



Strengthening hospital resilience in the Eastern Mediterranean Region

A policy paper on
facility-level
preparedness



World Health
Organization
REGIONAL OFFICE FOR THE Eastern Mediterranean



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WHO Library Cataloguing in Publication Data

Names: World Health Organization. Regional Office for the Eastern Mediterranean

Title: Strengthening hospital resilience in the Eastern Mediterranean Region: a policy paper on facility-level preparedness / World Health Organization. Regional Office for the Eastern Mediterranean

Description: Cairo: World Health Organization. Regional Office for the Eastern Mediterranean, 2022 | Includes bibliographical references

Identifier: ISBN 978-92-9022-957-5 (pbk.) | ISBN 978-92-9022-958-2 (online)

Subjects: Hospitals | Hospital Planning | Health Facility Planning | Universal Health Insurance | Equipment and Supplies, Hospital | Eastern Mediterranean Region

Classification: NLM WX 140

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Suggested citation. Strengthening hospital resilience in the Eastern Mediterranean Region: a policy paper on facility-level preparedness. Cairo: WHO Regional Office for the Eastern Mediterranean; 2022. Licence: CC BY-NC-SA 3.0 IGO.

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Acknowledgements

This policy paper is the result of a cross-departmental collaboration between the Universal Health Coverage/Health Systems, Science, Information and Dissemination, Health Emergencies and Healthier Populations departments at the WHO Regional Office for the Eastern Mediterranean.

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The team would like to acknowledge Dr Ahmed Al-Mandhari (WHO Regional Director for the Eastern Mediterranean), Dr Rana Hajjeh (Director of Programme Management), Dr Awad Mataria (Director, Universal Health Coverage/Health Systems), Dr Arash Rashidian (Director, Science, Information and Dissemination) and Dr Richard Brennan (Director, WHO Health Emergencies) for their leadership and support of this project.

Background

To achieve universal health coverage and protect global health security, efforts must be made to strengthen health systems and their resilience continuously throughout the preparedness and risk reduction cycle (1). This process must be in place prior to the onset of an emergency and throughout the recovery process. Hospitals are microcosms of health systems and have been the backbone of the COVID-19 response globally. Consequently, strengthening hospital emergency preparedness improves the capacity of health systems to respond to unforeseen shocks (2,3). A year into the pandemic response, hospitals across the WHO Eastern Mediterranean Region's diverse health systems have adapted to maintain essential services, manage surges of critical COVID-19 infections, and respond to the COVID-19 and other emergencies or disasters in the face of constantly evolving and complex challenges (4,5,6). This adaptability to respond to the pandemic while maintaining critical functions underpins hospital resilience (7,8,9). Furthermore, in the face of subsequent waves and shocks to health systems, hospitals must optimize their preparedness for emergency and outbreak response and build resilience (10,11).

This paper introduces hospital resilience and its critical role in health systems. It outlines the common challenges faced by hospitals in the Eastern Mediterranean Region and provides recommendations for policy-makers and hospital managers on improving preparedness for greater resilience.

Hospitals in the Eastern Mediterranean Region

Hospitals in the Eastern Mediterranean Region differ in size, proprietorship, assignment, and performance. The total number of hospital beds in the Region is estimated to be 740 000. Except for Lebanon, the majority of hospital beds in the Region are in the public sector (80%), with the remaining in private for-profit (18%) and private not-for-profit (2%) hospitals. The range of hospital beds per 10 000 population varies from 3.9 to 32 in the 22 countries/territories in the Region. Hospitals also vary widely in size, location (rural and urban), resources, specialization (general versus specialty hospitals) and organization, as well as their position in the health system (first-level hospitals, secondary care hospitals and large teaching institutions).

Source: Introducing the framework for action for the hospital sector in the Eastern Mediterranean Region. Technical paper EM/RC66/5 presented to the 66th session of the WHO Regional Committee for the Eastern Mediterranean. Cairo: WHO Regional Office for the Eastern Mediterranean; 2019 (https://applications.emro.who.int/docs/RC_Technical_Papers_2019_5_en.pdf).

Strengthening health systems and hospital resilience, particularly in the cycle of preparedness, response and recovery from the COVID-19 pandemic is critical and timely (5,12,13). Hospitals in the Region's low- and middle-income countries (LMICs), many of which are affected by emergencies, including graded emergencies, face many challenges which impair efficiency and quality of care (14,15). Delivery of adequate health services in this context, is hindered by lack of emergency and contingency plans and case management guidelines as well as insufficient bed capacity, shortages (basic supplies, essential medicines and equipment, qualified health workers, personal protective equipment), inadequate infection prevention and control programmes, and unreliable water and electricity sources (14–16). In 2019, a systematic review of disaster preparedness for hospitals in the Region found that a lack of contingency planning and insufficient availability of resources were likely to threaten hospital preparedness to respond to outbreaks (17).

In responding to COVID-19, the lack of hospital preparedness for emergencies, including infectious disease outbreaks at the facility, system, and national levels, resulted in delays and inefficiencies at a larger scale (17,18,19). Hospital emergency response plans were either lacking or not operational in many hospitals throughout the Region (6). Challenges in hospital operations were exacerbated by problems in human resource management (burnout, shortage of critical care nurses and specialists, inadequate training), funding constraints and inadequate supplies (high cost of medications and oxygen supplies, shortages in drugs and equipment, losses in revenue) and clinical management (inconsistent/opposing guidelines) (6). Furthermore, the provision of routine services, including non-COVID-19 emergency care services, has been severely disrupted. Worldwide, COVID-19 has uncovered the importance of hospital resilience and the need to strengthen hospital capacity for preparedness, response and recovery to mitigate the impacts of the pandemic and other stressors on clinical management, essential services provision, health workforce, supply chains, risk communication and overall health systems responsiveness (20,21,22,23). Moreover, strengthening hospital capacities for preparedness, response and recovery is essential to mitigating the impact of the current pandemic and other future emergencies (20,21,22,23).

What is hospital resilience?

The concept of resilience is introduced in the context of emergency and disaster risk reduction where a health facility, or more broadly a health system, can:

- 1) **absorb** the unforeseen shocks of an emergency;
- 2) **adapt** and respond to the emerging immediate and acute needs of the community, **maintain** its core functions and **ensure** the continuity of essential health services, and **deliver** efficient, safe, high-quality and person-centred care; and
- 3) **transform** to recover, reduce vulnerability, and improve its readiness for future crises.

Scholars confirm that these three levels of resilience can be achieved through the four 'PPRR' stages of prevention and mitigation (P), preparation and planning (P), response and relief (R), and recovery (R), and require multi-pronged and integrated interventions strengthening infrastructure, staffing, policies, planning and management, information systems, communication, coordination, among others (3,6,7,8,10,11,12,13,14).

resilience

Strengthening hospital preparedness is the first step towards building health systems resilience. Informed by the “5 Ss” framework for strong health systems and the WHO Regional Office for the Eastern Mediterranean’s hospital readiness checklist for COVID-19, hospitals must address infrastructure, surge capacity, resource mobilization, procurement of supplies, staffing (availability, compensation, retention, capacity-building, protection from nosocomial transmission and promotion of mental well-being), facility-level information, communications, financing and coordination systems, among other things (21,24,25,26).

In strengthening preparedness toward building resilient hospitals, these areas should be prioritized by policy-makers and hospital managers according to their context (25,26). Facility-level preparedness strategies and plans should encompass: 1) strengthening leadership and coordination; 2) contingency planning and flexible financing 3) adapting hospital infrastructure and safety, and managing non-structural components such as logistics, and life-saving supplies and inventory management; 4) optimizing staffing; 5) enhancing medical and disaster response functions to ensure continuity of essential and critical services; 6) engaging with community support structures and transforming systems towards recovery from emergencies; and 7) building information-systems for evidence-based policy- and decision-making (3,7,22,27).

1. Leadership and coordination

Building the managerial capacities of hospital directors and strengthening leadership is the first step towards hospital preparedness and resilience.

Resilient hospitals are led by multidisciplinary teams capable of adaptability and agility in their decision-making (11). Strong leadership utilizing a proactive, all-hazards, holistic and systematic approach to preparedness and resilience enables implementing the necessary interventions across each of the 10 hospital readiness domains to optimize ‘space’, ‘services’, ‘stuff’, ‘staff’ and ‘support’ (25,26,28). Moreover, integrating public health experts into hospital senior management teams facilitates a shift in mindset from one of reactivity towards prevention, mitigation, preparedness and planning (28).

Clear communication and coordination with all staff and external partners, is also crucial (3,17,20,29). At both the national and facility-levels, the participation of relevant stakeholders with defined roles and responsibilities, facilitates the timely implementation of these preparedness and response plans (3,17,29). Studies have shown that hospitals utilizing clearly structured, flexible and multidisciplinary emergency operating centres (EOCs) or incident management mechanisms were more equipped to manage COVID-19 and its impact on hospital operations (8,24). Studies have also shown that increasing hospital autonomy within the appropriate accountability structures is important in strengthening leadership and coordination (28).

2

2. Contingency planning and flexible financing

Studies on hospital resilience consistently highlight planning and management among the top strategies to improve operations and the capacity to recover from shocks (7,8,30). Creating facility-based contingency plans for various types of hazard and disaster, along with detailed standard operating procedures (SOPs), is key to strengthening hospital preparedness. Practicing preparedness and engaging in risk reduction activities such as drills and simulation exercises creates a smoother response (31). These activities and training should engage all types of hospital worker (28).

Adapting agile plans, management structures and legal preparations strengthens hospital preparedness (8,29). Hospital managers may adopt specific tools to estimate resources (human, material and financial) according to various disaster, hazard and infectious outbreak scenarios; this is important in LMICs and countries facing emergencies, where hospitals already suffer chronic threats, including shortages of medicines and equipment, understaffing, financial limitations and disruptions to supply chain mechanisms (14,16,28,29). Additionally, access to diverse, earmarked, dedicated and flexible funding for emergencies, collaborations between various departments and sectors, and the utilization of public-private partnerships, all contribute to more robust facility-based plans (12,13,16,22).

Strengthening hospital resilience relies on assessing facility strengths and weaknesses by ongoing risk assessments of all possible hazards and early warning systems for detection of problems and activation of response plans. In health systems affected by chronic insecurity or protracted crises, innovative efforts are needed to overcome resource limitations, shortages and disrupted supply chains and improve hospital safety, agility, quality and adaptability to shocks (11,14). Hospitals in these settings would greatly benefit from aligning their facility-based plans with national emergency care systems and creating and constantly updating post-event recovery plans (9,12,29,32). Strengthening facility and national emergency care systems, taking into account chronic insecurity, prolonged conflicts and health system fragility, is crucial to the cycle of preparedness, response and recovery (12,13,14,32).

3

3. Infrastructure, logistics and supplies

Hospital investment in infrastructural agility and maintaining critical transportation in the face of different types of hazard, whether natural disasters, humanitarian conflicts, or infectious disease outbreaks, are necessary preventive measures (26). These measures will reduce vulnerability, maintain core functions, and increase critical care and surge capacities for emergency response (20,22,27,29). Hospitals would benefit from investing in resilience engineering and including engineers as part of multidisciplinary leadership teams. A focus on improving organizational culture and capacities to respond, monitor, anticipate and finally learn from shocks will improve patient safety, occupational health and overall system performance (33,34).

In responding to COVID-19, hospitals learned of the limitations of relying on global markets and international supply chains. Hospitals would benefit from

utilizing risk-adjusted distribution of supplies to ensure efficient and equitable allocation, bulk-purchasing, early procurement and investment in facility-level inventory management (28). In countries experiencing emergencies, efforts must be made to integrate logistics and supplies management in national preparedness and health systems strengthening strategies to mitigate disruptions to procurement and distribution (13,35).

4. Adequate, multidisciplinary and resilient hospital workforce

Human resource management is cited extensively across the global literature as one of the vital pillars in strengthening hospital emergency preparedness and resilience (6). Before the onset of a disaster or an emergency, hospital managers must plan for surge staffing, utilizing innovative task-shifting and appropriate holistic incentive packages to address the critical shortages of health workers and high workloads in difficult working conditions (23,29,36). Hospitals in the Region should also utilize multidisciplinary teams to manage and respond to health emergencies, including cadres from non-health sectors, such as engineers, supply-chain experts and logisticians. Prior engagement with sociologists and social scientists, community activists, civil society and religious leaders is also important (2,18,28,30). Additionally, across the Region, hospitals would benefit from scaling up the capacities of nurses to support the response to disasters and emergencies, including disease outbreaks.

It is necessary that all hospital staff, regardless of their clinical function and specialty, receive timely communication on issues such as preparedness and response protocols, work patterns and measures for infection prevention and control (IPC), hands-on training on personal protective equipment (PPE) and resources management, insurance and treatment if infected, and consistent and appropriate compensation (30,31,37). Building hospital workforce resilience requires continuous capacity-building and training on preparedness measures, epidemiological foundations (i.e. education about the pathogen, modes of transmission, symptoms and protective measures), updates to clinical guidelines and IPC protocols, sensitization on the use of PPE and clinical management of critical cases (8,28,35).

Additionally, a resilient hospital workforce should be equipped with enhanced competencies related to stress management, mental health and psychosocial support, communication and interprofessional teamwork (22,38). The COVID-19 pandemic confirmed what global studies have concluded regarding the critical importance and severe under-prioritization of front-line mental health (6). To improve resilience, hospital managers should invest in preventing and mitigating burnout and stress, which ultimately affects response quality (23,30,38,39).

5. Safe and continuous clinical services and surge capacity

Building resilient hospitals requires identifying essential and critical services and maintaining the continuity of these services during disasters or emergencies (20,27,29). For instance, in responding to COVID-19, some hospitals in the Region

expanded their surge capacities, maintained essential services and increased their capacities for critical care management through various innovative and cost-effective interventions (28). These interventions included scaling up the use of telemedicine, working closely with primary care settings and community-based initiatives, and optimizing the use of public–private partnerships, especially in resource-restricted settings (8,18,40,41,42,43).

Agility in distributing human and capital resources is essential for hospital resiliency. It provides flexibility to accommodate surges, adapt response plans, alter standards of care and adjust infrastructure to create additional spaces for triage, critical care and IPC (10,16,22,29). Infrastructural and operational adaptability provides the basis for recovery and preparedness for future public health emergencies (7).

Additionally, continuous learning and evaluation of interventions, adapting clinical guidelines, utilizing scenario analysis and promoting multidisciplinary clinical teams are essential to building hospital resilience and preparedness (3,17,31). Strategic and systemic investment in IPC structures is necessary to improve the quality and safety of the hospital response during outbreaks (28). These investments can range from short-term (i.e. designating IPC officers, distributing PPE, updating and training all staff on preventive measures) to longer-term and infrastructural interventions (i.e. quality control mechanisms, continuous evaluation of adherence and making a culture change in provider attitudes and perceptions) (6). An added benefit of these investments is that they can push hospitals towards standardization and compliance, which are predictors of more robust preparedness and resilience (7,22,38,44,45,46,47,48,49).

6. Risk communication and community engagement

Hospitals integrated within communities, responding to their needs and prioritizing patient-centred care are more likely to manage outbreaks and emergencies better. The interlinkages between hospitals and the community can be utilized to reduce vulnerability, enhance ownership and adherence and ensure continuous and high-quality service delivery through each stage of the disaster response cycle of prevention, planning, response and recovery (7,8,16,24).

Hospitals would also benefit from utilizing community engagement to reduce fear and stigma, combat rumours, increase surveillance, screening, and triage and communicate preventive measures. The symbiotic link between hospitals and communities can optimize referral pathways from hospitals to primary care to reduce hospital load and increase capacity for managing critical cases. Hospital engagement with the community can also be used to increase public access to updated health information (2,8). Across the Region, community engagement has great potential, especially for hospitals in the Region's emergency-affected and LMICs, which have benefited from collaboration with community partners (28,35).

Hospitals play a key role in rebuilding public trust, ensuring health equity and transforming health systems towards inclusivity and leaving no one behind by dismantling barriers to health access, particularly for those whose intersectional identities leave them at increased vulnerability, including, but not limited to, youth, migrants and displaced persons (35,50).

7. Functional information systems

Among the key pillars to strengthening hospital resilience is strengthening facility-level information systems and management. Functional hospital health information systems (HHIS) are cross-cutting and central, acting as the motherboard for hospital operationality, preparedness and subsequent resilience. HHIS should support all the activities mentioned above, all preparedness strategies and all hospital readiness interventions to optimize service delivery during emergencies (11,22,25,26). At a minimum, these HHIS should include clinical and managerial indicators, inform contingency planning and resources allocation (human, financial and supplies), support the continuity of essential services delivery and capture surveillance data. Hospitals should prioritize strengthening these information systems along with other evidence-generation activities to improve evidence-based decision-making and evaluate the effectiveness of their policies and protocols (24). Hospital information systems need to be integrated with the national information system to inform policies and national public health security.

Conclusion and the way forward

In conclusion, COVID-19 has exposed the necessity to improve hospital preparedness and resilience for all types of disaster and emergency, especially across the WHO Eastern Mediterranean Region's emergency-affected and LMICs, and fragile health systems. Inadequate hospital emergency preparedness in the Region exacerbates threats to building resilient health systems and achieving universal health coverage and global health security.

Investing in facility-based preparedness is the key to building resilient hospitals and health systems. Improving facility-level readiness and planning, investing in resilient and adaptable infrastructure, building the leadership capacities of hospital managers, adapting hospital organizational culture through motivating and training a multidisciplinary team, and repairing systems towards recovery, not only improves operations and the emergency response, but also saves lives and rebuilds community trust.

During acute events, hospitals prioritize the immediate response, manage surges, deploy live-saving resources, optimize IPC and maintain critical functions. Nevertheless, a framework is needed to conceptualize and guide the implementation of hospital preparedness and resilience efforts, especially in the context of the fragility and insecurity which threaten many countries in the Region.

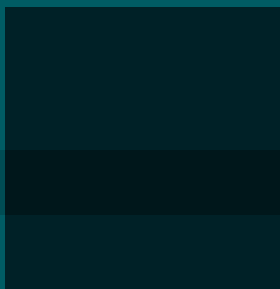
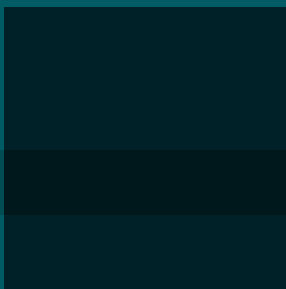
Hospital managers and policy-makers would benefit from prioritizing and investing in hospital preparedness through a holistic and integrated approach led by primary health care and rooted in community engagement and health systems strengthening, during and throughout the outbreak and emergency response cycle. This is the prerequisite towards improving hospital sector and health system resilience. Moreover, interventions to strengthen preparedness and evaluate response activities further, contribute to cost-savings, improve hospital efficiency, effectiveness, safety and quality, and increase access to health care services.

Furthermore, strengthening hospital preparedness within multisectoral national plans will be essential for health system recovery and resilience in the face of future disasters and the protection of health security for all.

References

1. Wenham C, Katz R, Birungi C, Boden L, Eccleston-Turner M, Gostin L, et al. Global health security and universal health coverage: from a marriage of convenience to a strategic, effective partnership. *BMJ Global Health*. 2019 Jan 1;4(1):e001145.
2. Ridde V, Gautier L, Dagenais C, Chabrol F, Hou R, Bonnet E, et al. Learning from public health and hospital resilience to the SARS-CoV-2 pandemic: protocol for a multiple case study (Brazil, Canada, China, France, Japan, and Mali). *Health Research Policy and Systems*. 2021 May 6;19(1):76.
3. Samsuddin NM, Takim R, Nawawi AH, Syed Alwee SNA. Disaster preparedness attributes and hospital's resilience in Malaysia. *Procedia Engineering*. 2018 Jan 1;212:371–8.
4. Al-Mandhari A, Kodama C, Abubakar A, Brennan R. Solidarity in response to COVID-19 outbreak in the Eastern. *Eastern Mediterranean Health Journal*. 2020 May 1;26:492–4.
5. Mataria A, Brennan R, Rashidian A, Hutin Y, Hammerich A, El-Adawy M, et al. "Health for All by All" during a pandemic: "Protect Everyone" and "Keep the Promise" of universal health coverage in the Eastern Mediterranean Region. *East Mediterr Health J*. 2020 Dec 9;26(12):1436–9.
6. Hospitals experiences combatting COVID-19 in the Eastern Mediterranean Region. Cairo: WHO Regional Office for the Eastern Mediterranean; 2020.
7. Cristian B. Hospital resilience: a recent concept in disaster preparedness. *J Crit Care Med (Targu Mures)*. 2018 Jul 1;4(3):81–2.
8. Haldane V, De Foo C, Abdalla SM, Jung A-S, Tan M, Wu S, et al. Health systems resilience in managing the COVID-19 pandemic: lessons from 28 countries. *Nature Medicine*. 2021 May 17;1–17.
9. Kruk ME, Myers M, Varpilah ST, Dahn BT. What is a resilient health system? Lessons from Ebola. *The Lancet*. 2015 May 9;385(9980):1910–2.
10. Biddle L, Wahedi K, Bozorgmehr K. Health system resilience: a literature review of empirical research. *Health Policy and Planning*. 2020 Oct 1;35(8):1084–109.
11. Iflaifel M, Lim RH, Ryan K, Crowley C. Resilient health care: a systematic review of conceptualisations, study methods and factors that develop resilience. *BMC Health Services Research*. 2020 Apr 17;20(1):324.
12. Implementation guide for health systems recovery in emergencies: transforming challenges into opportunities. Cairo: WHO Regional Office for the Eastern Mediterranean; 2020 (<https://policycommons.net/artifacts/1243894/implementation-guide-for-health-systems-recovery-in-emergencies/>).
13. Health emergency and disaster risk management framework. Geneva: World Health Organization; 2019 (<https://apps.who.int/iris/handle/10665/326106>).
14. Jordan K, Lewis TP, Roberts B. Quality in crisis: a systematic review of the quality of health systems in humanitarian settings. *Conflict and Health*. 2021 Feb 2;15(1):7.
15. Ravaghi H, Afshari M, Isfahani P, Bélorgeot VD. A systematic review on hospital inefficiency in the Eastern Mediterranean Region: sources and solutions. *BMC Health Services Research*. 2019 Nov 12;19(1):830.
16. Tjoflåt I, Hansen BS. Building resilience in humanitarian hospital programs during protracted conflicts: opportunities and limitations. In: Wiig S, Fahlbruch B, editors. *Exploring resilience: a scientific journey from practice to theory*. Cham: Springer International Publishing; 2019 (https://doi.org/10.1007/978-3-030-03189-3_12).
17. Alruwaili A, Islam S, Usher K. Disaster preparedness in hospitals in the Middle East: an integrative literature review. *Disaster Medicine and Public Health Preparedness*. 2019 Aug;13(4):806–16.
18. Durski KN, Osterholm M, Majumdar SS, Nilles E, Bausch DG, Atun R. Shifting the paradigm: using disease outbreaks to build resilient health systems. *BMJ Global Health*. 2020 May 1;5(5):e002499.
19. Griffin KM, Karas MG, Ivascu NS, Lief L. Hospital preparedness for COVID-19: a practical guide from a critical care perspective. *Am J Respir Crit Care Med*. 2020 Jun 1;201(11):1337–44.
20. Aminzadeh M, Farrokhi M, Ebadi A, Masoumi GR, Kolivand P, Khankeh HR. Hospital management preparedness tools in biological events: A scoping review. *Journal of Education and Health Promotion*. 2019 Jan 1;8(1):234.
21. Phua J, Weng L, Ling L, Egi M, Lim C-M, Divatia JV, et al. Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations. *The Lancet Respiratory Medicine*. 2020 Apr;S2213260020301612.
22. Fallah-Aliabadi S, Ostadtaghizadeh A, Ardalan A, Fatemi F, Khazai B, Mirjalili MR. Towards developing a model for the evaluation of hospital disaster resilience: a systematic review. *BMC Health Services Research*. 2020 Jan 29;20(1):64.
23. Balay-odao EM, Alquwez N, Inocian EP, Alotaibi RS. Hospital preparedness, resilience, and psychological burden among clinical nurses in addressing the COVID-19 crisis in Riyadh, Saudi Arabia. *Front Public Health* [online]. 8 January 2021 (<https://www.frontiersin.org/articles/10.3389/fpubh.2020.573932/full>).
24. Hanefeld J, Mayhew S, Legido-Quigley H, Martineau F, Karanikolos M, Blanchet K, et al. Towards an understanding of resilience: responding to health systems shocks. *Health Policy Plan*. 2018 Apr;33(3):355–67.
25. Ensuring readiness for COVID-19: checklists for emergency medical services and hospitals. Report No.1. Cairo: WHO Regional Office for the Eastern Mediterranean; 2021.
26. Porter M, Farmer P, Yong Kim J. PIH's Five S's: Essential elements for strong health systems [website]. Boston: Partners In Health; 2021 (<https://www.pih.org/article/pihs-five-ss-essential-elements-strong-health-systems>).
27. Zhong S, Clark M, Hou X-Y, Zang Y, Fitzgerald G. Development of hospital disaster resilience: Conceptual framework and potential measurement. *Emergency medicine journal*. 2013 Sep 12;31.

28. Ravaghi H, Khalil M. Lessons learned from hospitals responses combating COVID-19 in the Eastern Mediterranean Region. Paper presented at AUPHA Annual Conference 2021. Washington, DC: AUPHA; 2021 (<http://annualmeeting.aupha.org/annualmeeting/virtualschedule/sessiondescriptions#buildingthe>).
29. Nuzzo JB, Meyer D, Snyder M, Ravi SJ, Lapascu A, Souleles J, et al. What makes health systems resilient against infectious disease outbreaks and natural hazards? Results from a scoping review. *BMC Public Health*. 2019 Oct 17;19(1):1310.
30. Traverson L, Stennett J, Mathevet I, Zacarias ACP, Sousa KP de, Andrade A, et al. Learning from the resilience of hospitals and their staff to the COVID-19 pandemic: a scoping review. *medRxiv*. 2021 Apr 25;2021.04.22.21255908.
31. Rapid hospital readiness checklist for COVID-19. Geneva: World Health Organization; 2020 (<https://apps.who.int/iris/handle/10665/332778>).
32. Mowafi H, Sakr H, Ravaghi H, Elmahal O, Slama S, Samhoury D, et al. Leveraging the COVID-19 response to improve emergency care systems in the Eastern Mediterranean Region. *East Mediterr Health J*. 2020 Jun 24;26(6):626–9.
33. Bertoni VB, Ransolin N, Wachs P, Righi AW. Resilience, safety and health: reflections about Covid-19 assistance. In: Black NL, Neumann WP, Noy I, editors. *Proceedings of the 21st Congress of the International Ergonomics Association (IEA 2021)*. Cham: Springer International Publishing; 2021.;239–45 (Lecture Notes in Networks and Systems).
34. Yin S, Chong CY, Ng KC, Lee KP. Resilience engineering in practice: Reflecting on a pediatric hospital's preparation for unknown coronavirus outbreak. *Journal of Hospital Administration*. 2020 Nov 26;9(6):1.
35. Ratner L, Martin-Blais R, Warrell C, Narla NP. Reflections on resilience during the COVID-19 pandemic: six lessons from working in resource-denied settings. *The American Journal of Tropical Medicine and Hygiene*. 2020 Apr 17;102(6):1178–80.
36. Khalil M, Alameddine M. Recruitment and retention strategies, policies, and their barriers: A narrative review in the Eastern Mediterranean Region. *Health Science Reports*. 2020;3(4):e192.
37. Al-Hunaishi W, Hoe VC, Chinna K. Factors associated with healthcare workers willingness to participate in disasters: a cross-sectional study in Sana'a, Yemen. *BMJ Open*. 2019 Oct 1;9(10):e030547.
38. Rieckert A, Schuit E, Bleijenberg N, Cate D ten, Lange W de, Ginkel JM de M, et al. How can we build and maintain the resilience of our health care professionals during COVID-19? Recommendations based on a scoping review. *BMJ Open*. 2021 Jan 1;11(1):e043718.
39. Stennett J, Hou R, Traverson L, Ridde V, Zinszer K, Chabrol F. Lessons learned from the resilience of Chinese hospitals to the COVID-19 pandemic: a scoping review. *medRxiv*. 2021 Mar 17;2021.03.15.21253509.
40. Daw MA. Corona virus infection in Syria, Libya and Yemen; an alarming devastating threat. *Travel Medicine and Infectious Disease*. 2020 Apr;101652.
41. Seddighi H, Seddighi S, Salmani I, Sharifi Sedeh M. Public-private-people partnerships (4P) for improving the response to COVID-19 in Iran. *Disaster Med Public Health Prep*. 2020;1–6.
42. Abbara A, Rayes D, Fahham O, Alhiraki OA, Khalil M, Alomar A, et al. Coronavirus 2019 and health systems affected by protracted conflict: the case of Syria. *International Journal of Infectious Diseases*. 2020;96:192–195 (<http://www.sciencedirect.com/science/article/pii/S1201971220303088>).
43. Elhadi M, Msherghi A, Elgzairi M, Alsuyihili A, Elkhafefi F, Bouhuwaish A, et al. Assessment of the preparedness of obstetrics and gynecology healthcare systems during the COVID-19 pandemic in Libya. *International Journal of Gynecology & Obstetrics*. 2020;150(3):406–8.
44. Abdi A, Ahmed AY, Abdulmunim M, Karanja MJ, Solomon A, Muhammad F, et al. Preliminary findings of COVID-19 infection in health workers in Somalia: A reason for concern. *International Journal of Infectious Diseases*. 2021 Mar 1;104:734–6.
45. Abdel Wahed WY, Hefzy EM, Ahmed MI, Hamed NS. Assessment of knowledge, attitudes, and perception of health care workers regarding COVID-19, a cross-sectional study from Egypt. *J Community Health*. 2020;45: 1242–1251 (<https://doi.org/10.1007/s10900-020-00882-0>).
46. Boloori A, Saghaian S. COVID-19: What intervention policies are most effective? A Brief report using data from Government of Bahrain. HKS Working Paper No. RWP20-011. Rochester, NY: Social Science Research Network; 2020 (<https://papers.ssrn.com/abstract=3620451>).
47. Gasana J, Shehab M. Coronavirus Disease (COVID 19): Handling challenges in Kuwait. *Sci*. 2020 Jun;2(2):40.
48. Barati M, Bashirian S, Jenabi E, Khazaei S, Karimi-Shahanjari A, Zareian S, et al. Factors associated with preventive behaviours of COVID-19 among hospital staff in Iran in 2020: an application of the protection motivation theory. *Journal of Hospital Infection*. 2020 Jul 1;105(3):430–3.
49. Abolfotouh MA, Almutairi AF, BaniMustafa AA, Hussein MA. Perception and attitude of healthcare workers in Saudi Arabia with regard to Covid-19 pandemic and potential associated predictors. *BMC Infectious Diseases*. 2020 Sep 29;20(1):719.
50. Haldane V, Morgan GT. From resilient to transilient health systems: the deep transformation of health systems in response to the COVID-19 pandemic. *Health Policy and Planning*. 2021 Feb 1;36(1):134–5.



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