*International Journal Of Health, Engineering And Technology (IJHET)* *E-ISSN 2829 - 8683*
Volume 4, Number 5, January 2026, *Page. 1710 - 1719*
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# Challenges and Strategies of Health Human Resource Management in Addressing Global Changes in The Digital Era

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***Abstract***

*Digital transformation has become a strategic pillar in strengthening global health systems, particularly in improving service efficiency, quality, and accessibility. These changes demand adaptive and competent health human resources capable of responding to rapid technological advancements. This study aims to analyze the challenges and strategies of health human resource management in addressing global changes in the digital era. A literature review method was employed through a systematic search of scientific articles published between 2021 and 2025 using PubMed, ScienceDirect, and Google Scholar databases. The findings indicate that major challenges in health human resource management include limited financing, gaps in digital competence and literacy, high workload, inadequate digital infrastructure, data security and ethical issues, and weak collaboration among stakeholders. Strategies to address these challenges include sustained investment in digital health infrastructure, strengthening policies and regulatory frameworks, continuous education and training, curriculum development, implementation of ethical digital governance, and enhanced cross-sector collaboration. This review concludes that adaptive and innovative health human resource management plays a crucial role in supporting sustainable and effective digital health transformation in the context of global change.*

***Keywords: Health Human Resources; Digital Transformation; Digital Competence; Healthcare Innovation.***

## INTRODUCTION

Health digitalization has become a major trend in the medical sector, enhancing service efficiency, expanding access through telemedicine, and supporting data-driven clinical decision-making. In addition, digital innovation strengthens collaboration among stakeholders within an integrated health system (Rudy C. Tarumingkeng, 2025). In the era of Industry 4.0, health human resources serve as drivers of innovation and strategic assets that require continuous development of digital competencies to remain competitive and prepared to face national and global challenges (Al Rajab et al., 2023).

One of the main challenges is the digital divide, as not all individuals have equal access to or competence in utilizing technology. Furthermore, issues related to data security and the protection of sensitive health information have become critical concerns (Irianto, Setiawan, & Hadi, 2021). A study by (Dwi & Purba, 2024) emphasizes that these challenges are exacerbated by limited infrastructure and a shortage of human resources with expertise in digital technology. The COVID-19 pandemic also highlighted the vulnerability of global health systems in responding to crises, underscoring the importance of strengthening resilient systems through sustainable pharmaceutical supply chains and the implementation of digital surveillance (Ibnu & Ali, 2025). Inadequate coordination between central and local governments has further led to policy misalignment with field conditions, resulting in low effectiveness, efficiency, and achievement of health program targets (Hadi, 2022). Additional challenges arise from disparities in infrastructure and digital literacy, particularly in rural and remote areas; without equitable interventions, digitalization risks deepening inequalities in health service delivery. Therefore, strong collaboration between the public and private sectors, as well as across countries, is required to strengthen digital governance, policy innovation, and inclusive investment to ensure that the benefits of technology are distributed equitably (Chiam, Lim, & Teredesai, 2024).

Thus, the development and utilization of health human resources are strategic in enhancing the competencies and performance of healthcare workers in health service facilities. Alongside efforts to

improve and strengthen health human resource management worldwide, it is essential to consider how these global changes shape the needs and challenges faced by the health sector (Aprianto & Zuchri, 2021). Collaborative and data-driven strategic management based on local contexts serves as a key framework for aligning health programs with the Sustainable Development Goals (SDGs) 2030 and Universal Health Coverage (UHC) targets (Septiani, 2025). This study focuses on analyzing the challenges and strategies of health human resources in responding to global changes in the digital era and provides recommendations to support improvements in the quality, distribution, and efficiency of health services.

## RESEARCH METHODS

This study employed a literature review design, examining various relevant sources, including scientific journal articles, books, and research reports. The literature search was conducted through several major databases, namely PubMed, ScienceDirect, and Google Scholar. Selected articles were limited to publications within the last five years (2021–2025) to ensure the freshness and relevance of the information. Data sources included empirical studies and theoretical reviews addressing the challenges and strategies for managing human resources in health in the digital era, both in global and cross-national contexts. The research results are then presented in a comprehensive discussion in this article.

## RESULTS AND DISCUSSION

A literature review conducted to analyze the challenges and strategies of human resource management in health identified 10 relevant articles from various databases, published in the last five years. These findings are then summarized and systematically presented in Table 1.

Table 1. Literature Review Results

| No | Author(s) and Year | Author(s) and Year | Title | Research Design | Research Findings |
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| 1 | (Hossain, Syeed, Fatema, & Uddin, 2022) | Hossain, Syeed, Fatema, & Uddin (2022) | *The Perception of Health Professionals in Bangladesh toward the Digitalization of the Health Sector* | Quantitative and Qualitative Survey | The findings indicate that the digitalization of health services still faces several major challenges, including limited financial resources, the absence of clear medicolegal guidelines, weak supporting organizational structures, and inadequate medical education curricula in developing digital competencies. To address these issues, long-term sustainable planning, coordinated economic and technological investment, and curriculum updates along with training |

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| | | | | | programs are required to prepare and motivate health professionals to adapt to and actively participate in digital health transformation. |
| 2 | (Erfani et al., 2025) | Erfani et al. (2025) | *Factors Influencing Digital Health Competence Among Healthcare Professionals: A Cross-Sectional Study* | Quantitative Study | The study shows that the main challenge in developing digital health competence is the skills gap among healthcare professionals, particularly those with lower educational backgrounds, less work experience, and limited use of digital technology. This condition affects readiness, including ethical aspects of technology use. Therefore, targeted strategies such as continuous training, improved digital literacy, and organizational policy support are needed to promote safe and ethical technology use and support successful digital transformation in healthcare. |
| 3 | (Hammarén, Pölkki, & Kanste, 2024) | Hammarén, Pölkki, & Kanste (2024) | *The Management of Digital Competence Sharing in Health Care: A Qualitative Study of Managers' and Professionals' Views* | Qualitative Descriptive Study | The study finds that key challenges in managing digital competence in healthcare include limited resources, increased workload due to technological developments, generational gaps in digital skills, and the lack of a strong knowledge-sharing culture. In addition, suboptimal managerial roles in identifying and utilizing digital competencies hinder digital transformation. Required strategies include active management support, continuous training, intergenerational learning, and the creation of a collaborative and safe work |

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| | | | | | environment to strengthen digital competence sharing and support successful digitalization. |
| 4 | (Jarva et al., 2022) | Jarva et al. (2022) | *Healthcare Professionals' Perceptions of Digital Health Competence: A Qualitative Descriptive Study* | Qualitative Descriptive Study | The findings indicate that the main challenge of digital health competence is that some healthcare professionals are still unskilled and lack confidence in using digital technologies in service delivery. Strategies include continuous training and mentoring to enable healthcare professionals to use digital services appropriately while remaining patient-centered. |
| 5 | (Numair et al., 2021) | Numair et al. (2021) | *Barriers to the Digitization of Health Information: A Qualitative and Quantitative Study in Kenya and Lao PDR Using a Cloud-Based Maternal and Child Registration System* | Qualitative Study | The study shows that the main challenges in implementing digital health systems include high workloads, limited training and resources, and low motivation among healthcare workers. Required strategies include adequate training provision, simplification of work processes, incentives, and improved workplace support to ensure sustainable and effective implementation of digital health systems. |
| 6 | (Capasso et al., 2025) | Capasso et al. (2025) | *"In This Era, the Digital Era, Telehealth Is a Tool That We Can Use to Provide Specialized Care": A Qualitative Evaluation of the Implementation of Programmes That Use Digital Health to Improve Antenatal Care in* | Qualitative Study | The findings indicate that challenges in implementing information and communication technology (ICT) in maternal health services in remote areas include limited digital infrastructure, shortages of healthcare personnel, and weak administrative support. Required strategies include sustained investment in digital health infrastructure, strengthening telemedicine policies and |

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| | | | *Rural and Jungle Areas of Honduras and Peru* | | systems, and enhancing human resource capacity to ensure effective and sustainable use of technology. |
| 7 | (Haimi & Inchi, 2025) | Haimi & Inchi (2025) | *Bridging Distance, Delivering Care: Pediatric Tele-Nutrition in the Digital Health Era—A Narrative Review* | Qualitative Study | The study shows that key challenges in pediatric tele-nutrition services include limitations in physical examinations, unequal access to technology, inconsistent financing policies, and the need for healthcare workforce training. Strategies include implementing hybrid care models, improving healthcare worker competencies, strengthening sustainable regulations and financing, and promoting equitable digital access to support effective and sustainable tele-nutrition services. |
| 8 | (Abuhammad, 2025) | Abuhammad (2025) | *Strengthening Ethical Practices of Patient Data Confidentiality and Sharing Among Nurses in the Artificial Intelligence-Driven Healthcare Era* | Qualitative Study | The findings indicate that the main challenge in implementing AI in healthcare is protecting patient data confidentiality due to limited knowledge, training, and institutional support for nurses. Required strategies include strengthening nursing education, developing ethical policies and guidelines for AI use, and improving institutional governance to maintain patient trust and ethical standards of care. |
| 9 | (Egbewande et al., 2025) | Egbewande et al. (2025) | *Integration of Digital Health into Pharmacy Education in Nigeria: Challenges and Recommendations* | Qualitative Study | The study shows that the main challenges in integrating digital health into pharmacy education include limited infrastructure, inflexible curricula, weak collaboration with digital |

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| | | | *for National Adoption* | | health stakeholders, and low technology adoption. Required strategies include curriculum updates, strengthening infrastructure and technological capacity, enhancing collaboration with stakeholders, and developing training programs to prepare pharmacy graduates for digital-era pharmaceutical practice. |
| 10 | (Idahor et al., 2025) | Idahor et al. (2025) | *Infectious Disease Surveillance in the Era of Big Data and AI: Opportunities and Pitfalls* | Qualitative Study | The findings indicate that major challenges in applying big data and artificial intelligence (AI) to infectious disease surveillance include data privacy and security issues, unequal access to technology, algorithmic bias, overreliance on automated systems, and limited digital infrastructure in low-resource settings. Required strategies include strategic investment in digital infrastructure, strengthening cross-sector collaboration, developing clear ethical and regulatory frameworks, and applying balanced approaches that combine AI utilization with human oversight to ensure effective, equitable, and responsible disease surveillance. |

**Challenges Faced by Health Human Resource Management in the Digital Era**

Along with the dynamics of global change and the acceleration of digital transformation, human resource management in the health sector is facing increasingly complex challenges. These challenges include limited financing, constraints in health human resources—such as inadequate education and training—as well as low levels of collaboration with stakeholders within the digital health ecosystem.

One of the main challenges in health resources is financing. A study by (Hossain et al., 2022) states that the digitalization of health services faces various obstacles, including limited funding, the absence of clear medicolegal guidelines, and weak organizational support. This is consistent with the study by (Haimi & Inchi, 2025), which indicates that pediatric tele-nutrition services continue to encounter challenges, particularly inconsistencies in financing policies.

Another major challenge is the lack of digital competence among health human resources. (Jarva et al., 2022) report that the development of digital health competencies is still constrained by limited skills and low confidence among healthcare workers in using digital technologies. Similarly, (Numair et al., 2021) find that the implementation of digital health systems continues to face challenges such as high workloads, limited training and resources, and low motivation among healthcare personnel. In addition, educational curricula that are insufficiently adaptive to technological advancements and suboptimal supporting organizational structures also pose challenges for health human resources in the digital era.

(Erfani et al., 2025) further highlight disparities in competencies among healthcare workers, particularly among those with lower levels of education and work experience, which result in low readiness and limited understanding of the ethical use of digital technologies in Bangladesh. Infrastructure gaps, especially in regions with limited human resource capacity, as well as weak protection of patient data confidentiality due to insufficient knowledge and digital competencies, also constitute significant challenges. This is aligned with (Abuhammad, 2025), who emphasizes that the implementation of artificial intelligence (AI) in healthcare services raises concerns related to patient data confidentiality, influenced by limited knowledge, training, and institutional support for nurses. Likewise, (Idahor et al., 2025) note that the application of big data and AI in infectious disease surveillance faces major challenges, including data privacy and security issues, unequal access to technology, algorithmic bias, and limited digital infrastructure in low-resource settings.

Another challenge concerns the low level of collaboration with stakeholders in the digital health ecosystem. (Egbewande et al., 2025) report that the integration of digital health into pharmacy education is hindered by limited infrastructure, curricula that are insufficiently adaptive, weak collaboration with digital health stakeholders, and low levels of technology adoption in Nigeria.

**Health Human Resource Management Strategies to Address Global Changes in the Digital Era**

Strategic health management in the digital era is a structured approach that leverages digital technologies to enhance efficiency, access, service quality, and the competitiveness of health organizations. Digital-era health management plays a strategic role in driving the transformation of healthcare service systems toward greater efficiency, responsiveness, and sustainability. This role includes the development of long-term visions, policy innovation, readiness of technological infrastructure and human resources, as well as the implementation of digital governance that ensures data security and the protection of patient privacy (Saimi, 2025). The strategic management process consists of three main stages: environmental analysis, strategy formulation, and strategy evaluation (Barney, J. B., & Hesterly, W. S., 2019).

First, environmental analysis involves assessing internal factors such as resources and organizational capabilities, as well as external factors such as policies, technology, and market dynamics. This is consistent with (Jarva et al., 2022), who emphasize the importance of continuous training and mentoring to ensure that healthcare workers are able to utilize digital services optimally while remaining patient-centered. Similarly, (Haimi & Inchi, 2025) state that necessary efforts include the implementation of hybrid service models, enhancement of healthcare worker competencies, strengthening of sustainable regulations and financing, and the promotion of equitable digital access to support effective and sustainable tele-nutrition services.

Second, strategy formulation refers to the development of long-term organizational directions and objectives based on the results of environmental analysis. This aligns with (Capasso et al., 2025), who argue that strategic efforts should include sustained investment in digital health infrastructure development, strengthening telemedicine regulations and systems, and enhancing human resource capacity so that health technology implementation can be effective, integrated, and sustainable. (Egbewande et al., 2025) similarly note that required strategies include curriculum renewal, strengthening infrastructure and technological capacity, increasing stakeholder collaboration, and developing training programs to prepare pharmacy graduates for practice in the digital era.

Third, strategy implementation and evaluation involve executing the formulated plans, measuring performance, and adjusting strategies as necessary to ensure alignment with environmental changes and the achievement of organizational objectives. In line with (Hossain et al., 2022), this requires long-term sustainable planning, coordinated economic and technological investment, as well as curriculum updates and training programs to prepare and motivate healthcare workers to adapt and actively participate in the digital transformation of health services. (Idahor et al., 2025) share a similar perspective, emphasizing that strategies should include investment in digital infrastructure, strengthening cross-sector collaboration, establishing clear ethical and regulatory frameworks, and balancing the use of AI with human oversight to ensure effective and responsible disease surveillance.

**The Role of Innovation in Preparing Health Organizations for Future Challenges**

The application of innovation in managing healthcare workforce performance has a positive impact on improving the quality and effectiveness of health services. (Idahor et al., 2025) state that disease surveillance requires an approach that balances the use of artificial intelligence (AI) with human oversight to ensure effectiveness and responsibility. The implementation of ethical AI guidelines and the strengthening of institutional governance are also crucial to maintaining patient trust and ethical standards in healthcare services (Abuhammad, 2025).

Innovative performance management of healthcare workers requires continuous education and training support to enhance digital competencies and accelerate the digitalization of health services. Systematic and constructive feedback mechanisms play a vital role in promoting adaptability and improving healthcare workforce performance. In addition, organizations need to formulate and support goals and action plans tailored to the context and needs of each work unit (Hammarén et al., 2024).

## CONCLUSIONS

Digital transformation in the healthcare sector presents multidimensional challenges for human resource management in healthcare, including limited funding, a digital competency gap, uneven infrastructure, and ethical and data security issues. The study's findings indicate that the success of digitalizing healthcare services depends heavily on the readiness and capacity of healthcare workers, supported by adaptive policies, sustainable investment, and ongoing education and training. Therefore, implementing innovative, collaborative healthcare human resource management that focuses on strengthening digital competencies is key to supporting an effective, inclusive, and sustainable healthcare system amidst global change.

## REFERENCES

Abuhammad, Sawsan. (2025). Strengthening Ethical Practices of Patient Data Confidentiality and Sharing Among Nurses in the Artificial Intelligence-Driven Healthcare Era. *SAGE Open Nursing*, *11*. https://doi.org/10.1177/23779608251398113

Aprianto, Bagus, & Zuchri, Febrianti Nasaindah. (2021). Implementasi Manajemen Sumber Daya Manusia Kesehatan Di Fasilitas Kesehatan: a Literature Review. *Jurnal Kesehatan Tambusai*, *2*(3), 160–166. https://doi.org/10.31004/jkt.v2i3.2161

Capasso, Ariadna, Olinda, Carmen, Valdivia, Alcalde, Jhosselyn, Paola, Mejía, Barrientos, Núñez, Melvin Chávez, Ayala, Amalia, Marlen, Rosa, Oviedo, Flores, Fernandez, Gissela, Moreno, Iveth Larissa, Ramos, Flor, Llenny, Norma, Vilcarromero, Cruz, Blass, Yeniffer, Asunta, Marly, Villavicencio, Zumaeta, Zumaeta, Luzlita Canta, Cowan, Clyde, Vargas, Muñoz, Beatriz, Julia, Puicón, López, Mendoza, Llaquelina Pizarro, Lorena, Ivy, Romero, Talavera, Serruya, Suzanne, Mucio, Bremen De, & Colomar, Mercedes. (2025). *' In this era , the digital*

*era , telehealth is a tool that we can use to provide specialized care ': a qualitative evaluation of the implementation of programmes that use digital health to improve antenatal care in rural and jungle areas of Honduras and* . 1–13. https://doi.org/10.1136/bmjph-2024-002361

Chiam, Jodi, Lim, Aloysius, & Teredesai, Ankur. (2024). NudgeRank: Digital Algorithmic Nudging for Personalized Health. In *Proceedings of the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (Vol. 1). https://doi.org/10.1145/3637528.3671562

Dwi, Wulan, & Purba, Hajijah. (2024). Transformasi Digital dalam Kesehatan: Tinjauan Literatur tentang Inovasi, Tantangan, dan Dampak Teknologi Kesehatan Digital. *Jurnal Pendidikan Tambusai*, *8*, 4195–45201.

Egbewande, Oluwaseyi M., Haladu, Salim S., Akpovwobaa, Godspower, Agunu, Victor, Obi, Cynthia N., Kirui, Dorcas C., Okafor, Obiora I., Benson, Akpevwe E., & Inshutiyimana, Samuel. (2025). Integration of digital health into pharmacy education in Nigeria: Challenges and recommendations for national adoption. *Digital Health*, *11*, 1–4. https://doi.org/10.1177/20552076251390550

Erfani, Goran, McCready, Jemma, Gibson, Beckie, Nichol, Bethany, Unsworth, John, Jarva, Erika, MIKKONEN, Kristina, & TOMIETTO, Marco. (2025). Factors influencing digital health competence among healthcare professionals: A cross-sectional study. *Applied Nursing Research*, *82*(November 2024), 151922. https://doi.org/10.1016/j.apnr.2025.151922

Guterres, et al. (2025). The Global Impact of International Public Health: Addressing Challenges of Globalization, Health Disparities, and the Importance of International Cooperation in Health Initiatives. *International Journal of Innovative Science and Research Technology*, *10*(6), 1032–1040. https://doi.org/10.38124/ijisrt/25jun746

Hadi, Sutarto et. a. (2022). Manajemen Sumber Daya Manusia. In Ersis Warmansyah Abbas (Ed.), *Program Studi Pendidikan Ilmu Pengetahuan Sosial Fakultas Keguruan dan Ilmu Pendidikan Universitas Lambung Mangkurat Banjarmasin* (Pertama). Retrieved from https://books.google.com/books?hl=en&lr=&id=e2ppEAAAQBAJ&oi=fnd&pg=PA1&dq=manajemen+pengetahuan&ots=gV368HYlR3&sig=ugm1Twmq-r6Ya9ITLRHYA6ieJi0

Haimi, Motti, & Inchi, Liron. (2025). Bridging Distance, Delivering Care: Pediatric Tele-Nutrition in the Digital Health Era—A Narrative Review. *Healthcare (Switzerland)*, *13*(23), 1–39. https://doi.org/10.3390/healthcare13233107

Hammarén, Mira, Pölkki, Tarja, & Kanste, Outi. (2024). The management of digital competence sharing in health care: A qualitative study of managers' and professionals' views. *Journal of Advanced Nursing*, *80*(5), 2051–2064. https://doi.org/10.1111/jan.15963

Hossain, Md Shakhawat, Syeed, M. M. Mahbubu., Fatema, Kaniz, & Uddin, Mohammad Faisal. (2022). The Perception of Health Professionals in Bangladesh toward the Digitalization of the Health Sector. *International Journal of Environmental Research and Public Health*, *19*(20). https://doi.org/10.3390/ijerph192013695

Ibnu, Muh Sholeh, & Ali, Himad. (2025). Health Systems and Policy International Journal of. *International Journal of Health Systems and Policy*, *1*(1), 30–46. Retrieved from https://journal.as-salafiyah.id/index.php/ijhsp/index

Idahor, Courage O., Esomu, Ena Jane O., Ogbonna, Ndidiamaka, Momoh, Zaafirah, Ogbeide, Omo A., Ikhu-Omoregbe, Osamagbe, Adigwe, Augustina, Erhabor, Osayuwamen M., Osaghae, Osamagbe, Orons, Nosa, Idahor, Courage O., Esomu, Ena Jane O., Ogbonna, Ndidiamaka, Momoh, Zaafirah, Ogbeide, Omo A., Ikhu-Omoregbe, Osamagbe A., Adigwe, Augustina, Erhabor, Osayuwamen M., Osaghae, Osamagbe, & Oronsaye, Nosa J. (2025). Infectious Disease Surveillance in the Era of Big Data and AI: Opportunities and Pitfalls. *Cureus*, *17*(10). https://doi.org/10.7759/cureus.93929

Irianto, A., Setiawan, R., & Hadi, S. (2021). *Kesehatan masyarakat di era modern*.

Jarva, Erika, Oikarinen, Anne, Andersson, Janicke, Tuomikoski, Anna Maria, Kääriäinen, Maria, Meriläinen, Merja, & Mikkonen, Kristina. (2022). Healthcare professionals' perceptions of

digital health competence: A qualitative descriptive study. *Nursing Open*, *9*(2), 1379–1393. https://doi.org/10.1002/nop2.1184

Numair, Tarek, Harrell, Daniel Toshio, Huy, Nguyen Tien, Nishimoto, Futoshi, Muthiani, Yvonne, Nzou, Samson Muuo, Lasaphonh, Angkhana, Palama, Khomsonerasinh, Pongvongsa, Tiengkham, Moji, Kazuhiko, Hirayama, Kenji, & Kaneko, Satoshi. (2021). *Barriers-to-the-digitization-of-health-information-A-qualitative-and-quantitative-study-in-kenya-and-lao-pdr-using-a-cloudbased-maternal-and-child-registration-systemInternational-Journal-of-Environmental-Research-and.pdf*. 1–15.

Rudy C. Tarumingkeng. (2025). Pengembangan SDM Dalam Era Digital: Tantangan dan Peluang. In *Osf.Io*. Retrieved from https://osf.io/preprints/k2p8j/

Saimi. (2025). *KESEHATAN Inovasi Era Disrupsi Digital* (1st ed.). Banyumas: Arta Media Nusantara.

Septiani, et al. (2025). Transformasi Digital Dalam Sektor Kesehatan Kajian Literatur Untuk Mendukung Inovasi dan Efisiensi Layanan Kesehatan. *Cindoku : Jurnal Keperawatan Dan Ilmu Kesehatan*, *2*(1), 1–12. https://doi.org/10.61492/cindoku.v2i1.240