

Digitalization of care for chronic diseases with a focus on Diabetes: Ethical issues and concerns

Swateja Nimkar¹, Catherine Jones², Varuna Dhanabal³, Macie Martin⁴

¹Associate Professor of Health Services, University of Southern Indiana, 8600 University Boulevard, Evansville, USA (Correspondence Address).

²Director of Planning and Community Development, Generations Area 13 Agency on Aging and Disability.

³Pre-Medical/Public Health Student, University of Southern Indiana.

⁴Chronic Disease Self-Management Program Leader/Health Services Student, University of Southern Indiana.

Corresponding Author: Swateja Nimkar

E-mail: snimkar@usi.edu

ABSTRACT

This article discusses the global shift from in-person healthcare for diabetes and other chronic conditions to digitalization of health services because of the COVID-19 pandemic. It highlights the ethical issues associated with digitalization and how that might affect healthcare utilization. It also addresses the increasing need for digital healthcare, currently used applications, cybersecurity and insurance coverage concerns, continuity of care, patient and provider preferences, and gaps in the availability and accessibility of digital services.

Key words: digital health services, diabetes management, ethical issues.

Introduction

The impact of the COVID-19 pandemic has been monumental, and the domino effects resulted in grave issues in many areas of global healthcare. Under-utilization of healthcare services and inefficiencies in the accessibility of these services are important to maintain continuity of care in chronic diseases. We are primarily focusing on diabetes as it is a top global health concern and is often accompanied by other chronic conditions [1]. Unfortunately, medication prescribing and wellness checks for diabetes patients have significantly decreased in the past two years, and gaps between economically developed and developing countries raise concerns for the future of global healthcare [2]. One of the proposed solutions for this problem is digitalization including telemedicine, eHealth, mHealth, and other digital health programs.

Although the United States (U.S.) healthcare system has been using electronic services for managing chronic conditions, the COVID-19 challenges provided a new impetus to digitalization by compelling organizations and patients into using telemonitoring, virtual physician visits, online health promotion, mobile health, and artificial intelligence for diagnosis and disease management. The United Kingdom witnessed significantly reduced rates of diabetes checks and prescriptions during the lockdown and post-lockdown periods, with the highest reduction observed in older patients and marginalized individuals with Type II diabetes [3]. Nations like India quickly turned to telehealth to maintain continuity of care, assessing glucose control, remote monitoring of patient wellness and medication, along with social media usage to make up for limited telehealth resources [4]. In the Western Pacific, Australia has developed “MyDesmond” and “Type 2 and Me,” two

government sponsored, interactive e-learning platforms for self-management and education of diabetes [5]. However, Africa's sub-Saharan region is experiencing implementation challenges such as limited political support, lack of technology, and low health insurance coverage posing more barriers than facilitators for telehealth [6].

Health promotion and patient education services are critical to manage chronic disease symptoms and to prevent exacerbation between physician visits. The importance of self-management is more apparent when there is a disruption or delay in care due to unprecedented lockdowns, pandemic-induced restrictions and fear, and clinician and service shortages [3-4]. Evidence-based self-management programs empower patients to take charge of their health in between their physician visits, and some even offer virtual versions using video conferencing technology, email, and other platforms discussed in detail in the self-management and patient education section of this article. There is limited research addressing how ethical issues might impact these programs as the use of virtual versions has increased during the pandemic.

Table 1 (attached) displays global diabetes prevalence by region, corresponding comorbidities, and telehealth solutions implemented to tackle the global epidemic of diabetes [2]. Among specific digital services used, chatbots, email, telemonitoring, video consultations, social media applications, and online disease management programs are prominent and extensively used examples in healthcare [7-8].

Table 1. Global Comparison of Diabetes (T2D) Rates, Comorbidities, and Digital Health Applications

Global Region	Total Diabetes Patient Count in 2021	Most Common Comorbidities with Diabetes	Digital Services Offered for Diabetes and Related Chronic Diseases
Europe	61 million	Hypertension, hyperlipidemia	Dexcom G6 Continuous Glucose Monitoring Systems (CGM), Online health promotion programs
North America and Caribbean	51 million	Major Cardiovascular Disease (CVD), Kidney Disease, Diabetic Ketoacidosis	Dexcom G6 CGM System (USA) Tandem Diabetes (USA), telehealth devices, Online health promotion programs
Western Pacific (includes Australia, East Asia)	206 million	Obesity, hypoglycemia	Type 2 and Me, MyDesmond, Teleconsultations, Email
Southeast Asia	90 million	Hypertension, obesity, CVD	Chatbots, messaging and smartphone applications
Africa/ Middle East	97 million	Chronic kidney disease, CVD, stroke, coronary artery disease	SMS messaging, educational email, telephone consultations

Digital Health Services: Definitions, Applications, and Scope

Terms such as eHealth, mHealth and telemedicine are often used interchangeably but serve different purposes in digital healthcare. The World Health Organization (WHO) describes eHealth as a “cost-effective and secure use of information and communication technologies (ICT) in support of health and health-related fields” [9]. Mobile health, or mHealth, refers to applications using mobile phone technology for remote patient monitoring and real-time symptom tracking in digital health practices, acting as a useful tool that has gained attraction during the pandemic [10].

Any remote or long-distance doctor-patient interaction functions as telemedicine practice, which also falls under the umbrella of *telehealth*, which broadly describes all areas of nonclinical and clinical practices in healthcare research, education, and promotion.

The rise of teleconsultations and online disease management programs during COVID-19 has allowed for continuity of care for chronic diseases during the pandemic [11]. Additional global examples include MOOCs (Massive Open Online Courses) that teach self-management with additional telemonitoring diabetes tools such as Dexcom [12-13]. Southeast Asia has several programs for endocrinologic therapeutic advancements of diabetes treatment such as Diabetes Telemanagement System (DTMS) and FreeStyle Libre since 2015 for glucose monitoring [14].

With rapid advancements in telehealth services during the pandemic, reassessment of current digital technologies required observation of more recent studies of digital health applications for diabetes and other chronic diseases. Addressing beyond the telemonitoring, services such as DIABETe, an emerging form of “telemedicine 2.0” involve real-time synchronization with a patient’s health status to generate artificial intelligence (AI) alerts [15]. Current tablet technology and Wi-Fi usage is required for AI projects to provide non-invasive medical sensors and services to remotely track patient comorbidities and provide relevant educational tools for their well-being. Machine learning, as a subset advancement of AI, is also under consideration for risk management to detect risk factors and genomic data regarding chronic diseases and comorbidities such as diabetes, retinopathy, kidney disease through eHealth records and self-programming algorithms that have major potential for diagnostic and monitoring tools [16].

Digital Health Programs for Self-Management and Patient Education

After diagnosis of chronic diseases such as diabetes, it is beneficial for patients to be referred to an evidence-based self-management program focusing on symptom management and improved quality of life. Patient outcomes could be significantly improved by learning and applying health promotion skills such as increasing physical activity, getting better sleep and nutrition, and managing difficult emotions. One such health program is the Chronic Disease Self-Management Program (CDSMP). It was primarily offered as an in-person class that taught participants how to live a healthy life while managing their chronic conditions such as diabetes, arthritis, pain, heart disease, etc [17]. The CDSMP complements clinical treatments and encourages patients to truly partner with their physicians to maintain positive health outcomes. It focuses on lifestyle factors, increasing patients’ self-efficacy, medication adherence, improving patient-provider communication, using peer support and public health resources [17]. During the pandemic, in-person CDSMP classes were not possible, which led to virtual CDSMP. This transition was successfully implemented in many parts of the US and the continuity in services was made possible by the virtual version with improved access by overcoming geographical limitations.

As part of a Geriatrics Workforce Enhancement Program (GWEP) funded by the U.S. Health Resources and Services Administration, our team is offering a virtual version of CDSMP in twelve rural counties of the Midwestern US region targeting chronic disease patients referred from partnering clinics as well as self-referrals from the community, with a special focus on diabetes. The method involves providing an at-home toolkit for participants for accessibility to live, weekly video-conferencing sessions, a chronic disease handbook, additional telephonic support for diabetics, and peer support. To overcome some of the technology barriers, we offered patients the equipment and training needed to participate in virtual CDSMP. The advantages of virtual programming are long-term cost savings, convenience, the ability to provide care to those who have mobility limitations and those who live in rural areas, increase productive time spent with participants, and variability in program delivery.

Even prior to the pandemic, tele-CDSMP usage in rural communities had already proven its promising efficacy in the North American region. An experimental study of rural Northern Ontario communities revealed efficacy and flexibility for patients, stronger leadership, and improved group dynamics using the Stanford Tele-CDSMP six-week program for a patient population of approximately 40,000 [18]. However, this shift in the program delivery does not come without barriers. One of the drawbacks of digital health services is access to technology when participants are unable to receive a stable Internet or phone connection or face transportation

difficulties to a telehealth site. Important qualitative results of the study were the willingness to engage with the telehealth services that CDSMP provided, and the long-term connection with class peers after the program to maintain motivations of health maintenance and social dynamics during periods of physical isolation [18].

To encourage referrals and participation in self-management programs, relational databases could be set up between electronic medical records and local resources who offer these programs. Patient portals could be used for automatic relay of messages as new resources become available or for reminders about resources or programs tied to the diagnosis, age, or other demographic just as they do for appointments and medication refills. This can be particularly beneficial since individuals are often overwhelmed when first diagnosed with chronic conditions and need reliable and valid information on managing their conditions.

The operational and clinical barriers that are typically associated with clinic visits are reduced when health services are offered digitally and majority of the world's health organizations are already developing or implementing some form of digital healthcare [9,11,15]. Long wait times and patients' lack of participation in preventive care such as screenings were both significantly improved by telemedicine, as shown in an effectiveness study for digital screenings in patients at risk for diabetes induced retinopathy [19].

Ethical Issues in Digital Health Services

As a result of the pandemic, digital health has earned an irrefutable place in today's healthcare. The appeal of digital services for chronic disease and diabetes management is all too exciting with its reliability and cost-efficient implications. However, the weight of healthcare ethics and technological inadequacies must be addressed prior to implementing these services in mainstream global healthcare. Accessibility for underserved populations remains a debatable issue. It is ironic that digital health services seem to improve access but only for those who have stable access to the right technology.

Furthermore, the dynamic of patient-provider interaction is vital for high-quality care. While digital interactions have been able to facilitate care, the legal and ethical uncertainty of digital service protocols poses an obstacle for both clinical and non-clinical services. Although the U.S. healthcare system is at the forefront of digital healthcare, it has faced several core issues making it challenging to implement digital services effectively and uniformly. Varying regulatory policies for patient privacy across states, lack of uniform insurance coverage policies for digital services, issues of confidentiality, informed consent, data security, and physician liability are also barriers to effective digitalization of healthcare [20]. In Europe, some of these issues have been ensured through uniform regulation of the General Data Protection Regulation for personal data management, serving as a model for other nations [21].

The ability and preferences of users to adapt to the digital environment, resistance to change, and maintaining the emotional and cultural awareness about the patient from a distance are natural barriers to the widespread adoption of digital health services in chronic diseases [22-23]. From the health professional's perspective, inadequate digital training, long-term stability of provider-patient relationships, and threats to patient privacy and traditional patient care are barriers to the efficiency of digital healthcare [20,23]. A long-term patient-provider relationship is important in chronic disease management and such a relationship is based on trust and mutual responsibility. These values are best cultivated when people stand face to face, engage in eye contact, and feel the presence of another human being instead of a machine. Digital health services certainly provide several advantages as mentioned in the earlier sections. However, knowing that excessive reliance on virtual health services and artificial intelligence could be depersonalizing [24], health professionals and patients must make conscious efforts to overcome this challenge to truly reap the benefits of digital healthcare without compromising quality and access.

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