

CRITICAL OPINION

PAIN MANAGEMENT

Optimizing training programs and opportunities for professional development in the era of digital pain interventions: A unique opportunity for collaboration

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Abstract

Introduction: New digital health technologies provide accessible adjuncts to alleviating pain in the general population. The advent novel digital pain interventions have resulted in a rapidly evolving learning environment. Improving knowledge and understanding of these digital patient-centric approaches to treating pain is vital for our current practitioners and new cadre of trainees. The objective of this manuscript is to initiate a discussion about digital pain intervention educational needs of residents as well as attendings in PM&R, anesthesia and neurology.

Methodology: After reviewing Accreditation Council Graduate Medical Education (ACGME) and relevant American Board of Medical Specialties policies and best available evidence, including grey literature, we interviewed a group of practicing physicians in physiatry, anesthesiology and neurology, including program directors, to provide expert opinion, guidance and formulate recommendations on educational requirements, research endeavors, and learning techniques and opportunities in utilizing digital health interventions for management of pain. IRB approval was not required.

Conclusions: We hope that this manuscript will serve as the basis of designing a comprehensive educational program and outlining opportunities for research that prioritizes optimal care for pain patients and leverages the unique and complementary knowledge base within our fields.

Key words: Digital pain; Physiatry; anesthesiology; Neurology; Competency; Accreditation Council Graduate Medical education

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1. Commentary

Several digital pain technologies have recently entered the healthcare lexicon and are quickly transforming the healthcare industry. These devices are fast becoming a part of our ecosystem of health service offerings and are increasingly utilized in our medical practices. Improving our knowledge about these novel

digital patient-centric approaches to treating patients' pain has the potential to transform our health system. Pain Medicine in an American Board of Medical Subspecialties (ABMS) subspecialty and Accreditation Council Graduate Medical Education (ACGME) residency training is required in Psychiatry, Anesthesia, Neurology, Emergency Medicine, and

Family Medicine. There are also alternative non-ABMS boards offering certification. Traditionally, Psychiatry, Anesthesia and Neurology may be the medical specialties considered to most likely contribute to the nascent field of digital pain interventions. Each of these specialties has an independent residency training program of four years duration leading to board certifications in the respective fields.

Psychiatry is focused on the prevention, diagnosis, treatment and rehabilitation of disorders that produce temporary or permanent functional impairment, maximizing patients' physical, biological, psychological, social, and vocational functionality to improve their quality of life.¹ Psychiatrists employ several techniques and modalities to facilitate treatment of impairments- medications, injections, modalities, therapeutic exercise, prosthetics/orthotics, cognitive therapy, and adaptive devices.

Anesthesiology is focused on perioperative medical care.² Preoperatively, Anesthesiologists medically evaluate the patient before surgery and consult with the surgical team. Intraoperatively, they control the patient's level of consciousness, provide acute management of pain and continuously provide a medical assessment of the patient, monitor and support life functions during surgery- including heart rate, blood pressure, respiratory rate, oxygen saturation, body temperature and body fluid balance. Postoperatively, they supervise care after surgery, control pain with pain medications or specialized procedures to maximize patient comfort and discharge the patient from PACU. Anesthesiologists also coordinate the care of patients in the intensive care unit and administer drug therapies or perform special techniques for acute, chronic and cancer-related pain.

Neurology emphasizes the prevention, diagnosis and treatment of neurological disorders of the central and peripheral nervous system by obtaining a thorough history and a detailed neurological examination. Neurologists help maximize the patient's physical and neuro-cognitive recovery, and tools for the patient to cope with newfound deficits. Typical conditions that are evaluated and treated by a neurologist include traumatic brain injury, cerebrovascular accident, seizures, headaches, pain and sleep disorders.³

Though the educational focus in Psychiatry, Anesthesiology and Neurology seem quite disparate, practicing physicians in all three fields are equipped to manage pain. Accordingly, physicians from all three specialties may require further training in order to provide optimal care for patients with pain. Digital pain practitioners may wish to avail professional development opportunities to learn more about the pathophysiology of the relevant disease states, the traditional approaches to managing patients' pain, the effect of concurrent treatments, be comfortable selecting the most effective therapy, and learn to manage treatment responses and adverse reactions. Psychiatrists may feel a need to be facile with interventional procedures. Anesthesiologists may wish to learn about how to assume the role of clinicians in the management of patients- learn more about running a clinical practice, adjust to seeing patients primarily in an outpatient setting, and enjoy a more longitudinal exposure to patients. Last, neurologists may have a desire to refresh their knowledge of musculoskeletal pain in addition to procedure-based pain management.

Digital pain is a rapidly evolving field of using electronic tools, systems, devices and resources to generate, store or process data and to utilize pain reduction techniques for easing the suffering and improving the quality of life of individuals. Consequently, digital pain interventions are poised to become an accessible means of alleviating pain in the general population. In the United States, digital pain therapeutics fall under the Food and Drug Administration's (FDA's) definition of a medical device- which is anything other than a drug that is "intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease".⁴ Recent examples of FDA registrations, clearances or approvals of these novel devices include the following: wearable devices which sends electric signals to the body to inhibit pain nerve signals,⁵ smart phone applications which provide access to information and guided exercise therapy, remotely controlled implantables which stimulate certain nerves to achieve pain relief, virtual reality headsets,⁶ that facilitate distraction from pain as well as sensor guided therapies, biofeedback devices and implantable devices which may be controlled remotely (See Table 1). These digital therapeutics were selected

based on best available evidence on searches, including grey literature searches, and familiarity by practicing physicians. Many other promising digital pain interventions are under development and may be available in the next few years. These include certain wearable EMG sensors which provide pain-feedback,

smart phone apps, implantable devices and wearable EEG readers as pain trackers. Digital pain therapeutics may be divided into 4 main categories: Wearable devices, implantable devices, virtual reality, and miscellaneous. This table includes examples of some promising technologies that are FDA registered, cleared or approved.

Table 1: Digital pain therapeutics

Digital intervention	Description
Wearable devices	
Quell	A wireless wearable band that generates electric signals to stimulate the body to produce endogenous opioids to inhibit pain nerve signals.
Nervio Migra	A remote electrical neuromodulation device controlled through a smartphone application used for relieving acute migraines.
Oska Wellness	Uses a low level pulsed electromagnetic field (PEMF) to help reduce pain. It does not need to be directly attached to the skin but simply near the area of pain to be effective.
IB-Stim device	A percutaneous nerve stimulator which fits around the ear and delivers low-frequency bursts of electricity to stimulate certain cranial nerves to disrupt dysfunctional autonomic feedback loops that cause pain.
The NSS-2 Bridge device	A battery powered electrical nerve stimulator placed behind the ear to stimulate certain cranial nerves to provide relief from opioid withdrawal symptoms.
ActiPatch	A pulsed shortwave therapy (PSWT) device that helps reduce the intensity of musculoskeletal pain and is sensation free when worn.
The iReliev® Therapeutic Wearable System	A wireless rechargeable TENS unit which comes with multiple electrical muscle stimulation (EMS) programs for muscle conditioning.
The Game Ready System	Delivers targeted cold, intermittent compression, rapid contrast or heat therapy to help to reduce pain, swelling, and opioid consumption.
SPRINT Peripheral Nerve Stimulation System	A percutaneous device implanted by a physician to stimulate nerves around the affected part of the body to achieve pain relief.
Implantable	
Proclaim XR	A smart phone controlled spinal cord stimulator which delivers the lowest electrical signal needed to relieve pain which extends the system's battery life for upto 10 years.
Stimwave Freedom spinal cord stimulator (SCS) System	A small spinal cord stimulator that does not contain any leads or implanted pulse generator, but instead relies on an external radiofrequency transmitter and can be controlled via a smart phone.
Virtual reality	
Virtual Exercise Rehabilitation Assistant	An in-home interactive device that records an individual's movement in 3-D video and provides instruction and feedback for exercises in real time as well as enables tele-visits.
Virtual Reality Headsets	Engages the brain in an immersive three-dimensional experience facilitating distraction from pain.
Miscellaneous	
Photo biomodulation (Erchonia)	A spinal exoskeletal robot that provides precise laser for therapy to decrease inflammation, relieve pain and boost the immune system.

Current training programs and practice paradigms for care delivery have not been optimized for patient care in the digital era. Currently, physiatry, anesthesiology or neurology physicians who primarily administer pain interventions require specified training and experience. These training programs are quite different in their training and setting, but all include practice of pain medicine techniques. Because digital pain interventions have been introduced in clinical practice only recently, no specific training requirements have been outlined as yet. In the midst of this rapidly evolving environment for trainees and practicing physicians, innovative solutions must be sought to guarantee optimal training. Additional training for trainees and practicing physicians and enhanced collaboration between our specialties, will ensure optimize care of patients with novel digital pain interventions.

After reviewing ACGME⁷ and relevant ABMS policies and current evidence, including grey literature, we interviewed a group of practicing physicians, including program directors, to provide expert opinion, guidance and formulate recommendations on educational requirements, research endeavors, and learning techniques and opportunities in the introduction of these novel digital pain technologies.

As a result, we surmise that a physician practicing digital pain interventions will need to master the following key areas of knowledge and experience to be able to offer the best care for their patients. First and foremost, physicians need to be aware of, be motivated to learn more about, and be comfortable using digital health intervention in pain management. Physicians should thoroughly evaluate the need for digital pain interventions with a knowledge of alternative traditional interventions to determine the optimal intervention for each individual patient. Physicians need to be experienced in the particular digital pain intervention with a prescribed number of cases as part of their training requirements or maintenance of certification requirements. They should be confident in supervising the process for patient preparation, administration of the digital intervention, determining the number and timing of interventions and developing a plan for follow-up assessments and care of patients receiving digital pain interventions.

- Pathobiology of relevant disease states
- Indications for digital pain interventions for treating pain and alternative treatment options
- Contraindications to using digital pain devices
- Pretherapy evaluation, including initial workup requirements and potential contraindications and therapy considerations
- Basics of the procedure
- Posttherapy evaluation, and how to measure response to therapy and any adverse reactions
- Possible adverse events and their management, both in the acute setting and any expected late or chronic adverse events
- Appropriate follow-up visits

We believe that any or all of the following learning techniques may be beneficial for both trainees and practicing physicians who would like to learn or refresh their knowledge of digital pain interventions:

- Inclusion of digital intervention in pain management as an integral part of the residency curriculum and maintenance of certification requirements
- Obtain digital health education through didactics, self-directed learning, patient simulation or online modules
- Availability of case-based and problem-based learning training
- Obtain a hands-on approach to using digital pain devices
- Faculty support or mentorship for digital pain interventions research and procedures

In light of the exciting expansion in digital pain interventions, we hope that this guidance serves as a launching pad to determine learning opportunities in current residency training programs and determine how to modify existing residency training programs, provide insights into research opportunities, update the continuing medical education needs of practicing physicians to master new skills, direct a high quality multidisciplinary digital pain practice, and prioritize the best care for patients. However, the literature on efficacy of these therapeutics is sparse, which itself

then demands consideration of the dilemma that aside from the novelty of these interventions, there may not be a compelling reason to encourage widespread education or adoption until evidence of benefit is more apparent. Innovations are needed in education to include and implement a comprehensive curriculum in digital pain interventions. To that end, we expect to leverage the unique and complementary knowledge base within the fields of physical medicine and rehabilitation, anesthesiology and neurology to update the educational curriculum in ACGME-accredited training programs, amend formal requirements by the Residency Review Committees or establish new training pathways, and the maintenance of board requirements by the respective boards of medical specialties to achieve a truly multidisciplinary approach to pain medicine, working collaboratively among the medical specialists in a pain medicine clinic.

2. Conflict of interest

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

3. Authors' contribution

AN: writing the manuscript, research and literature review for the data

SM: Concept, manuscript editing

4. References

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