

Mini Review

Teledentistry and Digital Therapeutics (DTx) for dentistry

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Introduction

Due to the global pandemic spread of COVID-19, the medical field has experienced many changes [1]. One of the main changes is the attention to Telemedicine (Digital Medicine), which is a part of Digital Health. The combination of ‘Digital’ and ‘Dentistry’ can be awkward because dental treatment is often conducted face-to-face with clinical treatment, but it is planned to proceed with the inevitable flow of the times [2,3]. In addition, Digital therapeutics (DTx), a part of digital dentistry, is a narrower concept and has an evidence-based effect on diseases. This article contains opinions on the concept and current status of Teledentistry and the application of DTx [4].

In the case of the existing digital health, it has been introduced as a concept for personal health management and has received steady development and attention. However, the demand and development of digital medicine that is one step higher than this low-level medicine did not grow rapidly. However, the demand for telemedicine has increased due to the development of technologies such as artificial intelligence (AI), Internet of Things (IoT), Virtual reality (VR) and Augmented reality (AR) along with the spread of smartphones [5,6]. Currently, the development of telemedicine and digital medicine is progressing mainly in the United States and Europe [7]. In the case of dental treatment, because of the face-to-face treatment environment, the concept of digital medicine was slow to change in dentistry, and many dentists had difficulty adapting. However, amid the COVID-19 pandemic, the demand for digital medicine and digital dentistry has exploded. In addition, an environment for implementing many uses was prepared. In the case of digital therapeutics (DTx), it is a concept applied to digital medicine or digital dentistry of a slightly narrower concept. It is therapeutic that is involved in the diagnosis, management, and treatment of specific diseases. Characteristically, unlike the previous concepts, it must be proven to have an Evidence-based effect. Most of them are also software-based.

Digital health

Looking at the concept of digital health announced

More Information

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Submitted: July 21, 2022

Approved: August 04, 2022

Published: August 05, 2022

How to cite this article: Park SY. Teledentistry and Digital Therapeutics (DTx) for dentistry. J Clin Adv Dent. 2022; 6: 028-030.

DOI: 10.29328/journal.jcad.1001029

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by the FDA in 2020, ‘The broad scope of digital health includes categories such as mobile health (mHealth), health information technology (IT), wearable devices, telehealth and telemedicine and personalized medicine. Is defined as Digital health. Digital health is a broad concept and it can be seen as the use of digital technology for the purpose of improving patient health [8,9].

Digital medicine

A broader definition of digital medicine is a field that is concerned with the use of technologies for measurement and intervention in the context of human health. As hardware and software using digital technology, it is aimed at individual treatment, recovery, disease prevention, and health promotion. In the case of digital medicine, it can be used independently or in combination with existing treatment techniques [8,10].

Digital therapeutics

The definition of digital therapeutics can be “Digital therapeutics, a subset of digital health, are evidence-based therapeutic interventions driven by high-quality software programs to prevent, manage, or treat a medical disorder or disease” [11].

Digital therapeutics are evidenced-based, and most of them are based on behavioral correction or cognitive behavioral therapy [12]. This personal data is re-analyzed and becomes the basis for providing personalized medical care. Currently, development is actively underway in hypertension [12,13,14,15], diabetes [16], angina [17], Alzheimer’s [18],

insomnia, attention deficit hyperactivity disorder (ADHD), and psychiatric disorders (depression, anxiety, abuse) [11,17, 19,20] Figure 1.

Among the licensed cases of digital therapy devices, the first FDA-approved digital therapy is reSET® (Pear Therapeutics Inc., Boston, USA) for the treatment of drug addiction. It was created to treat addiction to drugs such as alcohol and cocaine and was the world's first digital therapy to be approved by the FDA in September 2017. For drug addiction treatment, the doctor prescribes reSET® to the patient, and the patient downloads a software application to input data and receive cognitive behavioral therapy. It is an example designed to fulfill the purpose and function of a typical digital therapist.

However, in the case of the current digital therapy, treatment is based on behavioral correction and monitoring. In the case of treatments that require practical and physical intervention, there is still a limit to substituting the treatment performed by the doctor at the clinic. It can be seen that there is a limit in terms of the protection of its own data so far.

Teledentistry and digital therapeutics in the dental system

Teledentistry can be developed in a way that helps to exist dental and oral diseases [2]. The first application is the remote monitoring function. In the case of the oral cavity, it has the advantage of being a part that can be accessed directly, so monitoring using a device is relatively simple. Typically, dental services can be effectively provided to patients living in rural areas. Detecting disease through early monitoring has the advantage of reducing the patient's risk and at the same time reducing the cost. Among many studies, the function of early detection of dental caries [21], periodontitis [22] and oral

cancer [23,24], using a smartphone camera is being studied. It is expected to support many parts and exert an effect with the advantage of not having to contact with the mask off in an environment that needs to reduce human-to-human contact such as COVID-19.

The second is the use of digital therapeutics that can provide behavioral correction and cognitive behavioral therapy for patients in need of treatment [25]. Many programs have been launched to improve oral hygiene by basically explaining tooth brushing and continuously evaluating its performance [26]. In addition, the introduction of digital therapeutics through cognitive behavioral therapy for pain and functional limitation or to correct bad habits in TMD patients will have an impact on areas that cannot be solved by existing medical care [4]. It is also thought to be able to function in many rehabilitation treatments, especially in the areas of simple hygiene management after various surgeries in the oral area, to assist in continuous rehabilitation treatment in the pronunciation and swallowing areas after oral cancer.

Third, medical practice using this technology is effective for data collection for future research purposes, and AI learning or cloud-based data integration can provide personalized medical care based on more accurate research [27,28].

The following forecasts should be carried out within the correct regulations and accurate research results and guidelines. Although organizations such as the USFDA have issued guidelines until recently, the pace of technological advances and unpredictable cases occur in situations such as a pandemic [29]. It should be used within the right standards and regulations that anyone can agree to in the medical field that needs to be approached conservatively.

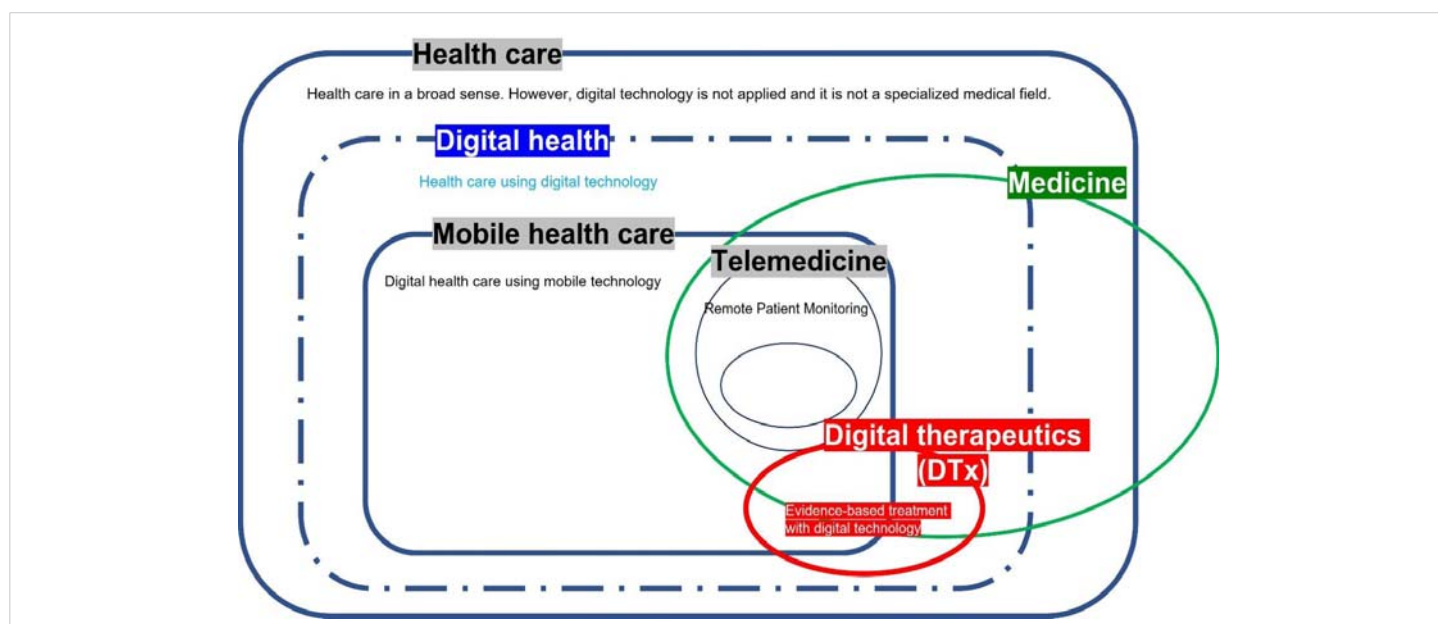


Figure 1: Digital health and Digital therapeutics relationship.

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