KJP

Korean J Pain 2023;36(4):478-480
https://doi.org/10.3344/kjp.23239
pISSN 2005-9159, eISSN 2093-0569

Letter to the Editor

The use of artificial intelligence in treating chronic back pain

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Received August 17, 2023; Revised September 5, 2023; Accepted September 5, 2023

Handling Editor: Francis S. Nahm

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TO THE EDITOR

Chronic back pain is a debilitating disorder that is believed to be experienced by close to a quarter of the adult population globally [1]. With the recent advancements in technology, artificial intelligence (AI) has played a crucial role in healthcare, such as safely filtering patient information, analyzing medical imaging, providing recommendations for diagnoses, and even acting as virtual assistants for both physicians and patients [2].

One of the ways AI has been used in pain medicine and in helping patients with low back pain is aiding in the diagnoses of various conditions through interpretations of MRI, CT, X-ray, and other imaging modalities. Previous studies have already assessed the accuracy of artificial intelligence in diagnosing low back pain associated with spinal stenosis, disc degeneration, and lumbar arthritis [3]. One systematic review found that through the use of various machine learning models, physicians can use AI to differentiate patients with and without low back pain through the analysis of brain MRI [3]. AI can be used to filter and interpret clinical data, electromyography studies, and even physical motion to diagnose or predict the onset of various low back pain conditions. Some studies in the systematic review reported an accuracy of up to over 90% [3].

AI can be used to not only interpret these imaging modalities, but it can be used to enhance and even reconstruct an entire imaging of the spine as well. AI algorithms can be trained to differentiate between noisy and clear MRI or CT images, where this training can be applied by having the software reconstruct high-quality images [4]. This will allow the radiologists, interventional pain physicians, and even spine surgeons to have a better understanding of the disease at hand and how to best operate on patients. Past studies have even mentioned the use of AI to create completely new images from given data. For example, with a given MRI image, AI can be used to translate the information into a synthetic CT image, allowing physicians to obtain a more comprehensive view of a patient's spine or nerves [4]. Even something as mundane as labeling the different parts can be completed by AI to save the physician's time.

AI can also be effectively used to identify pain using neurophysiology-based methods [5]. Electroencephalography (EEG), a technique that records the brain's electrical impulses, has been used to identify and even measure pain intensity [5,6]. A systematic review examined 22

studies for pain intensity and found that machine learning (ML) had an accuracy rate of over 80%, with results ranging from 82.73%–95.33%, when interpreting EEG data and predicting various states of pain [6]. Not only can AI be used to help physicians interpret medical images, it can also be used to detect biomarkers and biosignals for pain.

The benefits of AI can also be seen when it is used to monitor and even give suggestions to patients who experience chronic back pain. It can be used as an application software on mobile devices to track the activities and even symptoms of patients. Given this information, AI algorithms can be used to assess the quality of pain, monitor opioid use, analyze sleep patterns, suggest self-care techniques, and recommend exercises that would help with a patient's pain. One study has already analyzed the effectiveness of AI in providing physical activity recommendations that are personally tailored to each patient who experiences neck and back pain [7]. The researchers found that patients who used the AI-driven application for just 2 months experienced a statistically significant reduction in pain when compared to the control group who were just part of a rehabilitation group [7].

The use of AI is versatile in the healthcare field, especially in interventional pain medicine. Not only can it be used to help physicians predict and even diagnose various musculoskeletal conditions, such as osteoarthritis, disc herniation, spinal stenosis, and osteomyelitis, but it can also be used to help patients gain control of their pain. Although pain is subjective for everyone, AI can be used to monitor a patient's physiological markers, such as facial expression, skin conductance, heart rate, and more [5]. It can then be employed to customize specific treatment regimens for patients with different needs, including personalized physical exercises, relaxation activities, lifestyle changes, dietary planning, and medication administration. The use of AI will help bridge the barriers between physicians and patients by enhancing communication, keeping accurate patient records, tracking patient lifestyles, providing exercise or medication reminders, and even answering questions that require quick responses [1–4,7]. Although AI can be used to positively impact patient care, it is important to keep in mind the importance of responsible AI use in healthcare [8]. For example, AI can make errors during diagnoses and can be susceptible to digital hacking [9]. As a result, it is paramount that healthcare providers double check the work of AI and put safeguards in place that would ensure patient privacy when using these types of software and algorithms.

DATA AVAILABILITY

Data sharing is not applicable to this article as no datasets were generated or analyzed for this study.

ACKNOWLEDGMENTS

We would like to acknowledge and thank all of the authors who contributed to this article.

CONFLICT OF INTEREST

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

FUNDING

No funding to declare.

AUTHOR CONTRIBUTIONS

Kenny Do: Writing/manuscript preparation; Eric Kawana: Writing/manuscript preparation; Benjamin Vachirakorntong: Writing/manuscript preparation; Jenifer Do: Writing/manuscript preparation; Ross Seibel: Supervision.

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