Translating e-pain research into patient care

Authors:
Brian E. McGuire*, Ellen M. Henderson, Patrick J. McGrath

School of Psychology and Centre for Pain Research, National University of Ireland, Galway, Ireland,
Louis Dundas Centre for Children’s Palliative Care, UCL Great Ormond Street, Institute of Child Health, London, United Kingdom,
Research Services, IWK Health Centre, Halifax, NS, Canada

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*Corresponding author. Address: School of Psychology, National University of Ireland, University Road, Galway, Ireland H91 EV56. E-mail address: Brian.mcguire@nuigalway.ie (B. McGuire). Tel: 1353 (0)91493266; fax 1353 (0)91 534930.
1. Introduction

Recently, a call was made to expand the availability of pain self-management for the public, but several obstacles limit access to pain services such as distance, cost, and availability. Technology-based interventions can help with access to pain management, and consideration of these opportunities is timely given service pressures, changing consumer preferences, and the burgeoning ownership of personal computers and smartphones. In that context, we have described (1) the features of e-pain technologies, (2) the challenges in developing e-pain technologies, (3) the existing evidence in relation to technology-based pain management, (4) the debate regarding regulation of e-pain treatments, and (5) the likely steps for future development of these interventions.

2. What are e-pain technologies?

Technology-based pain management can be Internet-based or mobile device based, or a mixture of both technologies—we use the term e-pain technologies when referring to both. E-pain technologies can be divided into 3 main types: (1) interventions for managing pain (which tend to be primarily psychological and activity-focused treatments); (2) pain symptom diaries (mostly on mobile phone apps); and (3) wearable devices for collecting real-time data such as exercise data, sleep activity, and other physiological data. Figure 1 depicts a conceptual e-pain treatment programme with both a web-based platform and a mobile-based component, where the programme both delivers and receives information from the patient and can tailor the intervention based on the patient’s responses.

In this review, we have focused on psychological treatment studies rather than symptom monitoring and we have divided the review into Internet-based interventions and mobile device interventions. We propose that there is an emerging evidence base for web-based interventions and that the next steps involve more nuanced effectiveness research, followed by credentialing and implementation. Mobile technologies are at an earlier stage of development—while they hold out the potential for wide-scale uptake in the future, at present there is insufficient evidence to recommend wide uptake. More research is needed on acceptability, feasibility, and effectiveness.

3. Challenges in the development and evaluation of e-pain interventions

A recent review identified several limitations in the design of pain management apps, similar considerations apply to web-based technologies but we contend that web-based interventions have successfully addressed some of these limitations. These limitations are considered further here:

(1) Limited capability to allow for personalization of treatment—almost all clinical interactions involve the clinical judgment of the clinician and the negotiation and agreement of a course of treatment, with modifications made based on patient feedback. This complex review and revise circuit poses a technology challenge, where treatment algorithms must be developed to take account of a wide range of possible combinations of variables. The technology to do this exists—several recent programmes have incorporated variants of this feature.

(2) Lack of involvement of health professionals in development and evaluation of apps, especially those available in app stores. For example, 2 studies of pain apps for smartphones found that only 14% to 18% of the apps were created with scientific or clinical expertise and none of the apps
reported the psychometric properties of the diaries. In contrast, most of the Internet interventions have been developed by clinicians and researchers in academic institutions. Although the involvement of health experts is not a guarantee of effectiveness, we believe it reduces the risk of unsafe and ineffective treatments.

E-pain interventions deliberately seek to minimise the “real-time” involvement of clinicians, but we do not know if (or how much) therapist contact is needed or in what format, to engage patients and maximise clinical outcomes. A recent Internet intervention for chronic pain was equally effective with either optional or no therapist support as when there was scheduled therapist contact. Although a therapeutic relationship can develop when therapy is delivered over the phone, we do not know if this relationship can be replicated without contact between the practitioner and service user or indeed whether this relationship is necessary.

(3) Lack of a foundation in current research or behavioural theories. If an intervention purports to offer therapeutic potential, then it is reasonable to seek to identify the effective elements of the treatment. Knowledge about the behaviour change techniques used and any guiding theoretical models can help with replication of interventions and development of new treatment content. With the exception of web-based Cognitive Behavioral Therapy (CBT) and Acceptance and Commitment Therapy (ACT) interventions, few studies describe a theoretical basis for the intervention or identify the possible mechanisms of action.

(4) Lack of scientific evaluation through feasibility or effectiveness testing. For the consumer and a technology developer, a “successful” technology is one that is used by many people, whereas scientists and clinicians want to know whether the technology is effective. Before e-pain interventions are widely used by clinicians, there is a need to answer some fundamental questions:

- Are the interventions fit for purpose-safe and clinically effective?
- What are the effective components?
- What is the best format for delivery of the intervention (is therapist contact needed, how much, how often)?
- Who benefits from the interventions?
- Are they cost-effective?

In the next section, we review the evidence for the effectiveness of e-pain interventions.

4. Are e-pain interventions effective?

The evidence for e-pain technologies differs depending on the primary delivery format (web based or mobile based). Two Cochrane reviews found evidence that Internet-based treatments reduced pain, disability, depression, and anxiety in adults and children after the intervention, giving cause for optimism.

Since then, at least 9 more studies have been published, focused equally on adults and children. In Table 1 (suppl, available online at http://links.lww.com/PAIN/A327), we have provided a selected and annotated summary of some of the recent papers in the area, looking separately at mobile devices and web-based programmes. As is evident from the summary, there is considerably better evidence to support web-based interventions but an absence of evidence to yet recommend mobile app interventions.
In relation to mobile apps, there remains a need for studies that examine the feasibility, acceptability, and effectiveness of these interventions. If the effective web-based interventions can be adapted for mobile devices, then there is good reason for optimism, because smartphone usage is now widespread and this means many more people could get access to pain management interventions.

For web-based interventions, Table 1 (suppl) shows a clear trend of effectiveness, with stronger evidence emerging in more recent studies—possibly due to better quality studies, better technology and treatment interface, better awareness of effective components or a combination of these factors. The studies also show evidence of good acceptability as indicated by excellent adherence, especially in more recent studies where personalizing the nature of the communication appears to have been helpful, eg, having a name and photo or video of the (virtual) therapist, and where regular communication was important, even if that was automated. Qualitative studies also indicate that health consumers are open to using e-pain methodologies.33

As well as examining clinical effectiveness, we need more data on the cost-effectiveness of e-pain interventions—while e-pain services may intuitively appear likely to be cheaper than face-to-face services because they reduce the need for face-to-face contact,10 we do not know how this compares to the costs associated with development and support of e-pain interventions. This area requires focused attention from the research community.

5. Should e-pain interventions be regulated?

The proliferation of e-pain technologies raises the question of whether there should be some form of credentialing and/or regulation of e-therapies. In the traditional health sector, there is some safety and recourse for patients who attend clinicians with recognized qualifications, recognized affiliations, and who practice under a professional code of ethics. Unfortunately, these protections are less easily secured when patients avail of e-pain interventions that are simply accessed via an app or web page that may be based in other jurisdictions. In the United States, the Federal Drug Administration has proposed a set of regulations to tackle the issue of determining which health apps will be regulated.14 Some clinicians have critiqued this proposed regulatory approach for its cumbersome registration process for app developers and the lack of pace of regulation in comparison with technology development.2

The alternative to formal oversight of e-pain technologies is to use self-regulation and codes of good practice. There are ethical guidelines for Internet-mediated research4 and for Internet-mediated clinical interventions,6,7 and we contend that delivery of e-pain services should be subject to the same ethical guidelines as apply to face-to-face treatments. If a health professional, on the basis of good evidence, recommends an app then the ethical mandate is not any greater than a health professional prescribing another treatment. The problem is the health professional often has no way of knowing which e-pain technology is effective or appropriate for the patient. Thus, there is an imperative to ensure that e-pain technologies are appropriately evaluated and disseminated with a “stamp of approval” on which prescribers and consumers can rely.

6. Improving access to e-pain technologies
In line with a recommended model of stepped care for psychological support in pain management,34 e-pain interventions can operate as standalone low-intensity interventions that can be offered as a first-line of treatment. Even at this level, interventions can be individually tailored using software such as IRIS.41 At a second level, clinicians can use e-pain programs to supplement their face-to-face treatment of more complex presentations.

There are many e-clinics and e-programs already in operation in research institutions, and the private sector and several others have successfully scaled up to reach a wide audience (eg, Refs. 3,13,27,28,30,36,40). But many effective programs remain within the confines of academic institutions and there are several major challenges involved in making effective e-interventions widely available within existing service structures that assume face-to-face contact. Several groups have made recommendations regarding uptake of e-pain technologies (American College of Physicians,8 Canadian Medical Association,6 IMS Institute for Healthcare Informatics20) and have suggested a number of criteria for the use of e-pain technologies, summarized here alongside our own views in what we consider to be the necessary steps for wider uptake:

1. A curated list of interventions that are (a) usable and (b) have evidence for effectiveness
2. Endorsement by an appropriate organization (eg, a professional body)
3. Practice infrastructure for e-technology prescribing and monitoring progress
4. Training for health care providers to prescribe and supervise e-pain interventions
5. Mechanism to monetise prescribing and monitoring
6. Meets privacy and security regulations
7. Protection of the prescriber and the institution from liability arising from technology usage
8. Low or no cost for the user
9. Has an impact on patient outcomes
10. Compatible with existing health record systems
11. A system to monetise the intervention owner so that the service can be maintained, improved, and expanded.

When examining ways of introducing new treatments into existing health systems, consideration can also be given to use of other communication systems such as social media and games based media to reach a wider audience. For example, there is a move toward the use of “gamification”23 or “serious games” to offer treatments embedded within online games to people for whom this approach might improve access and engagement, such as children and young adults.

7. Conclusions

The prospects for e-technologies for chronic pain are positive but there are several challenges. For example, evidence of efficacy in highly controlled studies does not always translate into evidence of effectiveness at the level of health service implementation.16 We contend that there is sufficient evidence to support the wider implementation of large-scale pragmatic clinical trials delivered via web-based programs, but there is a lack of evidence to support wider implementation of trials.
delivered through mobile devices. Efficacy studies of mobile-based interventions are likely to emerge over the next 2 years.

Patients want interventions that are easy to access, secure, effective, and have minimal or no cost. Health care providers want interventions that they will get paid for prescribing, will help many patients, will not expose them to liability, and are easy to prescribe eg, from within the electronic health record. E-pain technologies offer the potential to satisfy these requirements.
Figure 1. Sample e-pain intervention model with web-based platform and mobile-based symptom monitor.
References


