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Digital Health Competencies in Times of Crisis: Strengthening Healthcare Resilience and Sustainability in Bahrain Amid Regional Conflict

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Abstract

In light of the present geopolitical unrest in the Middle East, this study investigates the significance of digital health capabilities in maintaining healthcare delivery in Bahrain. By guaranteeing continuity of care in times of crisis, the growing dependence on telemedicine, electronic health records, and artificial intelligence has improved healthcare resilience. A competency-based approach is used, with a focus on data-driven decision-making, digital communication, ethical behavior, and workforce readiness. Digital technologies greatly improve system adaptability, accessibility, and efficiency, especially during emergencies, according to evidence from the literature now under publication (Whitelaw et al., 2020; Iyengar et al., 2025). Nonetheless, enduring deficiencies in training, digital literacy, and workforce readiness continue to be significant obstacles to the development of sustainable and crisis-resilient healthcare systems (Das, Kumar, and Bhandari, 2025; Shiferaw, Tilahun, and Endehabtu, 2020). The study emphasizes the necessity of building policy and organized competency frameworks to improve healthcare system sustainability in Bahrain.

Keywords: Digital health, Competencies, Sustainability

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Introduction

By improving accessibility, effectiveness, and care quality, digital health technologies are progressively changing healthcare systems (Rohwer et al., 2022; Okwor et al., 2024).

Bahrain's national healthcare initiatives prioritize innovation and better service delivery through digital transformation that is in line with sustainability goals and Bahrain Vision 2030 (Government of Bahrain, 2025; World Health Organization, 2024).
Healthcare delivery has been profoundly altered by the integration of telemedicine, artificial intelligence, and electronic health records, especially in times of crisis like pandemics and regional instability (Valdes et al., 2022; Iyawa, Herselman, and Botha, 2025).
Research indicates that digital platforms facilitate remote healthcare delivery while enhancing care coordination and system efficiency (Chen, Lehmann, and Malin, 2024; Whitelaw et al., 2020).

However, the digital competencies of healthcarepersonnel determine how effective these technologies are.

Research shows that gaps in worker preparedness, low digital literacy, and insufficient training impede successful adoption (Nazeha et al., 2020; Sumner et al., 2025; Alotaibi, Wilson, and Traynor, 2025).

These restrictions become more noticeable during times of crisis since healthcare systems have to operate under tight circumstances.

Therefore, digital health competencies are crucial for both ordinary healthcare delivery and maintaining care continuity in times of emergency.

Through a thorough analysis of the body of research, this study seeks to investigate their contribution to the development of resilient and sustainable healthcare systems in Bahrain.

Method

In order to compile data on digital health capabilities and healthcare sustainability, this study uses a methodical literature review approach. In accordance with systematic review guidelines, an organized procedure for identification, screening, eligibility, and inclusion was used (Longhini, Rossettini, and Palese, 2022).

The linked paper served as the source of the literature, which included policy reports, peer-reviewed articles, and systematic reviews on telemedicine, digital competences, and healthcare transformation. Studies pertaining to digital skills, workforce preparedness, ethical behavior, and system resilience were the main emphasis of the inclusion criteria; irrelevant or non-empirical studies were eliminated. Table 1 reflects the flow process.

Table 1: Flow Table

Stage	Number of Studies
Records Identified	168
Screened	81
Eligible	60
Included	42

A thematic analysis approach was applied to identify key competency domains and recurring challenges (Ramachandran et al., 2024; Paias Ferreira and Magalhães, 2025). This ensured a rigorous and objective synthesis of the literature

Results

Digital Health Competency Domains

The review identified five core domains (refer to table 2):

Table 2: Digital Health Competency Domains

Domain	Description
Technical Skills	Use of EHR, telemedicine tools
Clinical Skills	Remote diagnosis and care
Communication	Digital patient interaction
Ethical Awareness	Privacy and data protection
Data-driven Decisions	Use of analytics in care

These domains align with established frameworks that prioritize communication, ethical awareness, and ICT competency (Nazeha et al., 2020; Jimenez et al., 2020).

Effective utilization of digital technologies like telemedicine platforms and EHR systems is made possible by technical competencies (Ferreira et al., 2025). Using medical knowledge in virtual settings is a component of clinical competences (Lee et al., 2025). In digital environments, communication skills are crucial for preserving patient trust and involvement (Nguyen et al., 2024; Rashed, 2025).

Concerns like confidentiality, cybersecurity, and data privacy are addressed by ethical skills (Alhomidan et al., 2025; Chakravarthy et al., 2025). Through analytics and digital insights, data-driven decision-making improves therapeutic outcomes (Gutiérrez et al., 2025).

Role in Crisis and Healthcare Sustainability

In order to continue providing healthcare during emergencies, digital competencies are essential. Telemedicine facilitates distant consultations and lessens dependency on physical infrastructure (Al-Hamoudi et al., 2022; Alsebaie, 2023).

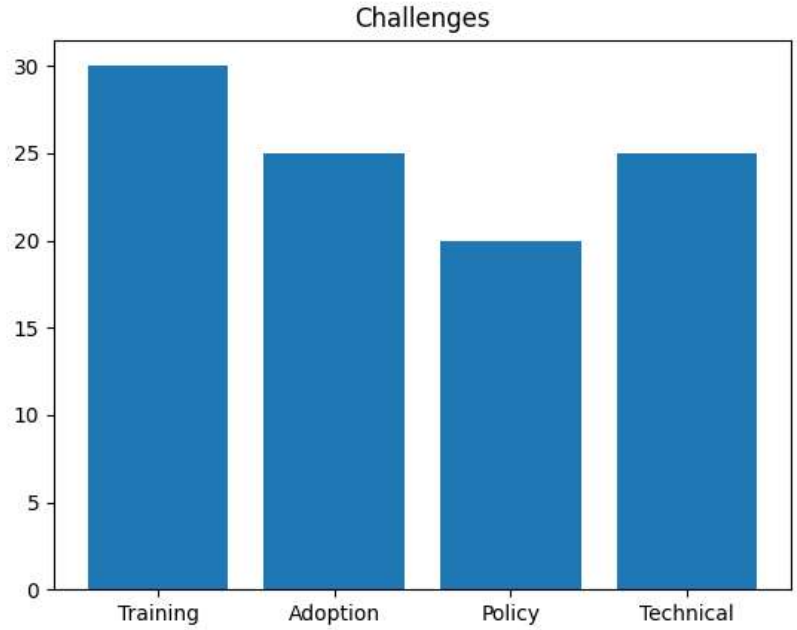
Real-time data exchange is made easier by digital systems, which enhance emergency response and coordination (Iyengar et al., 2025). The introduction of digital health during COVID-19 in Bahrain highlighted the significance of worker preparedness (Shareef et al., 2023).

Additionally, by increasing accessibility, cutting expenses, and increasing efficiency, digital competences support sustainability (Cavicchi, Oppi, and Vagnoni, 2022). They are especially helpful for remote care delivery and vulnerable populations.

Gaps and Challenges

Even if the significance of digital capabilities is acknowledged, a number of obstacles still exist. Many healthcare personnel lack the skills needed to properly employ digital tools, and the review reveals gaps in education and training.

Figure 1: Shows the main challenges to apply digital health in the included literatures.



Despite progress, significant challenges persist:

- Lack of structured training programs (Das, Kumar and Bhandari, 2025)
- Low digital literacy among healthcare professionals (Shiferaw et al., 2020)
- Absence of standardized competency frameworks (El Hag et al., 2025)
- Interoperability and technical system limitations (Osei-Frimpong et al., 2023)
- Cybersecurity concerns and ethical risks (Alhomidan et al., 2025)

Additionally, disparities in digital access may widen healthcare inequalities (Haimi, 2023; Wilson et al., 2024).

Discussion

The results validate the importance of digital health competences in creating robust healthcare systems. These skills allow for flexibility and continuity of care in crisis situations (Iyawa et al., 2025).

Digital technology integration is in line with developments in the global transformation of healthcare (Giansanti, 2025; Forslund, 2024). But attaining sustainability necessitates: Continuous professional development (Firmansyah et al., 2025)

- Policy and institutional support (European Journal of Public Health, 2025)
- Standardized competency frameworks (Meskó et al., 2024)

A systems-thinking approach is necessary, recognizing healthcare as an interconnected system (Plsek and Greenhalgh, 2018). Collaboration between policymakers, institutions, and healthcare providers is essential.

Limitations

There are a number of limitations to this study. First, it may not be able to capture context-specific insights because it depends on secondary data from previously published research. Second, generalizability may be impacted by the inclusion of studies from various healthcare systems, which could cause unpredictability in findings.

Conclusion

For healthcare to be resilient and sustainable, especially in times of disaster and conflict, digital health competences are crucial. The results emphasize how crucial worker preparedness is to facilitating the efficient use of digital technology to preserve continuity of care. To achieve sustainable healthcare systems in Bahrain, it is essential to improve digital competences through focused training programs, legislative assistance, and infrastructure investment. Future studies should concentrate on developing context-specific frameworks to direct implementation and conducting empirical evaluations of skill levels.

References:

1. Al-Hamoudi, W.S. et al. (2022) Telemedicine utilization in the Middle East: a scoping review. BMJ Open, 12(3). Available at: https://bmjopen.bmj.com/content/12/3/e058455 (Accessed: 9 March 2026).
2. Alhomidan, Z.S. et al. (2025) Confidentiality in the era of electronic health records. International Journal of Community Medicine and Public Health. Available at: https://www.ijcmph.com/index.php/ijcmph/article/view/13909 (Accessed: 24 February 2026).
3. Alotaibi, N., Wilson, C.B. and Traynor, M. (2025) Enhancing digital readiness in healthcare. BMC Health Services Research. Available at: https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-025-12663-3 (Accessed: 28 February 2026).
4. Alsebaie, F.Y. (2023) Telemedicine acceptance in Bahrain. Available at: https://www.arpgweb.com/pdf-files/jssr9(3)26-32.pdf. (Accessed: 9 March 2026).
5. Alam, T. et al. (2024) Digital communication tools in healthcare. Available at: https://pubmed.ncbi.nlm.nih.gov/39042297/ (Accessed: 24 February 2026).
6. Cavicchi, C., Oppi, C. and Vagnoni, E. (2022) Sustainable healthcare organisations. Available at: https://www.mdpi.com/2071-1050/14/9/4958 (Accessed: 11 March 2026).
7. Das, A. Bhandari, Y., and Kumar, P. (2025) 'Digital literacy of the Indian health workforce: A core requirement for healthcare delivery in the 21st century', Journal of Surgical Specialties and Rural Practice, 6(1), pp. 9–12. Available at: https://journals.lww.com/10.4103/jssrp.jssrp_6_25. (Accessed: 28 February 2026).
8. El Hag, W.A.M., Othman, N.S., Dumaguin, S.J. and Newbold, S.K. (2025) 'Designing a health informatics competency framework aligned with digital health transformation and organizational practice', Applied Sciences Research Periodicals, 3(6). Available at: https://doi.org/10.63002/asrp.306.1230. (Accessed: 24th February 2026).
9. Ferreira, J.C., Elvas, L.B., Correia, R. and Mascarenhas, M. (2025) 'Empowering health professionals with digital skills to improve patient care and daily workflows', Healthcare, 13(3), 329. Available at: https://www.mdpi.com/2227-9032/13/3/329. (Accessed: 23rd February 2026).
10. Firmansyah, F., Ashari, M.R. and Syam, S., 2025. Building future-ready healthcare systems through digital literacy training. Medicor: Journal of Health Informatics and Health Policy, 3(1), pp.41–54. Available at: https://journal.idscipub.com/medicor/article/download/1081/765. (Accessed: 8 March 2026).
11. Forslund, M. (2024) Digital health and universal health coverage. Available at: https://www.who.int/publications/i/item/digital-health-uhc. (Accessed:12 Feb 2026).
12. Giansanti, D. (2025) 'The future of healthcare is digital: Unlocking the potential of mobile health and e-health solutions', Healthcare, 13(7), 802. Available at: https://www.mdpi.com/2227-9032/13/7/802. (Accessed: 26 February 2026).
13. Gutiérrez, S., Torres, V., Molina, M.M. and Härtel, S. (2025) 'Digital health competencies: core to effective health sector leadership', Studies in Health Technology and Informatics, 328, pp. 560–564. Available at: https://pubmed.ncbi.nlm.nih.gov/40588988/. (Accessed: 24th February 2026).
14. Haimi, M. (2023) 'The tragic paradoxical effect of telemedicine on healthcare disparities—A narrative review', BMC Medical Informatics and Decision Making, 23. Available at: https://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-023-02194-4. (Accessed: 11 March 2026).
15. Iyengar, K., et al. (2025) 'Use of technology to support health care providers delivering care: Systematic umbrella review', Journal of Medical Internet Research, 27, e66288. Available at: https://www.jmir.org/2025/1/e66288. (Accessed: 27 February 2026).
16. Iyawa, G.E., Herselman, M. and Botha, A. (2025) '25 years of digital health toward universal health coverage in low- and middle-income countries: Rapid systematic review', Journal of Medical Internet Research, 27, e59042. Available at: https://www.jmir.org/2025/1/e59042. (Accessed: 27 February 2026).
17. Jimenez, G. et al. (2020) A framework for digital health competencies. Available at: https://doi.org/10.2196/20333. (Accessed: 24 March 2026).

18. Lee, J.Y., et al. (2025) 'Effects of remote patient monitoring on health care utilization in patients with noncommunicable diseases: Systematic review and meta-analysis', JMIR mHealth and uHealth, 13, e68464. Available at: https://mhealth.jmir.org/2025/1/e68464/. (Accessed: 28 February 2026).
19. Longhini, J., Rossettini, G. and Palese, A. (2022) 'Digital health competencies among health care professionals: Systematic review', Journal of Medical Internet Research, 24(8), e36414. Available at: https://www.jmir.org/2022/8/e36414/. (Accessed: 27 February 2026).
20. Meskó, B. et al. (2024) Digital health competencies framework for professionals. Available at: https://doi.org/10.2196/51234 (Accessed: 21 Feb 2026).
21. Nazeha, N. et al. (2020) Digital workforce competency frameworks in healthcare. Available at: https://doi.org/10.2196/14625. (Accessed: 16 March 2026).
22. Nguyen, A.D., White, S.J., Tse, T., Cartmill, J.A., Roger, P., Hatem, S. and Willcock, S.M., 2024. Communication during telemedicine consultations in general practice: perspectives from general practitioners and their patients. BMC Primary Care, 25, p.324. Available at: https://doi.org/10.1186/s12875-024-02576-1. (Accessed: 8 March 2026).
23. Okwor, I.A., Hitch, G., Hakkim, S., Akbar, S., Sookhoo, D. and Kainesie, J. (2024) Digital technologies impact on healthcare delivery: A systematic review of artificial intelligence and machine learning adoption. AI. Available at: https://www.mdpi.com/2673-2688/5/4/95. (Accessed: 10 March 2026).
24. Osei-Frimpong, K., et al. (2023) 'Technical and regulatory challenges of digital health implementation in developing countries', Journal of Pharmaceutical Policy and Practice. Available at: https://www.tandfonline.com/doi/full/10.1080/13696998.2023.2249757. (Accessed: 11 March 2026).
25. Paias Ferreira, J. and Magalhães, T. (2025) 'Instruments to assess the digital health competencies of healthcare professionals: A scoping review', Frontiers in Public Health, 13, 1726452. Available at: https://www.frontiersin.org/articles/10.3389/fpubh.2025.1726452. (Accessed: 27 February 2026).
26. Plsek, P. and Greenhalgh, T. (2018) The challenge of complexity in healthcare. Available at: https://www.bmj.com/content/323/7313/625. (Accessed: 17 March 2026).
27. Ramachandran, S., Chang, H.J., Worthington, C., Kushniruk, A., Ibáñez-Carrasco, F., Davies, H., Brown, A. and Gilbert, M., 2024. Digital competencies and training approaches to enhance the capacity of practitioners to support the digital transformation of public health. JMIR Public Health and Surveillance, 10, e52798. Available at: https://doi.org/10.2196/52798. (Accessed: 8 March 2026).
28. Rashed, M.B., 2025. The imperative of communication skills in modern healthcare: a contemporary editorial. Archives of Community Medicine and Public Health, 11(4), pp.81-83. Available at: https://doi.org/10.17352/2455-5479.000227. (Accessed: 8 March 2026).
29. Shiferaw, K.B., Tilahun, B.C. and Endehabtu, B.F. (2020) Healthcare professionals' digital competency survey. Available at: https://doi.org/10.1186/s12911-020-01298-1. (Accessed: 26 Feb 2026).
30. Shareef, M., AlSherooqi, R., Altamimi, S., Isa, Z., Kamashki, H. & AlSayyad, A., 2023. Patients' Satisfaction with Teleconsultations during the COVID 19 Pandemic in the Kingdom of Bahrain. Journal of Bahrain Medical Society, 35(1), pp.20–33. Available at: https://www.bhmedsoc.com/jbms/media/Full_Text_PDF/JBMS278Full_Text_PDF.pdf. [Accessed 9 March 2026].
31. Sumner, B., Martin, R., Gladman, T. et al. (2025) 'Understanding the gap: defining essential digital health competencies for medical graduates', BMC Medical Education, 25, Article 682. Available at: https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-025-07194-8. (Accessed: 7 March 2026).
32. Valdes, D., Alqazlan, L., Procter, R. and Dale, J. (2022) 'Global evidence on the rapid adoption of telemedicine in primary care during the first 2 years of the COVID-19 pandemic: A scoping review protocol', Systematic Reviews, 11, 124. Available at: https://systematicreviewsjournal.biomedcentral.com/articles/10.1186/s13643-022-01934-3. (Accessed: 27 February 2026).
33. Wilson, S., Tolley, C., Mc Ardle, R., Lawson, L., Beswick, E., Hassan, N., Slight, R. & Slight, S. (2024) Recommendations to advance digital health equity: a systematic review of qualitative studies. npj Digital Medicine, 7, 173. Available at: https://www.nature.com/articles/s41746-024-01177-7. (Accessed: 28 February 2026).
34. World Health Organization (2024) Bahrain health policy and digital transformation. Available at: https://www.who.int/publications/i/item/bahrain-health-policy. (Accessed: 19 March 2026).