E–HEALTH OPPORTUNITIES FOR THE LOW AND MIDDLE–INCOME COUNTRIES

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ABSTRACT

Across the world, there is a critical expansion in digital technology through all fields, including health. Electronic health (e-Health) is the future of healthcare. E-Health could help in building better healthcare systems since it can be adopted to enhance communications, train health workforce, assist in job-related tasks and supervision. Additionally, precision medicine (PM), which is a modern approach in low and middle-income countries (LMICs), could facilitate addressing chronic diseases. Such techniques could promote innovative public health interventions that will improve population well-being worldwide to satisfy the indicators of sustainable development goal number-3 (SDG-3) that stresses on ensuring healthy lives and promoting welfare for all. However, e-Health data could be both a gain and a challenge for LMICs. A transformational and synergetic strategy is necessary to adopt these techniques as it would sustainably minimize the expanses of healthcare. Yet, national adoption of e-Health is gradually progressing in several LMICs. This review highlights the recent advances and future applications of mobile health and its impact on people's lives in the LMICs. It also displays perceptiveness towards the best practice for scaling electronic health (e-Health) initiatives in the LMICs guided by adapted experience from real case studies and exploring the impact on designing and deploying future health initiatives, especially for improving the health workforce. Finally, It suggests a structure for data governance policy to limit the hazards of breaching or abusing health data in e-Health platforms.

Introduction

Unfortunately, not everyone can gain from nowadays technology. Many have anyway been forgotten and the vulnerability is declining yet more for the economy, policy and society related outcomes of the quickly increasing disparity. Large technical jumps are being made; however, the society and economy-related profits stay geographically centred, mainly in the developed nations. Quite often, the low and middle-income countries (LMICs) are still away behind if not omitted entirely. This is because such countries keep confronting multiple and critical growth obstacles, encountering halts in their attempts to eliminate poverty, realize sustainable development and take part effectively in the progressively competing market worldwide. Among the main reasons are structural limits and the apparent disparities between LMICs and the others in fields like science, technology and innovation (STI). If such inequality are not addressed early enough, LMICs would not be able to realize the 2030 Agenda and its Sustainable Development Goals (SDGs) ('Utoikamanu, 2018).

In the LMICs, conventional strategies for growth supported by the premise that international investments and rising importations of capital products could derive, via disseminating technology and innovation, to developing profits, did not work as supposed. More significantly, reduced registration in higher education and therefore a shortage in the proficient workforce, reduced investment in research and development (R&D), and changeable or insufficient legal and political settings that could boost advancements, all lead to the deficient condition of science, technology and innovation. Regarding the health sector, electronic health (e-Health) can improve health systems, enhance the patient-provider relationship, empower novel paradigms of care, and transform the health systems to patient-centred healthcare in the low and middle-income countries (LMICs). Several digital initiatives have targeted healthcare challenges in the LMICs, trying to promote both access to healthcare and the quality of services. Ahead of piloting and exploration, such initiatives are targeting the call for practical scaling and integration to afford sustainable gains to the healthcare systems (Mitchell & Kan, 2019). LMICs have endorsed the breakthrough in technology more than that in industry, yet, e-health is perceived with some doubts. Hence, for adopting e-health initiatives, public and private sectors, as well as consumers, should play a significant role to adapt such technology (Okwen, 2019).

Telemedicine and the Shift in Healthcare Delivery

Health is a domain for innovative mobile solutions. Examples of applying e-Health include the rising adoption of telemedicine for remote diagnosis and management, standards to enhance the quality of care and more reliable access to services. Smartphone technology is among the cutting-edge solutions in the LMICs. Factors such as the lower cost of the smartphone, and the United Nations (UN) promise to provide Internet access in the LMICs by 2020, which would afford smartphones for everyone. Such technology has enhanced patient-provider communication, minimized costs, and boosted patients' care. The potentials extend from affordable and fast medical training towards reaching the point-of-care ultrasound. All the previously mentioned potentials are just a portion of what mobile solutions can offer to transform health universally. Telemedicine is an ever-evolving circle of power that could fit the future of health worldwide (Chung, 2016).

Precision Medicine in LMIC

In contrast to high-income countries (HICs), LMICs are missing to some extent, a first field in precision medicine (PM) that is genomic studies. LMICs, a significant percentage of the universe population, have access to fewer resources along with specific chronic illnesses and the related demand for durable care. Hence, adopting the promising PM is challenging if not adequately tackled since it might largely broaden the disparity in health inequalities among HICs and LMICs (Zgheib et al., 2020).

In most LMICs, the curve for chronic diseases, mainly cardiovascular diseases (CVDs), diabetes mellitus, cancer, and chronic respiratory disease, steadily comply with that in the developed nations and resulting in prevalent premature mortality and morbidity and the accompanied undeniable economic load. Moreover, an added significant issue is the growing drug-resistant microbes. In PM, subjective differences in genes, living and the environment for every individual is considered to manage and prevent illnesses. PM allows a personalized style where the proper therapy for the appropriate person at the appropriate timing. Several developed nations have already implemented PM. However, the preliminary high cost, for the long-term, would minimize the health expenses by eliminating the incompetent therapeutic methods. In LMICs, PM remains in its beginnings for problems like lacking

experience and proficiency, the shortage of data on the population and the limited fiscal funding (Haque et al., 2020).

Lately, genomic medicine has witnessed leading attempts in building capacities and partnerships in LMICs. Mindful adoption of PM in LMICs with a cooperative, progressive designing and strategy would advance community health. For the elevated preliminary expenses, strict standards and interventions could be prioritized. For instance, they are regulating the cost of medicine to be affordable to as many people as possible. Besides, the dynamic involvement of the private sector to endorse and boost PM might alleviate this load (Haque et al., 2020).

E-Health Potentials to Advance Health Workforce

Several pieces of research have demonstrated the potential of digital technologies to enhance the health workforce all over the health system. In LMICs, digital technology can build the capacity and promote the progress of the health workforce regarding training, stimulating, guiding, following up, and paying salaries, especially the health workers in distant or rural districts. Research findings pointed out that a variety of e-Health interventions for developing the health workforce has been examined and applied, for example, for training health workers, interacting among healthcare providers, professional networking, directing, and providing performance feedback to health workers. Those are an indication of enhanced productivity and effectiveness in pilots or small-scale projects. In global health, however, there is an increasing need to go beyond small-scale projects and determine the initial and ongoing expenses of deploying and scaling-up e-Health solutions, involving the return on investment. Consequently, deciding, adapting, and executing the most promising e-Health solutions for managing and developing the health workforce (Long, Pariyo, & Kallander, 2018).

Moreover, there is a pressing demand to support progressing ahead small-scale evidently, showing which e-Health interventions to pick, adopt, and execute at a larger scale. Also, investigations are required to show how the states can improve their e-Health administration and secure the tense invasion of web and mobile technologies to advance the lives of their people. The governments should also drive both the public and private sectors' workers to fulfil substantial progress and safety by e-Health interventions through improvements in technical areas like network speed and performance, data connectivity and analytics and cloud computing to promote healthcare workers' capability and widen both access and quality of health services. Eventually, a continuous hesitation to explore such greater concerns will drive wasted chances to maximize the striking capacities of innovative technologies on the healthcare system (Long et al., 2018).

Successful Cases from the LMICs

In LMICs, implementing telemedicine is getting attention and expanding at the same time, shown by its several frameworks which are adopted and frequently led there (Lemay et al., 2012). There is a growing acquisition of telemedicine tools such as the internet, mobile phones, and various information and communication technology devices. Governments as well as developing and funding entities, have started to invest more in telemedicine. Lately, Grand Challenges Canada and the Bill and Melinda Gates Foundation have begun to fund and boost many creative proposals for telemedicine initiatives which enhance health outcomes in LMICs. Moreover, several cited telemedicine initiatives have demonstrated encouraging outcomes in perinatal care, for example in Ghana, Sony Ericsson has sponsored the Millennium Village Project; in Albania, the World Health Organization (WHO) has sponsored both Project Optimize and Program for Appropriate Technology in Health (PATH); and in Cameroon, Grand Challenges Canada has sponsored the BornFyne project (Okwen, 2019).

Furthermore, in Malawi, Airtel 321 brings data on maternal and child nutrition through mobile phones in the native language. In Tanzania, a short message service (SMS)-based application has been designed to attain the new-borns' registration procedure more robust, cost-effective, and convenient for parents. In 2016, Zipline, an interplay of high-tech start-up aircraft producer, logistics service provider, and public healthcare system experts, started utilizing aircraft to transfer medical equipment to distant health clinics in Rwanda. Zipline's collaboration with the Rwanda government has significantly minimized the need time to secure vital medical resources ('Utoikamanu, 2018).

Scaling e-Health in the LMICs

Universally, coordinated attempts for scaling and integrating e-Health could allow creative approaches for patients and the healthcare

workforce in the LMICs. Real case studies of scaling e-Health in LMICs have revealed some chief focus domains being crucial towards progress. Initially, the inherent attributes of the program or initiative need to contribute real interests and approach an unmet demand, including input from the end-user. Next, each stakeholder should be involved, qualified and encouraged to execute the novel initiative. Also, the technological form of the initiative should be simple, interoperable and flexible. Besides, the policy context where the e-Health care initiative would be deployed should follow the broader healthcare system along with sustainable funding to maintain long-term extension, including private sector funding. Sequentially, acknowledging the external environment, including the relevant infrastructure to promote adopting digital initiatives (Labrique et al., 2018).

E-Health Data Governance

Consequently, the amount of big data worldwide has dramatically grown along with the fast rise in producing and consuming e-Health. Such technical growth anticipates more potentials for data-driven and evidence-based health framework planning, control and evaluation. However, more chances to abuse such data or for data breaches to confidential individual data, particularly with the ease to access, transcript, move electronic data on automated hubs provided that missing proper controls. Eventually, in the LMICs, insecure people are more challenged in discussing digital protection and privacy. Therefore, The likely gains in improving health systems and outcomes by the e-Health context are coupled with the necessity to adopt robust data governance architectures and stressing on the ethical consumption of the gathered private data by the e-Health platforms (Tiffin, George, & LeFevre, 2019).

Furthermore, the worldwide accelerated propagation of e-Health means- including LMICs- provides much hope towards approaching significant gaps in healthcare systems. However, there is a specific duty for scientists, initiative administrators and workers to guarantee stable electronic data governance and relevant, approved utilization, there is as well a critical task on states and international parties to set and necessitate proper electronic data governance controls and balances meanwhile continuing initiatives. One governance structure for e-Health data in healthcare systems research suggests principles regarding data governance at the micro-level where communications between

subjects facilitate member safeguard by approval means and ethical commitment with private data; at the meso-level where parties like ethics review committees, donors and data access boards operate collectively to secure suitable data utilization; and at the macro-level where lawmakers and states determine how data governance need to be initiated to warrant the security of subjects (Tiffin et al., 2019).

The universal society would profit from the WHO leadership in that domain. Meanwhile, state-level attempts are undertaken to drive higher responsibility and clarity in the data governance arrangements and standards schemes supporting electronic means being executed in the healthcare sector. In India, for example, the National Health Systems Resource Centre (NHSRC) has installed a Community of Research and Practice for Digital Health that is generating unbiased criteria to evaluate electronic means for the front-line healthcare workforce, covering data governance and ethics. Moreover, south to south cooperation of chief stakeholders is on the way to spread such proposals to South Africa and stakeholders all over the neighbourhood to stimulate an evidence-based decision-making procedures for establishing the governance of scaling-up electronic means in the healthcare sector (Tiffin et al., 2019).

E-Health and the Future of Healthcare Systems

The newly industrialized countries adopted foreign technologies to refresh their economy earlier to building their proper advancements in science and technology. Meanwhile, this movement mandated a broad foundation of science-literate citizens to gain access to a trained and proficient workforce, which is vital to progressing STI. However, LMICs are challenged with the shortage of high-speed connections and difficulties in equipment. Insufficient connections hinder access to the most promising broadband applications for healthcare, education, economy and other industries, coupled with territorial and universal knowledge channels. Most LMICs cannot afford broadband internet access for everyone. Innovative technologies have extraordinary futures to make gains for advancing the society and the economy of such countries. Hence, substantial effort is needed to prepare and enable both the public and the private sectors with the facilities to achieve it ('Utoikamanu, 2018).

Regarding bold steps, in September 2017, the Technology Bank has signed the host country

agreement between Turkey and the UN to endorse LMICs in building capacities with respect to STI; nurture interior and innovative territorial contexts and homegrown R&D; enable market access and help with the shift towards proper technologies. The Technology Bank will start actions by collaborating with other agencies from the UN to plan for evaluating the baseline STI and technology needs in five LMICs—Guinea, the Sudan, Haiti, Uganda and Timor-Leste. Additionally, after the year 2002, the Technology Bank in cooperation with Research4Life, a public-private alliance, has indeed employed "digital access to research", which has been operating in at least than 100 LMICs ('Utoikamanu, 2018).

Consequently, in the LMICs, although e-Health is expected to imply a definite shift in delivering health services, there continue vital difficulties in both adoption and progress. Unfortunately, the profited ones of the status quo will oppose such reforms notwithstanding the hope of more access and quality for the patient. Technology will shift the power equilibrium between the patient and the provider, driving advances in the health workforce and the state functions. Nevertheless, the global invasion of technology will make such moves inevitable. The initiatives' administrators should apply such innovations for the public welfare and warrant that they serve all and not just the ones who can afford for the care or manage the health sector (Mitchell & Kan, 2019).

Conclusion

It is probable for LMICs to catch up with the modern developments in novel technology. Cooperation between the public and the private sectors could achieve and prove that technology is not itself a destination but a precious facilitator along the way to realizing inclusive and sustainable development for all. Ultimately, it is still pressing that the health society worldwide does not evolve mesmerized with technology as a destination itself, instead asserting that a technological breakthrough is a tool to overcome challenges, enhance healthcare, and save lives. Through acknowledging the entire possibilities of e-Health, and ensuring proper stewardship, the world can boost realizing SDG-3, Health for All.

Conflicts of Interest

The author declare no conflicts of interest.

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