


TECHNICAL  
SERIES



**ON PRIMARY  
HEALTH CARE**



**Digital technologies:**  
shaping the future of  
primary health care

## **Acknowledgements**

This document was produced as part of the Technical Series on Primary Health Care on the occasion of the Global Conference on Primary Health Care under the overall direction of the Global Conference Coordination Team, led by Ed Kelley (WHO Headquarters), Hans Kluge (WHO Regional Office for Europe) and Vidhya Ganesh (UNICEF). Overall technical management for the Series was provided by Shannon Barkley (WHO Headquarters, Department of Service Delivery and Safety).

This paper was produced under the technical direction of Diana Zandi and Adriana Velazquez Berumen, WHO Headquarters, Geneva.

The principal author was Joan Dzenowagis, Consultant, WHO Headquarters, Geneva.

Valuable comments and suggestions to the first draft were made by WHO collaborating partners and office staff, in particular Susan Brown (GAVI), Bruce Chater (University of Queensland), Gaurav Garg (GAVI), Jun Gao (WHO regional office for South East Asia), Amanda Howe (WONCA), Dana Hovig (Gates Foundation), Austin Liu (Consultant, GAVI), Harris Lygidakis (WONCA), Lizzie Madden (Consultant, WHO Geneva) and Ewen McPhee (Australian College of Rural and Remote Medicine).

The views expressed in this document do not necessarily represent the opinions of the individuals mentioned here or their affiliated institutions.



## **Strengthening primary health care: a national imperative**

Across the world, the pursuit of more equitable, comprehensive and integrated models of health care was first inspired by the Declaration of Alma-Ata in 1978, which encouraged a focus on primary health care towards “...the progressive improvement of comprehensive health care for all, and giving priority to those most in need” (1). Forty years later, countries are coming together to reaffirm their aspiration and collective imperative to strengthen primary health care as they reinterpret the goals of Alma-Ata in a contemporary context (2). This brief highlights the opportunities created by digital technologies in achieving the vision for primary health care.

## **Digital technologies: a force for change**

Information and communication technologies were newly emerging when the Declaration of Alma-Ata was agreed four decades ago. At the time, the adoption of these technologies in health services was complex, costly and limited. The commonplace technologies of today such as smart phones, tablets and laptop computers did not exist. However, by 1990 new technologies – notably, the Internet – had begun to have a revolutionary impact. As they became more advanced (3), more assimilated in all sectors and mainstream in society these technologies have shown remarkable value for health.

From technologies that allow people to manage their health more effectively, to better ways of diagnosing disease, to monitoring the impact of policies on population health, digital technologies for health, or digital health, are having a profound effect on how health services are delivered and how health systems are run. The impressive trend in national policies for digital health<sup>1</sup> (more than 120 countries by 2015) (4) reflects the firm commitment to use digital technologies to advance the Sustainable Development Goals, support universal health coverage and shape the future of primary health care.

---

<sup>1</sup> The term digital health is used here as an overarching term to include eHealth and mHealth (e.g. telemedicine, electronic health records and wearable sensors) as well as developing areas such as the use of advanced computing sciences in the fields of big data and artificial intelligence, for example. Digital technologies also include some medical devices and assistive devices.



## Shaping the future of primary health care

Improving the accessibility, affordability and quality of health care is at the heart of primary health care. The three pillars of primary health care are primary care and essential public health functions as the core of integrated health services, multisectoral policy and action, and empowered people and communities (World Health Organization. A vision for primary health care in the 21st century. 2018). Numerous examples of digital technologies, outlined below, attest to their versatility, utility and ubiquity in supporting these pillars in the context of health development (5).

### High-quality primary care and essential public health functions

Digital technologies of all kinds have become essential resources in primary care and their uptake is growing (6), with the past decade seeing rapid integration of technology in a range of areas that support primary care and essential public health functions. In this context, common uses of digital technologies include searching medical knowledge resources, facilitating clinical support, monitoring quality of care, and mapping and monitoring the spread of infectious diseases, as well as tracking supplies of drugs and vaccines.

Integrating clinical support tools and referral systems into primary health care can help coordinate care and ensure its continuity across primary, secondary, acute and aged care services. Electronic health records capture information about an individual's health, medical conditions, medications and key events, which can be shared for referrals and timely clinical decision-making. Digital technologies can help improve the patient journey. They can prevent duplication of care processes and enhance communication between providers as well as avoid unplanned hospitalizations and visits for urgent care. Ensuring that the general public has access to timely, expert advice by telephone in health emergencies can save lives.

Redirecting interventions from secondary and tertiary care facilities such as hospital settings to people's homes through telemedicine, remote care and mobile health is already transforming primary care and moving health systems towards a more people-centred and integrated model of health service delivery. Services such as home monitoring (e.g. blood pressure, medication adjustment, and blood and urine testing) are key to this trend. Technologies that enable patient access to personalized information, appointment booking and tools to manage their chronic conditions provide further support in home settings.

Technologies can play an important role in patient safety by identifying risks and reducing harm in the primary care setting. For example, electronic sensors enable measurement of vital signs and activity tracking to assist staff in monitoring patients at risk of falls (7). Ensuring that information on prescribed medications can be accurately and securely shared through electronic prescribing reduces the likelihood of preventable adverse drug events (8). Researchers are capitalizing on the value of big data and the power of artificial intelligence to support complex clinical decision-making and the identification and reporting of adverse events (9).

Point-of-care diagnostic testing, such as for diabetes, HIV and malaria, can perform rapid analysis as a critical guide for treatment (10). Digital technologies have been instrumental in developing the medical and assistive devices of this century. For example, 3-D printing is revolutionizing the manufacture of medical devices, orthotics and prosthetics (11).

At the community level, health facility managers incorporating digital technologies need the knowledge and resources to ensure that the technologies they adopt fit their needs and can be supported, managed and effectively used. Local systems should also be able to share data with national systems, which requires alignment with a national plan as well as with existing legislation, regulation and policies for data privacy and protection. The proposed "scale" of technology implementation needs to be planned at the outset.

The use of digital technologies to inform, support and build capacity is an important means to empower the health workforce at the same time as improving the quality of care in primary health care. The future health workforce already lives in a connected world and will have ever greater access to digital technologies in both the public and private sphere. Providing them with communication devices, knowledge resources, and patient management and decision-support tools gives them the means to be more effective and autonomous in their work. Facilitating their education and training through digital tools such as e/mLearning, knowledge sharing and networks improves and reinforces their professional skills. Enabling learners in communities to build knowledge and skills through training modules and online courses offered by distant institutions in order to join the workforce empowers whole communities.



## Multisectoral policy and action

One fundamental way that digital health supports primary health care is by improving the ability to gather, analyse, manage and exchange data and information in all areas of health. Digital technologies are being used to improve health information systems from the community level to district, national and even global levels. Their use also improves the timeliness and accuracy of public health data collection and reporting (12) and facilitates disease monitoring and surveillance. They are central to strengthening public health action, and support rapid, coordinated response in public health emergencies where many sectors and actors are involved.

The ministry of health is positioned to align the many stakeholders in digital health around national goals. Leadership and stakeholder engagement are critical, as is a long-term view to develop digital health in the context of a country's economic and health priorities. Partnering with other sectors, such as the information and communication technology sector, and stakeholders, such as innovators, can develop the expertise needed to bring innovation to those most in need. Innovative digital technologies, such as hand-held ultrasound and pulse oximeters, can provide effective diagnosis at the primary care level and improve the health and well-being of those in low-resource settings (13).

## Empowering people and engaging communities

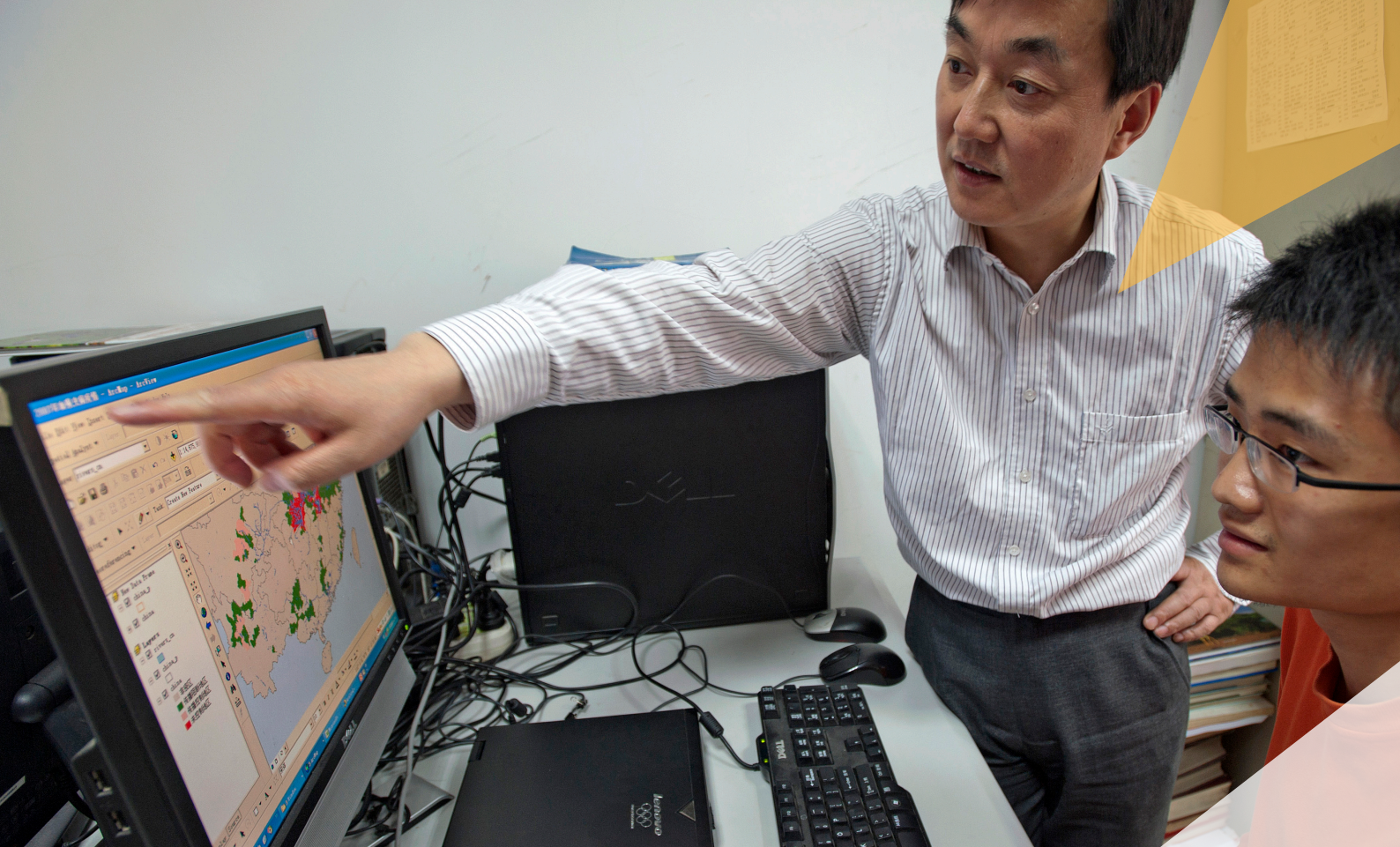
An educated, aware and engaged public is a goal of primary health care. Individuals and families can be encouraged to take an active role in their health and well-being, for example by connecting to high-quality health information and patient communities online. Effective use of digital technologies can also support self-care, provide ways to address health needs, and enable access to health services even when health expertise is at a distance. With technology, service users can feed back their experiences of care with the potential for increased transparency in the policy processes and assessments of health services.

Digital health provides the tools to reach individuals and the public with health messages that can be acted on, such as targeted health campaigns or text reminders via mobile telephones to take medication or attend clinic visits. Personalized support for health behaviour change is another growing application of digital health. For example, Be Healthy Be Mobile's mCessation programme has successfully helped tobacco users in India to quit tobacco by motivating and supporting registered participants through mobile text messages (14).

Improving the digital health literacy of the general public can help to educate, inform, motivate and empower individuals and families, and help them navigate and reduce the risks of participating in the online world. Critical appraisal skills regarding information sources, the reliability and safety of health products and apps, and awareness of social media influences (such as anti-vaccine messages) are essential skills to foster in both children and adults. Further research and health technology assessment are needed on the benefits, acceptability, unexpected outcomes and risks of digital technologies to patients and the public. Unfortunately, the digital divide is still a reality to be tackled in many countries in order to achieve the goals of primary health care. Too many people do not have access to affordable digital technologies, with the problem being more acute in low- and middle-income countries (15).

## Looking to the future

While the opportunities that digital health offers are increasingly understood as essential to a modern health system, there are social, economic and other barriers that affect a country's ability to take advantage of them and ensure equity in their use. Harnessing digital technologies for health requires cross-sectoral collaboration, commitment and strategic planning (16). Policy-makers need to build the mechanisms and capacity to identify, assess, support and oversee the integration of promising – as well as proven – technologies into primary care and public health. There should be careful consideration of the country context when introducing innovative approaches, ensuring the necessary oversight and regulation in order to realize the benefits and avoid harms.



To make digital health a reality in primary health care, countries must address its key components. These include: building the physical infrastructure; deploying appropriate services and applications; developing a capable health workforce; ensuring a sound legal and regulatory environment; and improving governance, policy, standardization and interoperability (16). It will also be critical to ensure that cross-border, regional and international efforts work in harmony and that governments build mechanisms to collaborate and share lessons learned. Governments are moving away from pilot projects towards strategic, integrated planning and sustainable financing mechanisms.

While technological development moves quickly, the same is not always true of public policy, clinical practice and the generation of evidence. Policy-makers must often decide whether to go forward based on imperfect evidence. Research on and evaluation of digital health outcomes and impact are therefore essential to support its safe and ethical implementation, promote accountability and justify the investment of funds.

As individuals increasingly become agents in their own care, policy frameworks and the use of digital technologies (such as biometric identification) must protect privacy and security if trust in digital health is to be maintained. Suitable regulation is also needed to ensure the quality and safety of software products, devices and applications that are used not only in primary health care but that may also be directly marketed or otherwise available to individuals.



Developing the digital skills of the health workforce is critical. Health professional training and education programmes will need to ensure that the workforce can use digital technologies proficiently in many settings, whether in the delivery of care, its management and administration, or in health systems planning and management.

There are many stakeholders in the digital arena: companies, non-profit organizations, foundations, engineers and innovators, academia, research and scientific institutes. In addition, nongovernmental organizations, donors, service providers and government institutions, individuals, families and communities play key roles, which continue to evolve in the digital health environment. Many see the potential for growth and acknowledge the need to work together to make advances relevant, safe, affordable, transparent and accessible. Those working to develop and promote digital technologies can be important strategic partners for governments. In that context, they must also recognize their responsibility to align, deliver, sustain and demonstrate value beyond the initial excitement of a launching a new technology or initiative.

## **Conclusion**

Digital technologies have already opened up a wealth of possibilities for shaping the future of primary health care and ensuring effective public health action. They have catalysed a host of changes in education, policy and practice as well as created new patterns of communication, empowerment and engagement. A recommitment by governments to the goals of primary health care and its values of inclusiveness and equity promises more changes to come, with digital technologies central to the vision and its realization.




## References

1. Primary health care: report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978/jointly sponsored by the World Health Organization and the United Nations Children's Fund. Geneva: World Health Organization; 1978. ([http://www.who.int/publications/almaata\\_declaration\\_en.pdf](http://www.who.int/publications/almaata_declaration_en.pdf), accessed 17 September 2018).
2. Global Conference on Primary Health Care. Towards Health for All. Media centre. World Health Organization (<http://www.who.int/mediacentre/events/2018/global-conference-phc/en/>, accessed 17 September 2018).
3. Greatest engineering achievements of the 20th century. The National Academy of Engineering. (<http://www.greatachievements.org/?id=3824>, accessed 17 September 2018).
4. Global Observatory for eHealth. Directory of eHealth policies. World Health Organization. (<http://www.who.int/goe/policies/en/>, accessed 17 September 2018).
5. Submissions from entities in the United Nations system and elsewhere on their efforts in 2014 to implement the outcome of the WSIS. Submission by World Health Organization (WHO). Commission on Science and Technology for Development; 2015. ([http://unctad.org/en/PublicationsLibrary/a70d65\\_bn\\_WHO.pdf](http://unctad.org/en/PublicationsLibrary/a70d65_bn_WHO.pdf), accessed 17 September 2018).
6. World Health Organization. Global Observatory for eHealth. Global diffusion of eHealth: making universal health coverage achievable. Geneva: World Health Organization; 2016. (<http://apps.who.int/iris/bitstream/10665/252529/1/9789241511780-eng.pdf?ua=1>, accessed 17 September 2018).
7. Oxehealth secures world-first accreditation for its vital signs technology. eHealthNews.eu. 18 September 2018 (<http://www.ehealthnews.eu/industry/5630-oxehealth-secures-world-first-accreditation-for-its-vital-signs-technology>, accessed 17 September 2018).
8. Electronic transfer of prescriptions. The Pharmacy Guild of Australia; May 2016 ([https://www.guild.org.au/\\_\\_data/assets/pdf\\_file/0025/5785/electronic-transfer-of-prescriptions-.pdf](https://www.guild.org.au/__data/assets/pdf_file/0025/5785/electronic-transfer-of-prescriptions-.pdf), accessed 21 September 2018).



9. Kite-Powell J. See how this hospital uses artificial intelligence to find kidney disease. *Forbes*. 8 June 2018 (<https://www.forbes.com/sites/jenniferhicks/2018/06/08/see-how-this-hospital-uses-artificial-intelligence-to-find-kidney-disease/#7a31b3442e8f>, accessed 21 September 2018).
10. Point-of-care G6PD testing to support safe use of primaquine for the treatment of vivax malaria. World Health Organization; 2015 (<http://www.who.int/malaria/mpac/mpac-march2015-erg-g6pd.pdf>, accessed 21 September 2018).
11. Hendricks D. 3D printing is already changing health care. *Harvard Business Review*. 4 March 2016 (<https://hbr.org/2016/03/3d-printing-is-already-changing-health-care>, accessed 17 September 2018).
12. Nigeria: Lassa acute viral haemorrhagic fever emergency plan of action final report. ReliefWeb. 2 October 2018. (<https://reliefweb.int/report/nigeria/nigeria-lassa-acute-viral-haemorrhagic-fever-emergency-plan-action-final-report-dref>, accessed 2 October 2018).
13. Compendium of innovative technologies for low-resource settings. Geneva: World Health Organization; 2015 (<http://who.int/ehealth/publications/compendium/en/>, accessed 21 September 2018).
14. Gopinathan P, Kaur J, Joshi S, Prasad VM, Pujari S, Panda P, et al. Self-reported quit rates and quit attempts among subscribers of a mobile text messaging-based tobacco cessation programme in India. *BMJ Innovations*. 2018;4:147–54. doi: 10.1136/bmjinnov-2018-000285
15. Global diffusion of eHealth: making universal health coverage achievable. Report of the third global survey on eHealth. Geneva: World Health Organization; 2016 (<http://apps.who.int/iris/bitstream/10665/252529/1/9789241511780-eng.pdf?ua=1>, accessed 17 September 2018).
16. National eHealth strategy toolkit. Geneva: World Health Organization and International Telecommunication Union; 2012. ([http://apps.who.int/iris/bitstream/10665/75211/1/9789241548465\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/75211/1/9789241548465_eng.pdf?ua=1), accessed 17 September 2018).

TECHNICAL  
SERIES



**ON PRIMARY  
HEALTH CARE**