Connected Health

Perspective

Telemedicine for blood pressure control in low- and middle-income countries: the journey ahead

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Abstract

In just over a half-century since the initiation of telemedicine, technological developments have created multiple options to shape how patients can access healthcare and interact with healthcare providers to better prevent and manage hypertension. In several high-income countries, patients are connecting to their healthcare providers online to book appointments, request prescriptions, see test results and engage in pro-active health management. Mounting evidence suggests that telemedicine and mobile health (mHealth) services can yield greater reductions in blood pressure when compared with usual care while also offering greater reach, efficiency, and potential cost-saving. A deeper examination of implementing such systems at scale in high-income countries shows varying approaches and levels of success. While research investigating the benefits of technology for blood pressure control in low- and middle-income countries is growing, in regions such as sub-Saharan Africa, economic and digital divides present major challenges to scaling such technology. Substantial national investments in infrastructure and skills development are needed alongside consultation with multiple stakeholders to ensure that technological advancements do not further drive health disparities in the region.

Keywords: Telemedicine, sub-Saharan Africa, hypertension, mHealth, access to healthcare, healthcare disparities, electronic health records, electronic medical records

Telemedicine began in the U.S. in 1968 when doctors at a local hospital offered remote clinical exams via a dedicated telemedicine booth to travellers passing through Boston's Logan International Airport[1]. Since then, advances in technology have supported the growth of both telemedicine and of mHealth, the use of mobile technology and digital communication platforms within health, including a multitude of available apps[2].

For hypertension management, these technologies have the potential to collect and send real-time blood pressure data, connect the patient and healthcare professional (HCP) more rapidly and cost-effectively than in-person consultations, engage the patient in clinical decision-making and in monitoring treatment effects, and support the delivery of patient-centred care[3]. All of these may promote a better relationship between patient and HCP, improve efficiency in service delivery, and promote better blood pressure control in patients if such technologies are universally accessible and acceptable.

Once the digital infrastructure is in place [Figure 1], the foundation needed to underpin the delivery of universal health care is a national electronic health record (EHR) system, a system whereby HCPs and all patients alike can access their health information, test results, treatment details, and appointments; add notes; and schedule reviews through a secure and easy-to-use portal from a home computer, laptop or mobile device.

In 2016, the World Health Organization (WHO) Global Observatory for eHealth reported that less than half of WHO member states had a national EHR system; of these states, 77% were high- or upper-middle-income countries[4]. Where EHRs were in place, use was shown across primary, secondary, and tertiary care levels, and EHRs frequently integrated with laboratory and pharmacy information systems. Indeed, such systems can enable communication between patients, family members and care teams across geographical divides, but such EHR systems require national commitment and adequate national funding investment, good digital infrastructure and legal frameworks, and the human resources needed for EHR design, implementation, and maintenance; all of these can be significant barriers for low- and middle-income countries (LMICs)[4]. However, even if these factors are put in place, this does not guarantee that the technology is seen as usable and adopted by its intended users. Experience from high-income countries shows that even the collection of data on usability and adoption of EHRs has challenges, as does the use of such data to improve systems at a regional or national level[5].

While there is great promise for telemedicine and mHealth to support better blood pressure control, it is critical that such digital health initiatives are universally accessible to all patients and HCPs. If this is not the case, the risk is that such systems will widen economic and digital divides between and within countries and contribute further to healthcare inequity, affecting those that cannot afford the best healthcare services. Even in upper-middle-income countries with high mobile phone ownership, such as South Africa, the digital divide (i.e., the inequity in access to and use of information communication technologies) persists and was brought into sharp focus recently when schools closed and moved to online education during the COVID-19 pandemic[6,7].

However, the pandemic also demanded a reconsideration of care for people living with hypertension at a time when clinics were overrun and patients avoided healthcare facilities. During the pandemic, we showed that community members from a historically disadvantaged urban township of Johannesburg, South Africa could accurately measure and upload their own blood pressure data to a secure electronic data capture portal from home if provided with an automated blood pressure device and simple instructions on a tablet[8], despite 79% of adults having inadequate health literacy levels. Indeed, patients preferred this self-
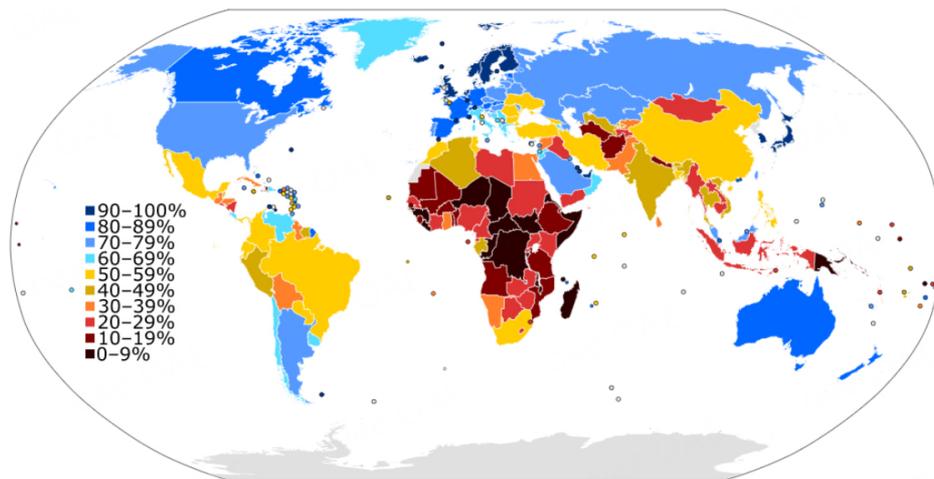
Figure 1. Internet penetration [number of Internet users as a percentage of a country's population, data from United Nations International Telecommunication Union 2015; source Jeff Ogden (W163), CC BY-SA 3.0 (https://creativecommons.org/licenses/by-sa/3.0), via Wikimedia Commons].

measurement approach to the long wait times frequently experienced at a clinic, and saw it as a way of self-monitoring and a reason to engage in healthier behaviours. Promoting enhanced health literacy and home-based blood pressure monitoring will be critical both as a first step to improve hypertension management and as a foundation to move telemedicine forward.

Even with numerous challenges, the use of technology to improve blood pressure control is accelerating in many LMICs. A recent systematic review showed that over 20 technology-based blood pressure intervention trials had been reported in sub-Saharan Africa (SSA) alone[9]. However, among the 46 SSA countries, research has been presented from only seven countries (15%) and, while not a focus of the review, an analysis of the authors and funding sources for these trials yields some interesting insights into how the field is being shaped within the region.

For example, most authors (over 70%) listed on the papers included in this review held an academic affiliation primarily within medical or health sciences, with a few academics from other fields including technology or informatics, social policy, anthropology, engineering, and economics. Around 10% of authors listed a clinical affiliation, primarily hospital-based, with one paper having a primary care affiliation, one in nursing and one in community health work. Approximately 8% of authors listed affiliations with NGOs/NPOs or charity-funded research institutions, 9% had industry affiliations, and only 1% of authors had national or provincial government affiliations. None of the research presented included authorship with industry, academia, clinical staff, or government, indicating public-private partnerships with government.

Funding for these trials came primarily from overseas, either from North American or UK government funding (38% of papers), industry funding (23%), or international universities and charities (15%). Where domestic funding was provided, this came from either universities (7%) or government research institutions (8%), with two papers not declaring the source of funding for the research.

Evidence is accumulating to suggest that blood pressure reductions can be greater when digital interventions are used compared with usual care[10,11]; but how do we move beyond formative research and pilot or small-scale studies to large-scale national implementation to realise the full potential benefits?

Intuitively, it seems that ownership is needed at all levels, from patients to providers to policy makers and the suppliers of such systems, and that the resource for national systems that generate a return on investment should come from national government, possibly with EHRs funded from a separate government eHealth budget[12].

In a review of the journeys taken to implement national EHR systems in three high-income countries, Morrison *et al.* (2011) describe how, regardless of national policies, healthcare systems, intended initial benefits or initial strategy, the "middle-out" approach appears preferable to either a bottom-up (patient/provider driven) or top-down (policy driven) approach[13]. This middle-out approach seeks to balance the local requirements of HCPs, including minimising disruption to workflows and the requirements of patients in their expectations of care, with national requirements for standardised or interoperable systems across all levels of care for the least financial outlay, allowing national audits and planning to improve health system quality, efficiency, and sustainability.

Integration and standardisation across systems will be critical to maximising outcomes such as patient health, tracking, appointments, health service use, medication use, forecasting stock requirements, and assessing the effectiveness of health systems for management of hypertension and for multiple health conditions. Such data could also feed analytics to target intervention delivery to key patient groups, such as tobacco cessation or weight loss, with tailored behaviour change strategies and feedback on intervention success to both HCP and patient. Educational material could be tailored to patient need or searchable from a range of validated and moderated content.

Given the current situation in SSA, at least, it seems that academics are playing a major role in this middle-out approach as a driving force for digital disruption in LMIC healthcare, considering the need to involve multiple stakeholders and disciplines. To maintain the momentum and guide it towards supporting equity in healthcare access, the WHO Global Observatory for eHealth recommends that countries learn from each other through the creation of regional or global networks and that indicators be embedded in all systems to assess access among marginalised or vulnerable groups[4]. The potential is here; how it is realised will be key.

DECLARATIONS

Author's contribution
The author contributed solely to the article.

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Not applicable.

Conflicts of interest
The author declared that there are no conflicts of interest.

Ethical approval and consent to participate
Not applicable.

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