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Digital Health

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ABSTRACT

Digital technologies are rapidly being integrated into almost every area of the healthcare industry. It is a broad umbrella term that refers to the use of digital technologies to enable universal healthcare access, improve healthcare quality, and enhance wellness. It may be regarded as the systematic application of digital technologies to support informed decision-making by individuals, the health workforce, and health institutions, in order to improve health outcomes and wellness for all. It is becoming a pervasive component of healthcare practice, with applications in almost all areas of the healthcare sector. It has attracted lots of attention in the past decade in several nations worldwide. This paper provides an introduction to digital health.

KEYWORDS: *digitalization, digital technologies, digital health, digital healthcare, digital care, digital medicine*

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INTRODUCTION

Digitization has become an integral part of everything we do. Digital technologies have transformed our lives. The digital disruption has delivered efficiency, transparency, and convenience. The convergence of technology, digitalization, additive manufacturing, artificial intelligence, and additive printing is upon us. The data-driven revolution is now transforming healthcare. It will have a huge impact on healthcare delivery and greatly improve patient experience [1].

Healthcare is a huge industry and the adoption of new technologies such as IoT and AI will transform every part of it. Digital technologies can help the healthcare industry in preventing disease, helping patients monitor and manage chronic conditions, lowering the cost of healthcare delivery, and making medicine more tailored to individual needs. Integrating technologies such as mobile phones, tablets, and sensors into health systems can save lives, extend the reach of healthcare services, reduce healthcare costs, and reduce number of visits to the physician [2]. The possibilities of using digital technology to improve healthcare are endless. Figure 1 depicts the transformation of digital health [3].

WHAT IS DIGITAL HEALTH?

Digital technologies are transforming the healthcare industry all over the world, forming a new domain known as "digital health." Digital health, or digital healthcare, is a broad term that refers to the use of emerging digital technologies such as big data and artificial intelligence in healthcare. It is variably known as telemedicine, health IT, eHealth, wireless health, and mHealth, to name a few. Its objective is to use digital technologies to improve health management for both patients and service providers. Digital health provides the opportunity to facilitate personalized medicine at affordable cost. It connects and empowers people to manage health and wellness, leveraging digital tools, technologies, and services to transform care delivery. It may be regarded as the space at the intersection of technology and healthcare. Digital health is a multi-disciplinary area involving several stakeholders such as clinicians, researchers, scientists, social sciences, engineers, decision-makers, pharmaceutical companies, health insurance companies, regulatory authorities, health system managers, data managers, and patients. It should be an integral part of national health priorities and

strategies and benefit people in a way that is ethical, safe, secure, reliable, equitable, and sustainable. It needs to be developed with principles of transparency, accessibility, scalability, replicability, interoperability, privacy, security, and confidentiality [4]. An overview of the digital healthcare landscape is shown in Figure 2 [5].

Digital technologies are a key component in digital health as enablers. Although some regard digital health as a healthcare technology including eHealth, mHealth, wearable devices, and artificial intelligence, a dominant concept in digital health seems to be mobile health (mHealth), which is related to other concepts such as telehealth, eHealth, and artificial intelligence in healthcare. Virtual healthcare technology (also known as telehealth or telemedicine) allows patients and doctors to touch base remotely through the use of video conferencing or mobile apps. The main focus of mHealth lies on wireless and mobile technologies and their use in treatment and determining health status [6].

Digital health products have become indispensable to the prevention, diagnosis, treatment, and management of health and disease. Health professionals use digital health products to gain insights on patient outcomes, conduct telehealth visits, and treat diseases that untreatable by traditional medicines. Patients are increasingly expecting healthcare on their own terms and they expect digital health to be the enabler [7].

Digital health is an emerging field of study premised on the availability of ever increasing amounts of data about people's lifestyles, habits, clinical histories, and pathophysiological characteristics. Without data and information, no digital healthcare evolutions can be realized. Real-time data collection and communication are critical to digital health initiatives. The defining feature of digital health has to do with data rather than technology. The goal of digital health therefore be described as generating a circulation of data [8].

APPLICATIONS

Digital health technologies are used in hospitals and healthcare facilities. Digital health technologies may one day potentially address some of healthcare's biggest challenges. Common applications of digital health include the following [9]:

- **Remote monitoring:** This is a digital health application where the data collected from sensors and cameras feed into EMRs/EHRs, and alert doctors of a patient's health condition before an emergency hospital visit is needed. Remote-care digital health solutions like telehealth and wearable devices are included in the new approach that healthcare professionals will be embracing as they position their businesses to best serve patients in a COVID-19 world.
- **Diagnostics:** This application is meant to improve access and availability of medical information.
- **Virtual care:** This application uses telehealth to overcome time and geography barriers in delivering healthcare services.
- **Data analytics:** This application gathers data from across the healthcare system in order to improve access, make informed decisions, and deliver best practices.
- **Personal wellness:** This may involve the use of fitness trackers and wearables for elderly to track location, detect falls, and raise alarms. Fitness trackers are used by everyone from stay-at-home parents to marathon runners. They help record the number of steps taken each day, as well as monitor sleep patterns. Figure 3 is an illustration of exercising for personal wellness [10].
- **Medical records:** Electronic health records or digital health records are the information backbone of digital health. Medical professionals would be able to base their examinations on a patient's health data and provide their diagnosis and treatment accordingly.

Some of these application areas are illustrated in Figure 4 [11]. Other applications of digital health include rheumatology care and digital care management.

BENEFITS

Digital health offers tremendous benefits in healthcare industry. Digital health tools have enormous potential to improve health and the effectiveness of healthcare delivery. They can significantly improve healthcare outcomes and global health equity. They also play an essential role in optimizing healthcare facilities, enhancing the patient experience. Other benefits of digital health include the following [12,13]:

- **Cost:** The goal of digital health is reducing costs while still improving quality of care. Digital health makes quality healthcare affordable in rural or hard-to-reach areas.
- **Empowering patients:** Digital health improves the patient experience and allows the patient to perform their exercises whenever and wherever they want. Digital health technologies assist patients self-manage their health conditions through regular monitoring and tracking.

- **Better patience outcomes:** Some healthcare practitioners believe that adopting digital health tools (including telemedicine/telehealth, remote monitoring, mobile health apps, and wearables) will help them improve their ability to care for their patients.
- **Building the workforce:** This requires educational frameworks and curricula to place an emphasis on interdisciplinary learning. Capacity building, development of digital literacy, and education in digital health will ensure that digital health tools are used correctly and competently in practice.
- **Opportunities for youths:** It is important for youth to meaningfully participate and engage in decision-making processes and gain practical experiences.
- **Digital ethics:** Training in digital ethics and the responsible use of information/data will help safeguard against potential future inequities.

CHALLENGES

As healthcare industry struggles with many challenges such as unsustainability, a shortage of medical professionals, and a highly regulated environment. Connectivity is a big issue for applying some of the digital health solutions. Other challenges include [14-16]:

- **Data Security:** Most of the debate about data usage for health purposes has focused on security and privacy The implementation of digital health solutions relies heavily on large data sets. Healthcare professionals can use this data to make more data-driven decisions about patient care. Data is always held on the respective home servers. This method allows for a high degree of data security and data sovereignty.
- **Interoperability:** A big challenge for using digital health tools is that they do not connect with each other. Data collection should be standardized to enable interoperability between devices. At the moment, interoperability seems to be largely unattainable. Data collection should be standardized to enable interoperability between devices. At the moment, interoperability seems to be largely unattainable.
- **Lack of standardization:** Not having common standards across medical services and healthcare providers has created plenty of applications based on numerous, varying, standards.
- **Integration:** Integration of new technologies is very important. Seamless technology integration is key to delivering the type of predictive and preventative experiences through digital health.
- **Trust:** Public trust in health data usage is of paramount importance. Providing trust is crucial in a newly emerging technology. We must make sure that the digital health tools are worthy of placing our trust in. Unauthorized persons should not be allowed to use patient's data without approval or informed consent of the patient.
- **Shortage of workers:** Adequately trained healthcare workers are in limited supply, stressing physicians, patients, payers, and providers. The needs-based shortage of healthcare workers globally is estimated to be about 17.4 million.

Without addressing these challenges, the future potential of digital health remains limited.

CONCLUSION

Digital health encompasses various terms including e-health, m-health, and telehealth. It captures everything from electronic patient records, remote monitoring, connected devices, diagnostics, and virtual care. The universe of digital health is rapidly expanding in size and capabilities. Digital health is now emerging in health systems, building on the strengths of the eHealth era. Leveraging digital technologies to transform care delivery is the promise of digital health. Digital health technologies can achieve transformed care, whereby individuals are empowered, connected and informed, and care delivery prioritizes health and wellness [17]. In spite of the considerable progress made by some nations, many nations still require institutional support for the implementation of digital health strategies.

Digital health is no longer just the bread and butter of science fiction movies. It is key for the future and wearables will play the leading role in the future of digital health. Patient access to the healthcare system will be personalized in the future since digital technology has the potential to deliver more personalized health experiences [18]. More information about digital health can be found in the books in [19-21] and the following related journals:

- Digital Health
- Human Resources for Health
- The Lancet Digital Health
- npj Digital Medicine
- digitalhealth

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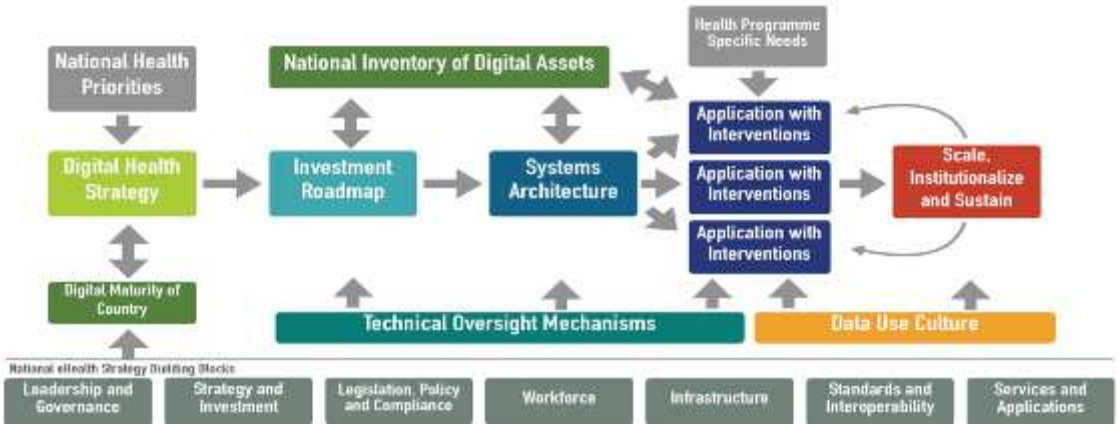

Figure 1 The transformation of digital health [3].

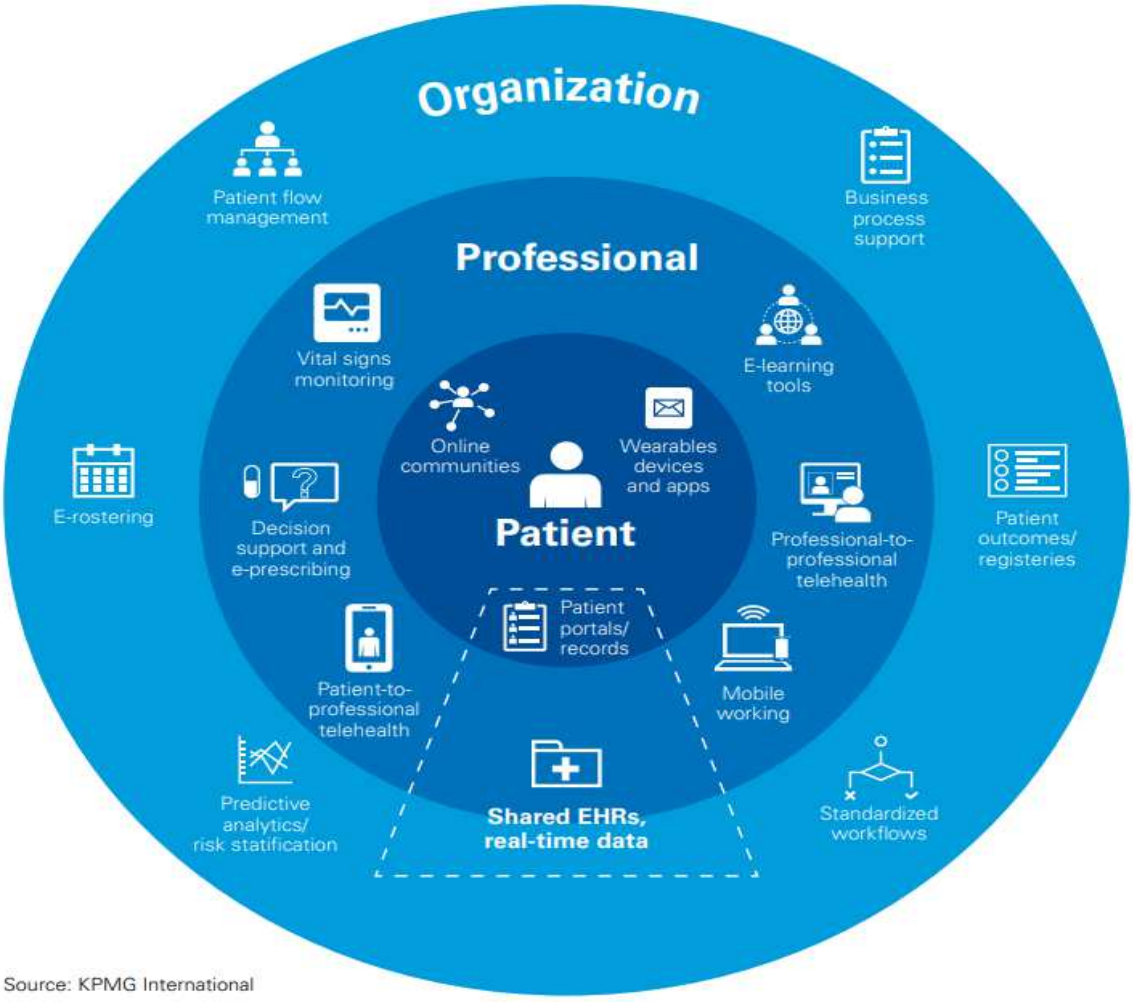

Figure 2 An overview of the digital healthcare landscape [5].

Figure 3 An illustration of personal wellness [10].

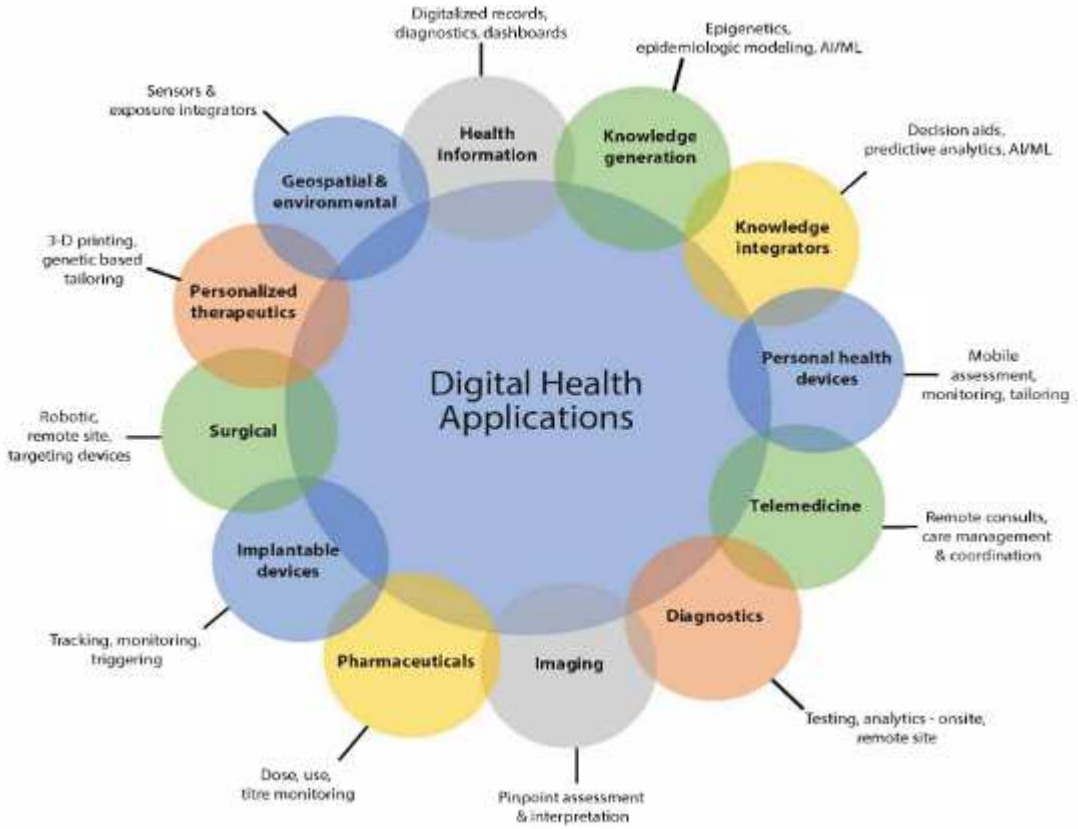

Figure 4 Some digital health application areas [11].