Applying the Resilient Health System Framework for Universal Health Coverage

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Abstract. Since the 1978 Declaration of Alma-Ata affirming health as a fundamental human right, policy-makers and stakeholders have proposed many different strategies to achieve the goal of 'health for all'. However, globally there still remains a lack of access to health information and quality health care, especially in low- and middle-income countries (LMIC). Digital health holds great promise to improve access and quality of care. We propose using the "resilient health system framework" as a guide to scale-up digital health as a means to achieve universal health care (UHC) and health for all. This article serves as a call to action for all governments to include population-based digital health tools as a foundational element in on-going health system priorities and service delivery.

Keywords. Digital health, Universal Health Coverage, resilient health system

Introduction

The 1978 Declaration of Alma-Ata at the International Conference on Primary Health Care affirmed health as a fundamental human right [1]. In order to attain 'health for

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all', the World Health Organization has endorsed Universal Health Coverage (UHC) as the means to achieve this ideal goal [2]. UHC encompasses health promotion, education, prevention, protection, treatment and palliative care. The WHO formally defines UHC as "…ensuring that all people have access to needed promotive, preventive, curative and rehabilitative health services, of sufficient quality to be effective, while also ensuring that people do not suffer financial hardship when paying for these services" [3].

Modern information and communication technologies (ICT) hold great promise to improve access and quality of health care delivery – known variably as eHealth, mobile Health, telehealth and collectively grouped under "digital health". This article, transpired from an international collaboration between clinicians, academics, and health system and technology leaders gathered at the Global Telemedicine 2015 conference in Toronto, Canada, and proposes an evidence-informed "resilient health system framework" as a guide for policy makers to scale-up digital health in their national, regional, and global efforts to support UHC. The objective was to consider the literature to date and discuss the role of digital health as a facilitator to achieve UHC, with a particular focus on low- and middle-income countries (LMIC).

1. Sustainable Development Goals and Universal Health Coverage

The lack of access to quality care globally makes achieving UHC a tremendous challenge. Achieving equitable health for all depends on our ability to identify effective ways to improve health care access and quality, share health practices to improve global tracking of population health and manage the spread of diseases [4]. Aligning with the recently developed Sustainable Development Goals (SDG) that calls for all countries and states to ensure healthy lives and well-being for all at all ages, SDG goal #3 – "Ensure healthy lives and promote well-being for all at all ages" – directly addresses the principles of UHC.

2. Digital Health to Achieve Universal Health Coverage

Digital health – using ICT such as telephone, computers and mobile digital devices for health – represents the integration of health and information technology to create strategic value to improve access, quality and cost effectiveness for nations and their citizens, and is recognized as essential to the global attainment of UHC. In addition to supporting the values and practical delivery of UHC, digital health facilitates collaboration amongst health professionals towards patient-centred care, partnership between patients and health professionals and public engagement. As digital health continues to evolve through modern technologies and infrastructure, it strives towards attaining SDG #9 – "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation".

However, the integration of digital health in LMIC countries, regions and communities is uneven and dependent on the local needs, context, and people. While there are successful examples of digital health initiatives to support remote communities to access healthcare, scaling-up these initiatives are challenging. Using a "resilient health system framework" will facilitate the progressive and judicious

implementation of population-based digital health tools in support of health system priorities through evidence-informed and policy-supported strategies.

3. The Resilient Health System Framework in Digital Health

The components of "the resilient health system framework" (Figure 1) to scale-up digital health are based on the literature and group members' own experiences and exposure to successful digital health deployment models.
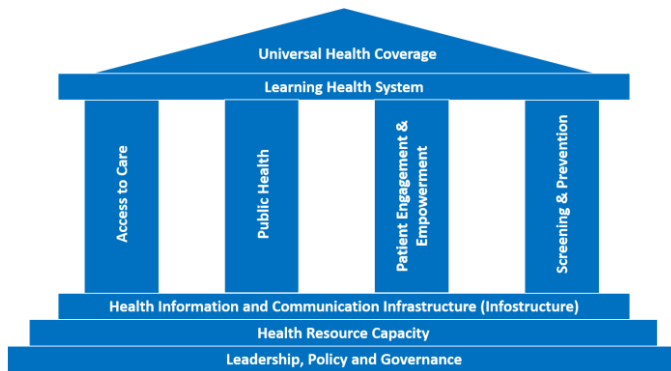

Figure 1. Framework structure

3.1. The Foundation

This framework is built on three interlocked platforms which together support the entire health care system: 1) leadership, policy and governance, 2) health resource capacity, and 3) information and communications infrastructure (infostructure).

3.1.1. Leadership, Policy and Governance

Accountable leadership, powerful policy, and effective governance are critical to achieving health equity [5]. Health governance steers the participation, performance, accountability and equity of stakeholders towards a common vision for UHC through:

- Defining the foundational components of a national digital health infrastructure, and engaging accountable and responsible stakeholders to co-create this united vision;
- Facilitating consistent access to health services from urban to rural areas, leveraging digital health tools where required;
- Improving quality of care across the healthcare continuum with improved decision support and access to health data and contextually related information for patients and care providers;
- Achieving gains in productivity and sustainability through equitable distribution of existing resources to extend the reach and capacity across communities, nations and regions with the support of ICT; and,
- Monitoring critical information to assess and continually improve health program effectiveness.

3.1.2. Health Resource Capacity

The success of digital health is contingent on establishing the necessary capacity and resources to build, use, and support access to high quality health services, and harvest useful information in the health system. The resource capacity requirements stretch beyond health professionals and technology specialists across the continuum of care to include business analysts and project managers - from health information managers to information security professionals and health network managers. There is a notable disparity in the availability, distribution, capacity and performance across the health system workforce. Countries will need to identify the range of skills, competencies and roles required at the regional, national and local levels to support a digital health ICT structure [6]. A strategic approach to build capacity should also take into consideration building human and institutional capacity, nurturing clinical and community champions, and developing the base of knowledgeable users to drive appropriate adoption of digital health in settings where care occurs.

Many countries have been taking steps in capacity building in digital health. Inter-professional residency programs and other health science communities and special interest groups leverage desktop and traditional videoconference technologies to enable learning and collaboration from all parts of the world. Conventional and online courses are offered in both European countries and North America [7] as well as in developing nations. The following is a short listing of some of these examples. Harmonization and sharing of these and other educational initiatives, and the establishment of a global directory of training facilities in Digital Health world-wide, would be worthwhile.

- The Telemedicine & Biomedical Informatics at Lucknow (India) run full time one-year diploma courses in five disciplines - Telemedicine, Hospital Information System, Nursing Informatics, Public Health Informatics and Digital Medical Library [8].
- The National Research and Education Networks (NREN) worldwide expand health resource capacities through programs such as the Academic Telehealth Community Collaborations, which bring together health scientists from a range of sub-specialties, including Science, Technology, Innovation, Education, Research, Communication, Assistance and Health Federal Authorities to discuss, finance and work together. Similar approaches are being implemented in Brazil [9] and India [10].
- The Brazilian Telemedicine University Network (RUTE) runs a three-month Capacity Program for Preceptors in inter-professional residency serving 50 institutions and 600 preceptors nationwide weekly by videoconference, yielding $3.5 million USD by averting unnecessary travel.
- The Asian eHealth Information Network [11] promotes best practice and knowledge exchange among Health Informatics Professionals through 'AeHIN Hour' webinars. AeHIN has focused on building capacity for countries to govern and manage their national eHealth programs.
- The Telemedicine Development Centre of Asia (Temdec) [12] shares leading edge medical information across Asia and Latin America, integrating the Asia Pacific Academic Network (APAN) and the Latin American Cooperation of Advanced Networks (RedClara Cooperación Latino Americana de Redes Avanzadas).
- The Government of Ethiopia launched WoredaNet in 2011 to connect 600 national agencies through [13] a national wide area network for the exchange

of video conferencing and other electronic information that can be routed locally within country. The policy, which connects a number of public hospitals and public universities, in each of the districts (woredas) across the country. One of the primary purposes of the network is to support video conferencing between government employees from the district up to the state level. One of the current uses of the network is for video conferencing to teach basic science courses for undergraduate medical education at three Ethiopian medical schools via a fourth medical school located in Addis Ababa.

The African Virtual University is an example of a multi-national collaborative. Sponsored by the African Development Bank, this innovative education institution services 57 eLearning centres in 27 African countries to provide academic programs and short courses as well as digital library resources to African students and academics. In 2014, AMREF Health Africa trained of 227 diploma-level health students including 95 nurses through eLearning across Ethiopia, Ghana, Kenya, Malawi, Nigeria, Tanzania, Uganda and Zambia [14].

3.1.3. Health Information and Communication Infrastructure (Infostructure)

The infostructure is an important instrument of policy as it operationalizes and rationalizes the design and focus of digital health investments that enable the country to achieve its health system goals and objectives, including UHC [15]. It consists of not only physical technology infrastructure, but also knowledge and insights that inform the functional design of the architecture underlying technology infrastructure. The infostructure supports health organizations and other health care partners in planning and delivering effective UHC through wise health decision-making at all levels. It encompasses the processes to manage the flow, integrity and security of health information as a strategic health system resource, and defines the architecture and standards required to enable information to be shared and technology to interoperate.

The infostructure should also connect and engage patients, families and communities by making possible the collection of and access to population-level data for health surveillance systems. In addition, the structures and terminologies are needed to enable consistent, contextualised and interoperable eLearning services and applications across settings and devices. For example, the Pan American Health Organization (PAHO) eHealth Strategy specifically addresses the need for, and quest to obtain, the standards required to ensure interoperability across organisations and countries within the region as a core requirement to build the knowledge economy and to provide the competencies needed to achieve UHC. The infostructure should also support scalability, making it possible to provide most appropriate and effective health interventions targeted to meet the needs of underserved populations as part of universal access of care. Properly architected and supported infostructure is not only more cost effective than solutions in silos, but is much more capable in leveraging new technologies in supporting emerging health care system priorities and managing costs.

3.2.   The Pillars

The pillars represent dependable health service delivery arms, which both generate and consume digital health information to meet the health needs of the population, and support the resilient health system framework in achieving UHC. These pillars include:

3.2.1. Access to Care

Digital health provides new avenues to improve access to care and enhance continuity of care. These approaches transcend geography to optimize health service delivery by improving both the quality and cost effectiveness of health care. Improving access to care includes extending its reach to all populations, accessing new information about patients and their care needs, providing additional options for health services, and enabling access to vaccines, medicines, education and training. ICT interoperability is necessary to connect disparate collections of digital data, enhance collaboration towards mutually shared health goals and priorities across stakeholders, facilitate access to services, and rapidly respond to health needs of constituencies. Interoperability also enables the collation of data from many dimensions of the health environment which allows for better decision-making and can serve as a catalyst for public-awareness and buy-in. The growing ubiquity of cellular networks when combined with applications in health opens avenues for access to care that heretofore were closed.

3.2.2. Public Health

Public health refers to all organized measures by public or private organizations to prevent disease, promote health, and prolong life among the population as a whole. As such, public health examines the total system of care and is not concerned only with the eradication of one particular disease [16]. Tracking and measuring national progress towards UHC is critical to identify, implement and realize the success of priority actions to improve population health and well-being. Digital health makes it possible to track population-based service delivery and outcome data against the Global Reference list of 100 standardized Core Health Indicators [17] prioritized by the global community to provide concise information on the health situation and trends. This effort can help identify service gaps, alleviate inequities in access of care, and illuminate resource wastage to ensure timely service, equitable social protection, and optimal health system productivity. Examples of digital health contribution to public health may include: epidemiologic surveillance of infectious diseases, specific work flows and processes, disease-focused patient registries and decision support to fight particularly prevalent or costly diseases.

3.2.3. Patient Engagement and Empowerment

Patient engagement can be defined as "actions individuals must take to obtain the greatest benefit from the health care services available to them" [18]. Digital health creates opportunities for patients to improve their own health by becoming more aware of and involved in self-care and decision-making in treatment approaches. Ideal patient engagement requires:

- Patient involvement at all levels of care, including shared leadership and decision-making;
- Communication and collaboration based on mutual respect and honest conversations leading to informed and involved care choices; and
- Valuing the experiential knowledge of patients and families and caregivers.

The key to success to patient engagement is the establishment and nurturing of a strong partnership between patients, caregivers, formal and informal care providers, health practitioners, professionals, policy makers and other health stakeholders. However, factors such as complex advice, lack of resources, poor communication and interaction, and paternalistic medicine can disengage the patient, thus limiting the achievement of effective patient engagement. Health professionals are encouraged to help patients in understanding their medical conditions. Nevertheless, the idea that doctors or health professionals know best might diminish patient's opinion about their own health, thereby leaving patients disengaged.

3.2.4. Screening and Prevention

Digital health holds significant promise for disease screening and prevention in LMIC. Benefits of digital health to support disease screening and prevention include timely access to health and patient information, early and rapid case detection, disease surveillance and population health [19]. Low-bandwidth and cost-efficient internet and mobile health solutions can assist to extend geographic access to clinical support for patients and health workers, while social media and global positioning systems (GPS) in digital communications devices can support disaster communications and crisis management [20]. Digital tools enable disease outbreaks monitoring and real-time surveillance of emerging public health threats. Technology-enabled immunization programs can support appropriate and consistent administration of vaccines, while digital systems can also assist public health providers to track the distribution and availability of vaccines in across regions. Access to electronic health records provides patient-centric information to support clinical decision making while providing data to inform both policy and health service planning. Internet connected devices can assist patients in low-income, remote environments, to send digital samples to on-line systems for immediate diagnosis and care planning [21]. Digital monitoring tools can support real-time oversight of maternal labour by obstetric care attendants, reducing the risk of complications and mortality during pregnancy and childbirth, simultaneously encouraging the development of a skilled maternal-fetal workforce in developing countries.

3.3.   The Ceiling

3.3.1. The Learning Health System

The "Learning Health System (LHS)" [22] constitutes a powerful and overarching canopy to support all aspects of UHC implementation and continuous improvement in health service delivery. The LHS paradigm denotes a health system where new insights and knowledge are continuously generated using information and evidence accumulating within the system itself. Its core driver is to strive towards delivering better, more efficient medical practices as a continuous journey of longitudinal patient care.

The foundation of a sound learning at the health system level depends on health workers on accurately recording and synthesizing patient data to guide decision support. Through continuous monitoring and effective data visualization, a sound evaluation of processes and actions can be effectively captured to support the continuous learning cycle. With the availability of trusted information to understand population characteristics, morbidity and mortality burdens, geographic variation, and strategic

resource allocation and tracking, digital health supports accountability, transparency, and ultimately the values of UHC through the dynamic process of continuous quality improvement.

Learning at the individual level must include continuous and evolving educational and training opportunities to enable ongoing absorption and implementation of quality improvement opportunities by actors themselves in the health system. The organizational culture and leadership of the LHS needs to build system-wide awareness and buy-in for on-going learning and improvement amongst all stakeholders. Technology enabled learning can support the education and experiential training of students, patients, and health sciences professionals. An effective health system infostructure should incorporate real time and asynchronous educational tools accessible via the internet to deliver cost-effective delivery of educational content, practical learning, and hands-on experiences. Examples include but not limited to telehealth-enabled simulation using trained actors as patients to provide feedback to learners, electronic medical record simulation exercises, personal health applications which support patient engagement and learning, and online educational opportunities which are able to reach vulnerable communities.

3.4. The Roof: Universal Health Coverage

All parts of this framework – from the foundation to the pillars and the ceiling - work synergistically towards supporting the roof structure. Optimizing existing ICT infrastructure and making strategic new investments in digital health solutions contribute to the acceleration of achieving UHC. The health system captures the evidence and works towards UHC through iterations in optimizing access, quality and productivity of care delivery universally. The resulting solutions will lead to innovative models from LMIC countries to high-income countries (HIC) and vice versa. Measuring UHC with ICT-enabled monitoring systems can also enhance evidence -based health policies and decision making with more reliable and sufficient data in formats and frequencies that ensure better health systems performance and prioritization of efforts [23].

Conclusion

While digital health is rapidly evolving globally, a thoughtful and cohesive strategy to guide local and global development will be essential to achieve UHC. The SDGs and their synergy towards supporting UHC in achieving health for all is a clarion call for multi-modal efforts to work towards this goal. Achieving UHC requires that we harness the data that spawns from our efforts to bring improvements in human development that are globally achievable, measureable, shareable, and replicable.

We call on nations to align digital health policy with governance that optimizes its ability to support UHC. Now more than ever, robust and resilient health systems will increasingly rely on digital health, and our neighborhoods and nations depend on interoperable and exchangeable data. We believe that this resilient health system framework, supported by digital health and information exchange, will support us on our journey towards attaining Universal Health Coverage.

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