Digital Therapeutics from Data Analytics and Information Security Perspectives

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Abstract

As chronic diseases increase due to aging, digital therapeutics have been created to address unmet demand due to increased social burdens such as health insurance finances and medical accessibility problems. The digital therapeutics are a sub-concept included in digital healthcare, an industrial area that manages personal health and diseases by incorporating ICT technology into the medical service field. Among digital healthcare technologies, digital therapeutics that can prevent, manage, and treat diseases, not just health care, are expected to play a vital role in future health care services. However, many people still have low conceptual awareness of digital treatments, so very few people use them. Therefore, this paper describes methods for increasing the conceptual awareness of digital treatments and spreading digital therapeutics regarding data analytics and information security. Accurate data analysis is an essential element in all processes of the design, development, and application of digital therapeutics. In addition, a strict response strategy to cyber threats is needed because personal data is used for analysis. Consequently, it is recommended to develop educational programs for students, teachers, and the public and provide materials necessary for education to make digital therapeutics known to many people. In addition, it is urgent to establish an environment where digital treatments can be used safely by activating the MyHealthway platform based on MyData and establishing a security model suitable for digital therapeutics. These methods will provide an opportunity for people needing digital treatments to access them.
Keywords: Digital Therapeutics, Data Analytics, Information Security, Korean MyData, MyHealthway, Information Education.

1. Introduction

With the development of digital-based information technology, digital transformation is taking place across all industries. Among many sectors, digital innovation in the medical field has recently been in the spotlight. Scientific American and the World Economic Forum (WEF), the leading popular science magazines, have selected digital therapeutics as one of the top 10 promising technologies in 2020. The other one is a hypothetical patient (WEF, 2020). In addition, McKinsey Global Research Institute, a think tank for McKinsey & Company, a global management consulting firm, has selected and announced digital therapeutics as one of the ten technologies that can have a meaningful impact on human health by 2040(Remes, J. et al., 2020). In line with the global trend, Korea is also paying attention to digital therapeutics. The Korea Health Industry Development Institute cited digital therapeutics as one of the top 10 technology trends in healthcare in 2021(Korea Health Industry Development Institute, 2021). Digital therapeutics are now being evaluated as future technologies that will bring innovations in the healthcare sector globally (WEF, 2020; Remes, J. et al., 2020). In the future, it seems impossible to explain medicine and the future of humanity without digital therapeutics. However, despite the importance and necessity of digital treatments, it has been found that many Koreans have low awareness of digital therapeutics. Shin, J. et al.,(2021) surveyed 500 adult men and women in Korea on recognizing digital therapeutics, and 83% of them said they were not familiar with them(Shin, J.et al., 2021). Therefore, in this paper, we proposed plans to inform the public about digital therapeutics technology from data analysis and information security perspectives.

2. Literature Review

2.1. Digital Therapeutics

In 2010, Welldoc, an American diabetes management service company, launched the type 2 diabetes management mobile app BlueStar and used the name Digital Therapeutics for commercial purposes. In the academic field, Digital Therapeutics began to be used in 2015 in a paper that published the results of two-year follow-up observations on subjects of previous studies of Internet-based diabetes prevention programs. Digital therapeutics were defined as Evidence-Based Treatment (EBT) provided online, and the method or form of delivery was limited to the Internet (Sepah, S. et al., 2015). In 2017, the app for drug addiction treatment, reSET, was approved by the FDA at Pear Therapeutics. As a result, various institutions and the medical community began to pay attention to digital therapeutics. As research and development on digital therapeutics start in earnest, it is expected to lead to a significant change in the paradigm of the existing pharmaceutical industry. Compared to existing drugs, digital therapeutics have lower development costs and shorter development periods.

2.2. Big Data and Digital Therapeutics

Digital therapeutics are created by analyzing data. They are improved and treat patients using analyzed data. This technology refers to software that changes a patient's behavior or lifestyle with a series of digital stimuli such as images and sounds and collects and analyzes the data obtained as a result (Lee, U. et al., 2022). Representative examples include therapeutic apps combined with medicines or medical devices or independently, VR, and treatment using artificial intelligence. Digital therapeutics are developed to process Personal Health Record

(PHR) with artificial intelligence technology to provide personalized services optimized for individuals. PHR encompasses Gene Data, genetic data generated by genetic analysis institutions, EMR Data, medical treatment, examination, and imaging devices generated by medical institutions, and Lifelog Data generated by smartphones and wearable devices. In addition, health data are largely divided into myData, including PHR, and healthcare big data, including public data, Institutional Review Board (IRB), and Common Data Model (CDM) based on electronic medical records of medical institutions. Fig. 1 shows the procedure for personalized treatment by enabling disease prediction, prevention, through machine learning and artificial intelligence based on big data.
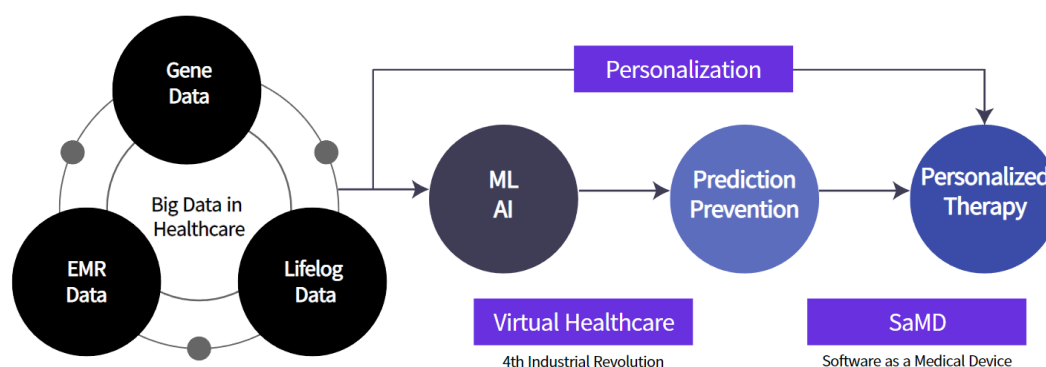
Fig. 1; Personalized Treatment Process through Data Analysis

However, there is always a risk that bio-information, including individual disease information and physical information, will be exposed and abused in utilizing big data of medical information. Medical information is sensitive personal information, and various security threats exist in storing, analyzing, and processing the collected information, so thorough analysis and response are required. For example, sharing medical records can be leaked during transmission, and even in authentication between shared domains, it is necessary to prepare for security threats such as unauthorized users' access to data and systems.

3. Measures to Raise Awareness of Digital Therapeutics Concepts
3.1. Development of Digital Therapeutics Education Programs and Textbooks

Various forms of education can be conducted to inform the general public of the concepts and application cases of digital treatments. There are various types of education, such as education focused on the principle of digital treatments for students, training for teachers, and education forums for adults. It is desirable to teach students basic principles for digital treatments such as Brain Computer Interface (BCI) and Virtual Reality Exposure Therapy (VRET) and provide information for future career choices. In addition, a gamification technique that incorporates games into education can be applied to increase learning immersion. In training for teachers, various class materials should be provided to students to take classes related to digital treatments. Fig. 2 shows teaching materials and textbooks developed for teachers (Choi, E. et al., 2021). Educational forums for the public invite domestic and foreign speakers to broaden their horizons according to the public's characteristics and understanding of digital therapeutics. In this case, citing various cases or

showing already developed digital therapeutic devices may also help improve their understanding.

Fig. 2; Teaching Materials and Textbooks

3.2. Revitalization of Digital Therapeutics through Korean MyData

The importance of data is growing to the point where it is called the second oil. Accordingly, as data's social and economic value increases, the Korean government launched the MyData policy in 2021 to strengthen the rights of individuals who are the subject of data and revitalize the data economy. MyData is the data subject's right to determine self-information, and individuals have control over the use and management of personal data. In addition, the EU implemented the GDPR in 2018 to protect citizens' personal information, strengthen individual information rights, and revitalize the digital economy. Moreover, In 2011, the UK implemented the Midata program, a policy that digitizes and provides personal information held by companies, and mandated the open banking 1 policy. Currently, Korea's MyData is expanding throughout various industries such as medical, transportation, and education, focusing on the financial sector in the early days of its introduction (Park, J. et al., 2021). MyData's use in the medical field is based on the My Healthway platform. This platform is a system that allows individuals to collect their health information in one place, provide data to the desired target, and use it directly. If My Healthway is implemented in earnest based on MyData soon, the general public is expected to take the lead in using digital treatments.

3.3. Securing the Safety of Digital Therapeutics Using Rigid Information Security Policy

As medical care became digital, the threat of cyberattacks was inevitable. For example, drug injection devices inserted into the body may malfunction due to attacks such as spoofing, and cyber attacks that remotely control artificial heartbeats can also be expected. The Korean government has expanded the information and communication network connection device defined in the Information and Communication Network Act to medical fields. It responds to the digitalized society by reorganizing the existing IoT security certification system into information protection certification. In addition, it will open a 'security living lab' that conducts security checks before launching products in the digital healthcare field. The US FDA also requires all medical device companies to identify and mitigate cybersecurity risks

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[1]Open banking: A business model that uses the Application Programming Interface (API) to share financial data between different parties.

as part of premarket submissions. In addition, leading countries of digital therapeutics provide cybersecurity guides after selling medical devices. They commonly recommend processes such as Monitoring, Update development, Information sharing, and End of Support (Bang, J. et al., 2020). In digital therapy, cyberattacks are at significant risk enough to threaten human lives, so a rigorous information security model is needed. If the safety of digital treatments is verified based on these models, more people can use digital therapeutics.

4. Conclusion

The digital therapeutics are new academic fields that entered the early stages of research. And it is highly likely to develop soon. The future cannot be discussed without digital healthcare in the medical and pharmaceutical fields. However, despite this innovative technology, many people are unaware of it. This paper proposes ways to make digital treatments known to many people and revitalize the market from a data analysis and cybersecurity perspective. Developing education programs related to digital treatments will improve the awareness of many people. Additionally, if the MyHealthway platform based on MyData is actively utilized and a strict information security model is established, more people will be able to access digital treatments in a safer environment.

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