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Editorial

Digital therapeutics in pain medicine

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In this issue of the Korean Journal of Pain, Joo et al. [1] reports a study on the effects of a virtual reality (VR) program on procedure-related pain in patients undergoing fluoroscopy-guided lumbar sympathetic ganglion block. In this study, the VR program provided an additional analgesic effect in combination with local anesthetic infiltration as well as an anxiolytic effect. This non-pharmacologic intervention is expected to be a useful adjunctive treatment for painful interventions, without serious complications.

To the best of my knowledge, the first application of VR technology in pain medicine might be SpiderWorld, a VR program for adjunctive analgesia during burn wound care, employed by Hoffman et al. [2]. Since then, the therapeutic effects of VR have been reported not only in patients with acute pain but also in patients with chronic pain such as fibromyalgia or headache [3]. Currently, several digital healthcare companies are trying to prove the therapeutic effect of VR programs and commercialize them in pain medicine. Firsthand technology Inc., founded by Hoffmann et al., has mainly explored the effects of VR programs, such as SnowWorld, in patients with acute and chronic pain [4]. AppliedVR Inc., another promising company in this field, has explored the efficacy of VR programs in acute postoperative and chronic pain [5].

However, medical applications of digital technologies are not limited to VR alone. The medical application of software programs or digital devices is being accepted as a new therapeutic modality, called digital therapeutics (DTx), with the accumulation of evidence of their effectiveness in medicine. The Digital Therapeutics Alliance defines DTx as "evidence-based therapeutic interventions driven by high-quality software programs to prevent, manage, or treat a medical disorder or disease" [6]. DTx belongs to contemporary digital healthcare and includes medical devices that focus primarily on the prevention, treatment, and management of diseases. It includes a variety of software programs, such as mobile applications, games, and chatbots, as well as VR. The first DTx application approved by the Food and Drug Administration (FDA) was reSET®, a cognitive behavioral therapy for substance use disorder using a smartphone application [6]. It was developed by Pear Therapeutics and released in November 2018 in partnership with Sandoz, a division of the Novartis group. Subsequently, reSET-O®, a smartphone application for opioid use disorder, was released in the market by Pear Therapeutics in December 2018, after obtaining FDA approval [6]. In a recent retrospective claims-based study, the

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use of the reSET-O® application was significantly associated with a decrease in medical costs [7]. In Korea, "Nunap vision," a software-based post-stroke rehabilitation program for visual field defects, was the first DTx application approved by the Ministry of Food and Drug Safety of Korea [8]. Currently, the development of DTx and its validation studies are being conducted in various medical fields [6].

DTx can be useful in various ways in pain medicine. First, DTx can enable collection of real-time pain data, which could provide valuable information to physicians as well as patients. A recent study in Korean fibromyalgia patients evaluated the effects of a real-time pain monitoring system using a wearable device [9]. In particular, rapid advances in wearable device technology will accelerate its implementation [10]. Real-time pain data can be continuously monitored using wearable devices and transferred to wirelessly connected databases [10]. A recent pilot study showed the feasibility of a real-time pain assessment tool using a commercialized smartwatch (Galaxy Gear S3, Samsung Electronics Co, Ltd. Suwon, Korea) in elderly patients [11]. This database could be an important source for big data science in pain medicine [12]. Second, DTx can enable patients to more effectively correct their lifestyle modifications related to chronic pain. The importance of lifestyle factors in the development and sustenance of chronic pain diseases as well as other chronic diseases [13] is often overlooked. Kaia Health, which focuses primarily on musculoskeletal disorders, has reported the effectiveness of their exercise program using smartphone application in patients with chronic low back pain [14]; the usefulness of their application in other musculoskeletal pain diseases is being studied. Third, DTx may play a role in pain education programs. Patient education allows patients to have the right knowledge of their pain, which can motivate them to actively participate in effective treatments. Recently, a pain management education program using a smartphone-based application reduced severity of pain and improved social functioning in adolescents with chronic pain [15]. A recent systematic review reported the beneficial effects of smartphone applications in pain management in an outpatient setting [16].

Although there are a few hurdles, such as regulatory authorization as well as further proof of their effectiveness, it may not be long before these devices can be used in real-world clinical practice, beyond the research area. In pain medicine, DTx are promising treatment option for pain management. Pain physicians should establish academic evidence of these emerging treatment modalities to optimize care for patients with acute and chronic pain and improve their health outcomes.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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