-based referral systems by digitally transferring patient information between providers, improving access to specialist care, reducing wait times, and enhancing communication between primary and specialty healthcare professionals [32, 33]. Mobile health (mHealth) utilizes mobile devices such as

smartphones and wearables to provide accessible and cost-effective health services while enabling seamless data exchange between patients and providers [34]. Evidence-based mHealth applications offer secure messaging, real-time health monitoring, and integration with EMRs to ensure continuity of care [35]. SMS-based interventions, for instance, deliver timely health reminders and support [36]. However, many consumer mHealth applications, particularly those focused on wellness, lack strong privacy protections, raising concerns about data security and confidentiality [35]. The widespread adoption of mHealth tools—including fitness trackers and mindfulness applications—adds complexity, as many of these platforms operate independently of healthcare systems [37]. This issue is especially relevant in disaster scenarios, where individuals may rely on personal health data stored on their mobile devices.

Artificial intelligence (AI) and machine learning (ML) are rapidly advancing fields that leverage data analytics and automation to solve complex healthcare challenges [38]. In disaster response, AI and ML applications assist with predicting crisis impacts, managing displaced populations, and optimizing medical resource allocation [36]. Additionally, they enhance diagnostic accuracy, training simulations, and clinical decision-making, particularly in settings with limited resources [39]. However, the widespread adoption of AI in healthcare is hindered by unresolved risks, ethical concerns, and implementation challenges, as highlighted in recent research [40]. Addressing these barriers is essential to unlocking AI's full potential in both routine and emergency medical contexts.

Overall, DHTs are transforming healthcare delivery, improving disaster response, and advancing sustainability initiatives. However, their successful integration requires clear definitions, standardized frameworks, and proactive efforts to address ethical, environmental, and security challenges. As the digital health landscape continues to evolve, ongoing research, collaboration, and regulatory oversight will be crucial in maximizing its benefits while mitigating potential risks [38].

Role of Health Professionals and General Practitioners:

Health professionals, especially general practitioners (GPs), play an important role in providing healthcare services, promoting public health, and managing both private and public health. As frontline healthcare providers, GPs and other health practitioners serve as the first point of contact for patients, offering comprehensive, continuous, and coordinated care. Their responsibilities span preventive care, diagnosis, treatment, and management of acute and chronic conditions, as well as health education and advocacy. In an era of evolving healthcare challenges, including the rise of chronic diseases, aging populations, and the increasing complexity of medical technologies, the role of health practitioners has expanded to include adapting to digital health innovations, addressing social determinants of health, and contributing to disaster preparedness and response [40].

Primary Care and Patient-Centered Care

Medical professionals are the foundation of primary care, offering comprehensive, patient-centered treatment that includes the physical, emotional, and social components of health. They are educated to handle a wide range of health issues, from minor ailments to severe chronic illnesses, and to arrange care with experts as needed. This broad scope of practice enables GPs to build long-term relationships with patients, fostering trust and continuity of care. By understanding patients' medical histories, lifestyles, and social contexts, GPs can tailor interventions to meet individual needs, improving health outcomes and patient satisfaction. Primary care also emphasizes preventive care, which is critical for reducing the burden of disease and healthcare costs. GPs play a key role in health promotion and disease prevention through routine screenings, vaccinations, and lifestyle counseling. For example, they identify risk factors for cardiovascular disease, diabetes, and cancer and

implement early interventions to mitigate these risks. By focusing on prevention, GPs contribute to the long-term health of individuals and communities, reducing the need for more intensive and costly treatments [34].

Management of Chronic Illnesses

Medical professionals are primarily responsible for managing chronic conditions, including diabetes, hypertension, and asthma. Chronic conditions are a leading cause of morbidity and mortality worldwide, and their prevalence is increasing due to aging populations and lifestyle changes. GPs are uniquely positioned to manage these conditions through regular monitoring, medication management, and patient education. They work collaboratively with patients to develop personalized care plans that address not only medical needs but also lifestyle modifications, such as diet and exercise. Effective chronic disease management requires a multidisciplinary approach, and GPs often coordinate care with other healthcare professionals, including nurses, dietitians, and physiotherapists. This team-based approach ensures that patients receive comprehensive care that addresses all aspects of their health. Additionally, GPs play a critical role in identifying and addressing comorbidities, which are common among patients with chronic conditions. By managing these complex cases, GPs help improve the quality of life and reduce hospitalizations [33,41].

Mental Health Treatment

Psychological wellness is an important part of general health, and GPs are frequently the initial point of contact for those with mental health problems. They are in charge of recognizing and treating prevalent psychological disorders, including anxiety, depression, and stress-related diseases. General practitioners do initial examinations, counsel patients, and prescribe drugs as needed. They also play an important role in lowering the stigma related to mental health by providing a secure and supportive setting for patients to express their problems. In cases where specialized care is required, GPs facilitate referrals to psychiatrists or mental health services. However, due to the shortage of mental health professionals in many regions, GPs often continue to provide ongoing support and monitoring for patients with mental health conditions. This underscores the importance of equipping GPs with the skills and resources needed to address mental health effectively [27,42].

Health Education and Advocacy

Health practitioners, particularly GPs, are educators and advocates for their patients and communities. They provide evidence-based information on health-related topics, empowering individuals to make informed decisions about their health. For example, GPs educate patients about the importance of vaccinations, smoking cessation, and healthy eating. They also address misconceptions and misinformation, which is especially important in the context of public health crises, such as the COVID-19 pandemic. Beyond individual patient interactions, GPs advocate for public health initiatives and policies that promote population health. They contribute to community health programs, participate in health campaigns, and collaborate with public health organizations to address issues such as obesity, substance abuse, and infectious diseases. By leveraging their expertise and influence, GPs play a vital role in shaping health policies and improving health equity [43].

Adaptation to Digital Healthcare Innovations

The adoption of digital health technologies (DHTs) has significantly altered the roles of healthcare practitioners. General practitioners (GPs) are increasingly utilizing telehealth, electronic health records (EHRs), and mobile health (mHealth) applications to improve the delivery of care. For example, telehealth enables GPs to conduct remote consultations, which broadens access to healthcare services for patients living in rural or underserved regions. EHRs facilitate the seamless exchange of patient information among healthcare providers, enhancing care coordination and minimizing errors. However, the integration of DHTs comes with its own set of challenges, such as the necessity for

training, concerns regarding data security, and the potential to worsen health disparities. GPs must effectively manage these challenges while ensuring that digital tools enhance, rather than replace, the essential human aspects of patient care. By adopting DHTs, GPs can boost operational efficiency, improve patient engagement, and enable data-driven decision-making [34,37].

Disaster Preparedness and Response

Health practitioners, including GPs, play a critical role in disaster preparedness and response. During emergencies such as natural disasters, pandemics, or terrorist attacks, GPs are often on the frontlines, providing immediate care to affected individuals. They also contribute to public health efforts by participating in vaccination campaigns, conducting disease surveillance, and educating communities about preventive measures. In disaster situations, GPs must adapt to rapidly changing circumstances, often working with limited resources and under significant pressure. Their ability to triage patients, manage trauma, and coordinate with emergency services is essential for minimizing casualties and ensuring an effective response. Additionally, GPs play a key role in the recovery phase, addressing the long-term health impacts of disasters and supporting the mental health of survivors [1,2].

Addressing Social Determinants of Health

Health practitioners recognize that health outcomes are influenced by social determinants such as income, education, housing, and access to healthcare. GPs are increasingly addressing these factors in their practice, advocating for policies that reduce health disparities and collaborating with social services to support vulnerable populations. For example, they may connect patients with housing assistance, food programs, or employment services to address underlying issues that impact health. By addressing social determinants of health, GPs contribute to a more equitable healthcare system and improve the overall well-being of their communities. This holistic approach aligns with the principles of primary care and underscores the importance of viewing health through a broader lens. The role of health practitioners, particularly general practitioners, is multifaceted and indispensable in modern healthcare. As primary care providers, they deliver comprehensive, patient-centered care that addresses a wide range of health needs. They manage chronic diseases, provide mental health support, and promote preventive care, contributing to improved health outcomes and reduced healthcare costs. GPs also serve as educators, advocates, and leaders in public health, addressing social determinants of health and adapting to digital health innovations. In times of crisis, they play a vital role in disaster preparedness and response, ensuring the resilience of healthcare systems. As healthcare continues to evolve, the role of GPs will remain central to achieving equitable, accessible, and high-quality care for all [34,43].

Conclusion:

The role of healthcare practitioners, particularly general practitioners (GPs), in disaster management is multifaceted and indispensable. As frontline providers, GPs are central to delivering immediate care, coordinating response efforts, and ensuring long-term recovery during natural disasters, health crises, and wars. Their responsibilities span all phases of emergency management, mitigation, preparedness, response, and recovery, making them critical to the resilience of healthcare systems in times of crisis. The integration of digital health technologies (DHTs) has further enhanced the capacity of healthcare practitioners to respond effectively to disasters. Tools such as telehealth, electronic health records (EHRs), and mobile health (mHealth) applications have revolutionized disaster response by enabling remote consultations, improving data sharing, and facilitating real-time communication. For instance, telehealth has proven invaluable during the COVID-19 pandemic, allowing GPs to provide care while minimizing exposure risks. Similarly, EHRs have ensured continuity of care for displaced populations, as seen in the aftermath of Hurricane Katrina. However, the adoption of DHTs in disaster management is not

without challenges. Disparities in digital access, particularly in low-resource settings, can exacerbate health inequities. Additionally, the environmental impact of DHTs, including e-waste and carbon footprints, must be addressed to ensure sustainable implementation. The lack of standardized frameworks for deploying DHTs in disaster scenarios further complicates their effective use, highlighting the need for evidence-based guidelines and robust infrastructure. Healthcare practitioners also play a vital role in addressing the social determinants of health, which are often exacerbated during disasters. By advocating for policies that reduce health disparities and collaborating with social services, GPs can mitigate the long-term impacts of disasters on vulnerable populations. Their ability to adapt to rapidly changing circumstances, manage trauma, and coordinate with emergency services underscores their importance in disaster response. In conclusion, the role of healthcare practitioners, particularly GPs, is central to effective disaster management. Their integration of DHTs, commitment to equitable care, and leadership in public health initiatives are essential for building resilient healthcare systems. As the frequency and complexity of disasters continue to rise, ongoing education, training, and research will be critical to ensuring that healthcare practitioners are equipped to meet these challenges and provide high-quality care in all circumstances.

Conflict of interest: NIL

Funding: NIL

References:

1. Feizolahzadeh S, Vaezi A, Mirzaei M, Khankeh H, Taheriniya A, Vafaeenasab M, Khorasani-Zavareh D. Barriers and facilitators to provide continuity of care to dischargeable patients in disasters: A qualitative study. Injury. 2019 Apr;50(4):869-876.
2. Tam G, Chan EYY, Liu S. Planning of a Health Emergency Disaster Risk Management Programme for a Chinese Ethnic Minority Community. Int J Environ Res Public Health. 2019 Mar 22;16(6)
3. Subramaniam P, Villeneuve M. Advancing emergency preparedness for people with disabilities and chronic health conditions in the community: a scoping review. Disabil Rehabil. 2020 Nov;42(22):3256-3264.
4. Greco S, Lewis EJ, Sanford J, Sawin EM, Ames A. Ethical Reasoning Debriefing in Disaster Simulations. J Prof Nurs. 2019 Mar-Apr;35(2):124-132.
5. Yameny, A. Characterization of SARS-CoV-2 Omicron XBB.1.5 sub-lineage: A review. *Journal of Medical and Life Science*, 2023; 5(2): 96-101. doi: 10.21608/jmals.2023.305080
6. Yameny, A. COVID-19 Laboratory diagnosis methods. *Journal of Bioscience and Applied Research*, 2023; 9(2): 94-101. doi: 10.21608/jbaar.2023.311827
7. Iserson KV. Remote Health Care at U.S. Antarctic Stations: A Comparison with Standard Emergency Medical Practice. J Emerg Med. 2019 May;56(5):544-550.
8. Burns PL, Douglas KA, Hu W. Primary care in disasters: opportunity to address a hidden burden of health care. Med J Aust. 2019 Apr;210(7):297-299.e1.
9. Chakraborty J, Grineski SE, Collins TW. Hurricane Harvey and people with disabilities: Disproportionate exposure to flooding in Houston, Texas. Soc Sci Med. 2019 Apr;226:176-181.
10. Schnall AH, Roth JJ, Ekpo LL, Guendel I, Davis M, Ellis EM. Disaster-Related Surveillance Among US Virgin Islands (USVI) Shelters During the Hurricanes Irma and Maria Response. Disaster Med Public Health Prep. 2019 Feb;13(1):38-43.
11. Yameny, A. Short Communication: The COVID-19 JN.1 variant diagnosed in Egypt.. *Journal of Medical and Life Science*, 2023; 5(4): 318-321. doi: 10.21608/jmals.2024.333814

12. Papadakis G, Chalabi Z, Khare S, Bone A, Hajat S, Kovats S. Health protection planning for extreme weather events and natural disasters. 2018 FallAm J Disaster Med. 13(4):227-236.
13. Sweileh WM. A bibliometric analysis of health-related literature on natural disasters from 1900 to 2017. Health Res Policy Syst. 2019 Feb 11;17(1):18.
14. Australian Institute of Health and Welfare Digital Health
15. Soobiah, C.; Cooper, M.; Kishimoto, V.; Bhatia, R.S.; Scott, T.; Maloney, S.; Larsen, D.; Wijeysundera, H.C.; Zelmer, J.; Gray, C.S.; et al. Identifying optimal frameworks to implement or evaluate digital health interventions: A scoping review protocol. *BMJ Open* **2020**, *10*, e037643.
16. United States Food and Drug Administration Digital Health.
17. Holmner, A.; Ebi, K.L.; Lazuardi, L.; Nilsson, M. Carbon footprint of telemedicine solutions--unexplored opportunity for reducing carbon emissions in the health sector. *PLoS ONE* **2014**, *9*, e105040.
18. Watts, N.; Amann, M.; Ayeb-Karlsson, S.; Belesova, K.; Bouley, T.; Boykoff, M.; Byass, P.; Cai, W.; Campbell-Lendrum, D.; Chambers, J.; et al. The Lancet Countdown on health and climate change: From 25 years of inaction to a global transformation for public health. *Lancet* **2018**, *391*, 581–630.
19. Rahimi-Ardabili, H.; Magrabi, F.; Coiera, E. Digital health for climate change mitigation and response: A scoping review. *J. Am. Med. Inform. Assoc.* **2022**, *29*, 2140–2152.
20. Lokmic-Tomkins, Z.; Davies, S.; Block, L.J.; Cochrane, L.; Dorin, A.; von Gerich, H.; Lozada-Perezmitre, E.; Reid, L.; Peltonen, L.M. Assessing the carbon footprint of digital health interventions: A scoping review. *J. Am. Med. Inform. Assoc.* **2022**, *29*, 2128–2139.
21. Lokmic-Tomkins, Z.; Borda, A.; Humphrey, K. Designing digital health applications for climate change mitigation and adaptation. *Med. J. Aust.* **2023**, *218*, 106–110.
22. Abalansa, S.; El Mahrad, B.; Icely, J.; Newton, A. Electronic Waste, an Environmental Problem Exported to Developing Countries: The GOOD, the BAD and the UGLY. *Sustainability* **2021**, *13*, 5302. [
23. World Health Organization Soaring E-Waste Affects the Health of Millions of Children, WHO Warns.
24. NEJM Catalyst, What is telehealth? *NEJM Catal.* **2018**, *4*.
25. Shah, B.R.; Schulman, K. Do not let a good crisis go to waste: Health care's path forward with virtual care. *NEJM Catal. Innov. Care Deliv.* **2021**,
26. Delaigue, S.; Bonnardot, L.; Steichen, O.; Garcia, D.M.; Venugopal, R.; Saint-Sauveur, J.F.; Wootton, R. Seven years of telemedicine in Médecins Sans Frontières demonstrate that offering direct specialist expertise in the frontline brings clinical and educational value. *J. Glob. Health* **2018**, *8*, 020414.
27. The National Alliance for Health Information Technology. *Defining Key Health Information Technology Terms*; The Office of the National Coordinator for Health Information Technology: Washington, DC, USA, 2008.
28. Australian Government Department of Health and Aged Care Electronic Health Records.
29. Brown, S.H.; Fischetti, L.F.; Graham, G.; Bates, J.; Lancaster, A.E.; McDaniel, D.; Gillon, J.; Darbe, M.; Kolodner, R.M. Use of Electronic Health Records in Disaster Response: The Experience of Department of Veterans Affairs After Hurricane Katrina. *Am. J. Public Health* **2007**, *97* (Suppl. 1), S136–S141.
30. Mohsin-Shaikh, S.; Furniss, D.; Blandford, A.; McLeod, M.; Ma, T.; Beykloo, M.Y.; Franklin, B.D. The impact of electronic prescribing systems on healthcare professionals' working practices in the hospital setting: A systematic review and narrative synthesis. *BMC Health Serv. Res.* **2019**, *19*, 742.

31. Australian Government Department of Health Fact Sheet—National Health Plan A Guide for Pharmacists.
32. Naseriasl, M.; Adham, D.; Janati, A. E-referral Solutions: Successful Experiences, Key Features and Challenges—a Systematic Review. *Mater Sociomed* **2015**, *27*, 195.
33. Azamar-Alonso, A.; Costa, A.P.; Huebner, L.A.; Tarride, J.E. Electronic referral systems in health care: A scoping review. *Clin. Outcomes Res.* **2019**, *11*, 325–333.
34. World Health Organization. *Executive Board, mHealth: Use of Appropriate Digital Technologies for Public Health: Report by the Director-General*; World Health Organization: Geneva, Switzerland, 2017.
35. Rowland, S.P.; Fitzgerald, J.E.; Holme, T.; Powell, J.; McGregor, A. What is the clinical value of mHealth for patients? *NPJ Digit. Med.* **2020**, *3*, 4.
36. Head, K.J.; Noar, S.M.; Iannarino, N.T.; Grant Harrington, N. Efficacy of text messaging-based interventions for health promotion: A meta-analysis. *Soc. Sci. Med.* **2013**, *97*, 41–48.
37. Nunes, A.; Limpo, T.; Castro, S.L. Acceptance of Mobile Health Applications: Examining Key Determinants and Moderators. *Front. Psychol.* **2019**, *10*, 2791.
38. McCarthy, J. Mathematical logic in artificial intelligence. *Daedalus* **1988**, *117*, 297–311.
39. Arora, A. Conceptualising artificial intelligence as a digital healthcare innovation: An introductory review. *Med. Devices* **2020**, *13*, 223.
40. Gupta, S.; Kamboj, S.; Bag, S. Role of risks in the development of responsible artificial intelligence in the digital healthcare domain. *Inf. Syst. Front.* **2021**, 1–18.
41. Yameny, A. Diabetes Mellitus Overview 2024. *Journal of Bioscience and Applied Research*, 2024; 10(3): 641-645. doi: 10.21608/jbaar.2024.382794
42. Britiller, M., Hassan, E., Anna, R. Factors associated with the Physical and Mental Fatigue Levels of Nurses in the Eastern Region Hospitals, Saudi Arabia. *Journal of Bioscience and Applied Research*, 2024; 10(4): 842-855. doi: 10.21608/jbaar.2024.323341.1086
43. Gunasekeran, D.V.; Tseng, R.M.W.W.; Tham, Y.-C.; Wong, T.Y. Applications of digital health for public health responses to COVID-19: A systematic scoping review of artificial intelligence, telehealth and related technologies. *NPJ Digit. Med.* **2021**, *4*, 40.

دور الممارس الصحي أثناء الكوارث الطبيعية والأزمات الصحية والحروب

المستخلص:

الخلفية : تزايدت الكوارث، سواء كانت طبيعية أو من صنع الإنسان، من حيث التكرار والتأثير، مما يستلزم استراتيجيات قوية للتأهب والاستجابة. يلعب الممارسون الصحيون، وخاصة الأطباء العامون(GPs) ، دورًا محوريًا في إدارة هذه الأزمات. منذ الهجمات الإرهابية عام 2001، تحسّن التأهب للكوارث مع تعزيز دمج الصحة العامة والممارسين الصحيين في عمليات التخطيط. أدت جائحة COVID-19 إلى تسريع تبني التقنيات الصحية الرقمية(DHTs) ، مثل التطبيب عن بُعد، والسجلات الصحية الإلكترونية(EHRs) ، والصحة المحمولة(mHealth) ، والتي أصبحت أدوات أساسية في الاستجابة للكوارث وتقديم الرعاية الصحية.

الهدف : يستعرض هذا البحث دور الممارسين الصحيين، وخاصة الأطباء العامين، في إدارة الكوارث، مع التركيز على مسؤولياتهم في مراحل التأهب، والاستجابة، والتعافي. كما يستكشف دمج التقنيات الصحية الرقمية في سيناريوهات الكوارث، إلى جانب فوائدها وتحدياتها المحتملة.

المنهجية : يعتمد هذا الاستعراض على تحليل الأدبيات المتعلقة بأطر إدارة الكوارث، ودور الأطباء العامين، وتطبيق التقنيات الصحية الرقمية في الرعاية الصحية أثناء الأزمات. يسلط الضوء على مكونات رئيسية مثل نظام قيادة الحوادث في المستشفيات(HICS) ، والمراحل الأربع لإدارة الطوارئ (التخفيف، التأهب، الاستجابة، التعافي)، واستخدام الأدوات الرقمية مثل التطبيب عن بُعد والذكاء الاصطناعي.

النتائج : يلعب الممارسون الصحيون دورًا حاسمًا في إدارة الكوارث، بدءًا من تقديم الرعاية الفورية وصولًا إلى تنسيق جهود التعافي طويلة الأمد. تعزز التقنيات الصحية الرقمية، بما في ذلك التطبيب عن بُعد والسجلات الصحية الإلكترونية، الاستجابة للكوارث عبر تحسين التواصل، وتبادل البيانات، وإدارة المرضى. ومع ذلك، تظل هناك تحديات مثل التفاوت في الوصول الرقمي، والنفايات الإلكترونية، والحاجة إلى أطر عمل موحدة.

الاستنتاج : يُعد الأطباء العامون والممارسون الصحيون عناصر أساسية في إدارة الكوارث، حيث يقدمون رعاية شاملة ويستفيدون من التقنيات الصحية الرقمية لتحسين كفاءة الاستجابة. يتطلب تعزيز تبني هذه التقنيات وضمان الوصول العادل إليها جهودًا مستمرة لتعزيز التأهب المستقبلي.

الكلمات المفتاحية : الممارسون الصحيون، الأطباء العامون، إدارة الكوارث، التقنيات الصحية الرقمية، التطبيب عن بُعد، الاستجابة للطوارئ، الصحة العامة.