Digital medicine

Virtual care for improved global health

Global access to health care is far from adequate, with health disparities widening; the rise of economic inequities and shortages in the health workforce are contributors. This is especially true for people who live in rural areas in low-income countries without access to essential health services. Yet digital infrastructure and technologies exist that could allow virtual and rapid provision of health care for many health conditions, for almost everyone, at any time, irrespective of their location. Virtual health care is not new. In fact, the first virtual diagnosis was described in 1879, just 3 years after Alexander Graham Bell patented the telephone. What makes it such a viable option today is the unprecedented growth in mobile telecommunications and internet access across many low-income and middle-income countries. In fact, 95% of the world's population now have cellular coverage. Built on this connected framework, with an expansive array of new digital tools, it's possible to reimagine how care can be provided.

The diagnosis of some acute conditions can be made possible with little more than a connected device and community health worker. Infectious diseases can be identified at the point of care, often via pathogen genomics, through finger-stick blood drops, urine, or saliva. Preliminary research suggests breath analytics might be able to identify malaria and tuberculosis. Parasitic infections can be diagnosed via mobile phone–based video microscope. Other connected imaging technologies for screening of oral and cervical cancers and eye and skin diseases are under investigation.

Smartphone ultrasound is another digital imaging technology that, after minimal training, can be used to acquire images anywhere, and with remote interpretation by experts, cardiac, pulmonary, and abdominal conditions can be diagnosed. The opportunities in pregnancy are noteworthy. Handheld ultrasound can be used to prevent or manage potentially life-threatening complications of pregnancy. Most global maternal deaths occur in low-income countries, and are high in rural areas with limited access to health care. Digital devices now enable health-care workers to track temperature, pulse, and blood pressure remotely and longitudinally. Additionally, tools for self-testing, such as urinalysis for proteinuria, are likely to be available soon, and when linked with effective and simple two-way communications via text, could allow for early identification of complications, such as pre-eclampsia and peripartum infections. It is also now possible to detect iron deficiency and anaemia non-invasively. All of these capabilities, as part of a response that includes access to antenatal care, attendance of skilled health workers during childbirth, and post-partum care, have the potential to reduce maternal mortality.

It is estimated that by 2020 non-communicable diseases will account for 80% of the global burden of disease. Diabetes and high blood pressure are both well suited for emerging virtual management programs. Furthermore, digital technologies have the potential to extend mental health workforce capacity with innovations that support treatment and clinical care, create virtual communities where patients can connect with mental health specialists, and provide online education programmes to help community health workers or other non-specialist providers improve their skills.

The ability to provide health care almost anywhere in the world, inconceivable just years ago, is now possible. With time, the connectivity infrastructure will become more robust, and digital technologies will multiply in variety as they also continue to decrease in size and cost. Informed by ongoing systematic evaluation, this will allow for even more frugal innovation of what's most critically needed; systems of care built around improved communications, bringing care closer to, if not directly to, the individual, and bolstering self-management. These systems, through continuous learning and improvement, could be platforms for integrating further innovation. A key component of these systems, to optimise efficiency, scalability, and cost-effectiveness, will be the anticipated growth of artificial intelligence that could facilitate care via clinicians and amplify their reach. To succeed as one element of wider solutions to global health disparities, these reimagined systems of care will need to be designed around the unique environment and needs of the intended users of health services, which is only possible through the direct involvement and guidance from those patients.

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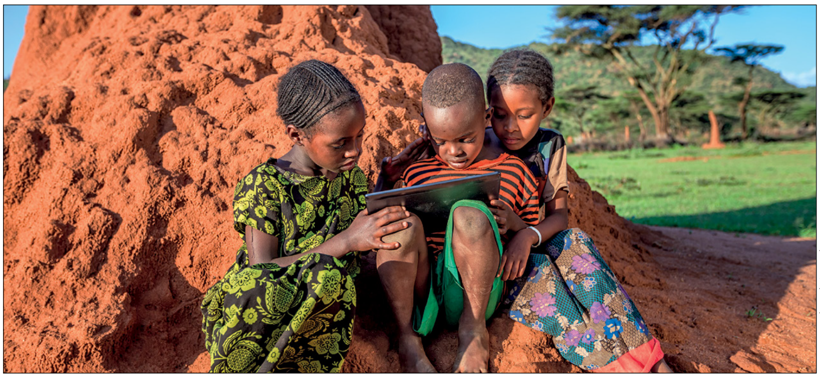

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For more on **Digital medicine** see **Comment** *Lancet* 2016; **388:** 740 and **Perspectives** *Lancet* 2017; **390:** 2135

Further Reading

Barber RM, Fullman N, Sorensen RJD, et al. Healthcare Access and Quality Index based on mortality from causes amenable to personal health care in 195 countries and territories, 1990–2015: a novel analysis from the Global Burden of Disease Study 2015. *Lancet* 2017; **390:** 231–66

Naslund JA, Aschbrenner KA, Araya R, et al. Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature. *Lancet Psychiatry* 2017; **4:** 486–500

Bhatti Y, Taylor A, Harris M, et al. Global lessons in frugal innovation to improve health care delivery in the United States. *Health Aff (Millwood)* 2017; **36:** 1912–19

SRS and EJT are supported by the US National Institutes of Health/National Center for Advancing Translational Sciences grant UL1TR001114 and a grant from the Qualcomm Foundation