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DIGITAL HEALTH: ADVANCES AND CHALLENGES

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Digital technology is rapidly transforming every sector of society, and the health sector is no exception. The integration of digital tools, ranging from mobile health (mHealth), telemedicine, applications to artificial intelligence (AI), big data analytics, and the Internet of Things (IoT), has led to the emergence of Digital Health as a new paradigm in population health management. This editorial discusses key advances and enduring challenges, finally 'way forward' in digital health development.

Digital Transformation in Health and Its Advances

The foundation of electronic health records (EHRs) was laid in the 1960s with the emergence of computer technology. However, it was not until the 1990s that EHRs became an affordable and practical reality. With the advent of faster computers, improved data storage, and enhanced interoperability, EHR systems enabled the development of early telemedicine solutions (Evans, 2016). This progress paved the way for mobile health (mHealth), wearable technologies, artificial intelligence (AI) applications, and increasingly sophisticated telemedicine platforms.

Digital health offers transformative opportunities for addressing longstanding health challenges with innovative solutions. It not only improves patient care through accurate diagnosis, faster communication, and enhanced services, but also accelerates medical and health research by providing deeper insights into health problems and enabling more effective management strategies. Not only for curative, but digital health also empowers individuals and healthcare providers early disease detection, disease surveillance, prevention, and health promotion through mobile applications, wearable devices, cloud technology, big data analytics, and artificial intelligence. By leveraging digital platforms, health data can be collected, analyzed, and processed in real time, enabling faster and more targeted community interventions.

During the COVID-19 pandemic, many countries rapidly developed national applications to support contact tracing, risk stratification, and vaccination campaigns. After the pandemic, these applications evolved into broader digital health platforms. For example,

Brunei's BruHealth app introduced multiple new features, including expanded national health screening programmes (such as cervical cancer screening), an AI-powered Health Index that considers diet, sleep, and stress levels, a feature to track individual health habits, and gamified wellness challenges (EVYD Technology, 2025). Similarly, Malaysia's MySejahtera app is now repositioned as a comprehensive digital health platform, incorporating vaccination services, digital health records, MyDAR (My Diabetes Action Record), and other health information services (MySejahtera, 2022; MySejahtera, 2025). These innovations highlight the potential of digital health to enhance access, reduce disparities, and improve the effectiveness of interventions, particularly in geographically dispersed and resource-limited settings.

Challenges and Constraints

Despite promising prospects and notable progress, several challenges persist in implementing and sustaining digital health systems.

Digital Divide and Equity Concerns

A significant challenge during digital transformation in health is the digital divide, unequal access to technology, internet, and digital literacy. The WHO warns that without equitable design and implementation, digital health solutions may worsen disparities, particularly among older adults, rural residents, and low-income groups (World Health Organization, 2021). UNESCO emphasizes that lack of affordable connectivity, devices, and digital skills hinders access not only to health services but also to education and broader civic engagement (United Nations Educational, Scientific and Cultural Organization, 2024). Consequently, addressing digital equity, through inclusive infrastructure, training, and user centered design, is essential to ensure digital health benefits all populations.

Data Fragmentation and Governance

Health data are often stored in siloed systems with limited interoperability. Data privacy laws remain underdeveloped or inconsistently enforced across the region. There is a pressing need for standardized health information exchange frameworks and robust governance policies that ensure confidentiality, accountability, and ethical use of digital health data (World Health Organization, 2021).

Workforce Capacity

The successful implementation of digital health solutions requires a workforce skilled in both health and digital technologies (World Health Organization, 2021). However, many health professionals in the region lack training in data analytics, informatics, or digital ethics (World Health Organization, 2025).

Regulatory and Ethical Challenges

Existing health regulations often struggle to keep pace with rapid technological advancements. For instance, the legal status of AI-driven diagnostics, cross-border telemedicine, and algorithmic decision-making remains unclear in many jurisdictions. Additionally, ethical concerns such as algorithmic bias, informed consent, and data ownership, further complicate the implementation of digital health solutions (World Health Organization, 2022).

Sustainability of Digital Initiatives

Many digital health projects in Southeast Asia are donor-funded or operate as pilot programmes without long-term sustainability planning. A shift toward integrating these technologies into

routine health system financing and governance structures is essential (World Health Organization, 2021).

Cybersecurity and Data Privacy
As health data become digital and often cloud-based, they are more vulnerable to breaches, hacking, and misuse. Many health ministries and digital health providers in the region struggle with implementing robust cybersecurity measures, leading to potential threats to patient confidentiality and trust (World Health Organization, 2022).

The Health Economics Perspective for Digital Health

Although the initial costs of digital transformation are undeniably high, including those related to infrastructure development, capacity building, and system integration, the long-term economic returns can be significant.

From a health economics standpoint, digital health offers multiple pathways for cost-effectiveness and value generation. More effective early detection and prevention can reduce costly complications of chronic diseases. Remote care delivery saves indirect costs such as travel, lost productivity, and caregiver burden. Administrative efficiency through digital records helps lower workforce costs and minimize system delays. Moreover, the scalability of digital tools enables marginal cost savings as the user base expands (Organisation for Economic Co-operation and Development, 2022; World Health Organization, 2021).

The Way Forward for Digital Health Development

To harness the full potential of digital health development in the region, the following strategic actions are recommended:

Invest in Digital Equity
Ensure inclusive access through universal digital infrastructure, digital literacy programmes, and human-centered design for marginalized populations.

Strengthen Governance and Interoperability
Develop unified digital health architectures (roadmap, strategies, funding), cross-border data exchange standards, and comprehensive data governance frameworks to protect individual rights and enhance trust.

Develop Policies, Laws, and Ethical Guidelines
Establish robust regulatory frameworks, ethical standards, and guidelines to guide the implementation and oversight of digital health solutions, ensuring accountability and alignment with national health objectives.

Build Workforce Capacity
Expand training opportunities and institutional support for digital health education and research.

Integrate Health Economic Evaluations
Institutionalize cost-effectiveness and value-for-money analysis in digital health policy and procurement processes to guide sustainable investment.

Foster Regional Collaboration
Leverage ASEAN and other regional bodies as platforms for policy harmonization, knowledge sharing, and joint innovation.

With regard to capacity building, universities across the region have launched specialized programmes to train professionals in this emerging field. For example:

i. **Brunei Darussalam:** Universiti Brunei Darussalam (UBD) offers both a Master of Digital Public Health (coursework and research tracks) and a PhD in Digital Public Health. These programmes, delivered through the PAPRSB Institute of Health Sciences in collaboration with the School of Digital Science, are designed to build local and regional capacity in areas such as epidemiological modeling, machine learning, and health data science (Universiti Brunei Darussalam, 2023).

ii. **Malaysia:** The International Medical University (IMU) offers an undergraduate programme in Digital Health, which integrates computing, data analytics, and health sciences (International Medical University, 2024). Universiti Malaya also offers an online course titled Digital Health Essentials, which covers practical aspects of digital health technologies and their implications for public health practice (Universiti Malaya, 2021).

These initiatives demonstrate the region's strong commitment to capacity building, ensuring that future health professionals are well-prepared to lead the digital transformation with competence and confidence.

Conclusions

Digital health stands at the intersection of technology, health equity, and sustainable development. In many countries, progress has been encouraging, yet challenges remain. As we navigate the post-pandemic era, there is an urgent need to design digital health ecosystems that are not only innovative but also inclusive, ethical, and economically viable. However, too often, countries rush into digital health without sufficient funding, strategic planning, or coordination, leading to fragmented systems and inefficiencies. It is therefore essential to prioritize strategic development (phase-by-phase), integrated planning, and sustainable funding to ensure that digital health investments are both effective and transformative.

References

Evans, R. S. (2016). Electronic Health Records: Then, Now, and in the Future. Yearbook of Medical Informatics, Suppl 1, S48. https://doi.org/10.15265/IYS-2016-s006

EVYD Technology (2025). BruHealth 5.0 Launches: Advances Digital Health For A Connected Brunei—EVYD Technology. https://www.evydtech.com/bruhealth-5-0-launches-advances-digital-health-for-a-connected-brunei/

International Medical University (2024). Study Digital Health at IMU Malaysia. IMU University. https://imu.edu.my/academics/undergraduate/digital-health/

MySejahtera (2022). MySejahtera. http://mysejahtera.moh.gov.my/en/

MySejahtera (2025). App Store. https://apps.apple.com/my/app/mysejahtera/id1504055630

Organisation for Economic Co-operation and Development (2022). Health at a Glance: Europe 2022. OECD. https://www.oecd.org/en/publications/health-at-a-glance-europe-2022_507433b0-en.html

Universiti Brunei Darussalam (2023). Digital Public Health Graduate Programmes—Universiti Brunei Darussalam. https://ubd.edu.bn/c3l/dph/

Universiti Malaya (2021). Welcome to Universiti Malaya Online Courses. https://onlinelearning.um.edu.my/courses/digital-health-essentials

United Nations Educational, Scientific and Cultural Organization (2024). Digital learning and transformation of education: What you need to know UNESCO. https://www.unesco.org/en/digital-education/need-know

World Health Organization (2021). Global strategy on digital health 2020-2025. https://www.who.int/publications/i/item/9789240020924

World Health Organization (2022). Ethics and governance of artificial intelligence for health. https://www.who.int/publications/i/item/9789240029200

World Health Organization (2025). DRAFT Regional Action Framework on Digital Health in the Western Pacific. https://www.who.int/westernpacific/publications/m/item/draft-regional-action-framework-on-digital-health-in-the-western-pacific-rc75