Applying Patient and Health Professional Preferences as part of Co-designing a New Digital Brief Intervention to Reduce Prescription Opioid Harm

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Abstract

Background: Few personalized, behavioral treatments are available to reduce opioid-related harm for patients with chronic non-cancer pain (CNCP).

Objective: We report on the second co-design phase of a digital brief intervention (BI) based on patient and health professional preferences.

Methods: Eligible patients with CNCP (N = 18; 10 females; Mage = 49.5) from public hospital waitlists and health professionals (N = 5; 2 females; Mage = 40.2) from pain and addiction clinics completed semi-structured phone interviews or focus groups exploring on BI preferences, needs, and implementation considerations. Grounded theory was used to thematically analyse data.

Results: From patient reports, nine suggestions related intervention content were identified: Non-pharmacological pain treatments; Personalized medication plan; Opioid use reflection and education; Biopsychosocial pain knowledge; Pain psychology education; Holistic assessment and feedback; Broader person-centered goals; Happiness and comfort goals; Varied coping skills options. Six patient suggestions related to the process and guiding principles: Therapist-guided; Engaging features; Compassionate, responsive, person-centered care; Digital solution maximizing reach; Educate and normalize system/policy challenges; Intervention engagement across settings. Finally, five themes were reflected in health professional reports: Digital health use rare but desired; Digital health useful for patient monitoring/accessing support; Patient motivation important; Digital BI app likely beneficial and at multiple care points; Safe medications use/managing pain goals. Reported barriers from health professionals were intervention intensity, potential costs, and patient responsiveness.

Conclusions: Digital BIs are highly desired by patients with CNCP and health professionals. This co-design study identified key

content areas, principles, enablers and barriers to guide development of such programs.

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Abstract

Background: Few personalized, behavioral treatments are available to reduce opioid-related harm for patients with chronic non-cancer pain (CNCP). **Objective:** We report on the second co-design phase of a digital brief intervention (BI) based on patient and health professional preferences. **Methods:** Eligible patients with CNCP (N = 18; 10 females; M_{age} = 49.5) from public hospital waitlists and health professionals (N = 5; 2 females; M_{age} = 40.2) from pain and addiction clinics completed semi-structured phone interviews or focus groups exploring on BI preferences, needs, and implementation considerations. Grounded theory was used to thematically analyse data. **Results:** From patient reports, nine suggestions related intervention content were identified: *Non-pharmacological pain treatments; Personalized medication plan; Opioid use reflection and education; Biopsychosocial pain knowledge; Pain psychology education; Holistic assessment and feedback; Broader person-centered goals; Happiness and comfort goals; Varied coping skills options.* Six patient suggestions related to the process and guiding principles: *Therapist-guided; Engaging features; Compassionate, responsive, person-centered care; Digital solution maximizing reach; Educate and normalize system/policy challenges; Intervention engagement across settings*. Finally, five themes were reflected in health professional reports: *Digital health use rare but desired; Digital health useful for patient monitoring/accessing support; Patient motivation important; Digital BI app likely beneficial and at multiple care points; Safe medications use/managing pain goals.* Reported barriers from health professionals were intervention intensity, potential costs, and patient responsiveness. **Discussion:** Digital BIs are highly desired by patients with CNCP and health professionals. This co-design study identified key content areas, principles, enablers and barriers to guide development of such programs.

Keywords: Chronic non-cancer pain; prescription opioid use; brief intervention; brief psychological intervention; co-design; patient partners; qualitative research; digital health.

Introduction

Clinical guidelines recommend behavioral, non-pharmacological treatments and interdisciplinary rehabilitation for the treatment of chronic non-cancer pain (CNCP) [e.g., 23]. However, there is a significant gap between research evidence and clinical practice, referred to as one of the 'Valleys of Death' [41] in the management of CNCP. Barriers to patients accessing best practice multidisciplinary specialist pain care include long waiting times, geography, high demand for treatment, treatment intensity, lack of trained behavioral therapists and cost [13; 17; 25; 31; 39]. Psychological treatments rarely reach patients with CNCP. Our patient lived experience research has found that most patients with CNCP are not offered psychological treatment (e.g., cognitive behavioral therapy) and are unaware that it is recommended as a first line, effective treatment for pain (under review). These experiences are supported by national research which shows that 87% of Australians with CNCP had not seen a psychologist for CNCP and almost 60% are not aware of the role of psychologists in pain care [3]. This is not unique to Australia. Patients around the world are not offered or referred to non-pharmacological interventions particularly when receiving opioid therapy [7; 16]. The COVID-19 pandemic has further hindered access to psychologists and pain care, with high demand highlighting significant workforce shortages [4] in addition to a lack of pain psychologist specialists and mental health workforce [18].

Digital health interventions (DHIs) for pain have been highlighted as a potential innovative solution to the accessibility problem, growing burden of CNCP, and global health threats [15; 24; 45]. DHIs for pain provide potential advantages to health systems, providers, and patients including improved accessibility, efficiency, and cost effectiveness. But DHIs are affected by similar knowledge to practice gaps with poor uptake and adherence. Patient access to DHIs outside of research studies is limited [21], reducing their real-world impact. Few DHIs that are publicly available have received empirical evaluation [21; 36]. These gaps in traditional and digital pain care are concerning and must be abridged if researchers and health professionals are to curb the trajectory of suffering for the increasing number of patients with CNCP.

A lack of patient and health professional partnering in research has been cited as a central reason for research failing to translate into clinical practice [27; 32; 43; 47]. Co-design of new DHIs has been highlighted as a potential solution to the translational challenge. Co-design involves meaningful stakeholder (e.g., patients, health professionals) involvement in the design, implementation, and translation of research [46]. Engaging *patient partners* alongside health professionals in the co-design of DHIs allows for tailoring to individual preferences and needs, which has the potential to increase treatment effectiveness, acceptance, and adoption in practice.

Patients and health professionals have been rarely involved in the co-design of DHIs for CNCP since it was recommended more than a decade ago [33]. Most DHIs are developed by the for-profit software industry [48] and lack a theoretical framework [36]. Only 19% of studies involve end-users in development and this is usually in an ad-hoc way [53]. Involvement of health professionals in the DHI design varies considerably (8.2%; 30.6%) [36; 53], few enable communication with health professionals or clinician access to patient data [22; 53] and almost no studies (<3%) involve both patients and health professionals in the design of DHIs [53].

There is an opportunity to optimize the research to practice nexus using co-design methods in all phases of developing new, brief DHIs. This study is part of a larger program of work to co-design, co-develop, and evaluate the feasibility of a digital brief intervention (digital BI) for patients with CNCP to reduce prescription opioid-related harm. Digital BIs provide a potentially efficient and scalable psychological and behavioral treatment option that facilitates rapid access to pain care [15; 26]. In the first phase of digital BI co-design, we examined the lived experiences of CNCP management, with a particular focus on opioid therapy in individual interviews (under review). In this second phase, we advanced this body of work by examining the needs and preferences of patients and health professionals as well as implementation barriers and enablers. This new knowledge will continue to inform future steps in the co-design of digital BIs for the population most at risk of the harmful effects of opioid medications.

Methods

Participants and recruitment

Participants ($N = 18$) were patients with a diagnosed CNCP condition who were purposively sampled to ensure adequate representation from both sexes, culturally and linguistically diverse backgrounds, and current and past use of opioid therapy. A full summary of patient participant recruitment is provided in a previous study (under review). In short, patient eligibility criteria included: aged between 18-70 years, experiencing clinical levels of CNCP (≥ 4/10 on the Pain Numerical Rating Scale on average over the past week), and seeking treatment from public health specialist addiction or pain services. Patient exclusion criteria were: high levels of distress (based on scores ≥ 13 on the Kessler Psychological Distress Scale (K6;[34]) and follow-up phone risk assessment or clinical judgement from the addiction specialist), non-English speaking, a history of recent injecting drug use, or currently positive with coronavirus SARS-CoV-2.

Patients were recruited through a tertiary hospital specialist pain clinic or community addiction specialist service. Patients were engaged either by mailing an information pack inviting those on the waitlist to participate (pain clinic) or were invited by the medical specialist and member of the research team (R.E.) during their on-site appointment (addiction service). Final sample size was determined by thematic saturation using Guest's [28] analysis approach applied during the data collection/inductive thematic analysis phase (see [under review] for more information).

Health professionals ($N = 5$) were also invited to participate in 1-1 interviews or focus groups to assess their needs and preferences for the digital BI. Health professionals recruited through the specialist pain and addiction clinics as well as through the research and clinical networks of the research team were eligible to participate if they were working in chronic pain management (public or private sector).

Design

A co-design approach [2] was used, applying the framework by Sanders and Stappers [60] and updated by Noorbergen et al. [51]. It outlines six, iterative co-design phases: pre-design, generative, prototyping, evaluative, implementation, and post-design. See Figure 1 for an overview. This study reports on the generative phase of the iterative co-design development process, which includes exploring barriers, enablers, and suggestions for the digital BI from both the patient and health professional perspectives. Patient perspectives were collected from individual interviews (*N*=18) and two focus groups which consisted of patients invited after the individual interviews (*n* = 7); health professional perspectives (*N* = 5) were collected from two focus groups.

The project was led by the study chief investigator (R.E.), who is a clinical psychologist-researcher. The multidisciplinary project team consisted of health care researchers (i.e., psychologists, physiotherapists, pain medicine specialists, addiction specialists), digital development partners (i.e., software developers and designers), and patient partners (i.e., individuals with a lived experience of CNCP including use of prescription opioid medications). The team met weekly (sometimes more often) during the development process.

[Insert Figure 1 here]

Measures

Online questionnaires

Patients were asked for their demographics, information about their pain condition, current medications, and history of mental health and substance use disorders. Validated measures included the Brief Pain Inventory [35; 49], Kessler Psychological Distress Scale (K6) [34], Depression, Anxiety and Stress (DASS-21) [37] and Current Opioid Misuse Measure (COMM) [11]. Full description of the measures can be found in Elphinston et al. (under review).

Health professionals completed an online survey asking questions about their demographics, clinical background and experience, workplace setting, training and professional development in pain, use of digital health interventions and types of telehealth use in clinical practice.

Patient semi-structured interview and focus group questions

Patients were first invited to participate in individual interviews via phone. Participants were introduced to the overall aim of the research; to co-design a digital BI to reduce prescription opioid medications harm. As part of a larger set of interview questions, patients were then asked about how they see their pain management in the future, their opioid use, and how they could assist others in using opioids more safely. See Table 1 for a summary of the questions.

Patients who completed the individual interviews and expressed interest in further co-design of the BI were invited to participate in the focus groups, which involved several activities corresponding to the components of the BI. To set the stage, participants completed an exercise involving sharing their pain story including the number and type of pain management strategies utilised. Participants then completed activities including questionnaire assessment and feedback, the biopsychosocial model of pain, opioid use education, personality coping skills training, and motivational interviewing and action planning. Patients also explored the problem (using a 'peel the onion' activity) and proposed solution requirements and were provided an example of a brief intervention for smoking cessation. The aim of these activities was to explore and confirm patient preferences and needs, drawing on the results of the individual interviews to guide discussion. The role of technology in delivering BIs was explored including how to best meet the patient needs of this population and implementation requirements. Patients also completed a value sliders exercise, rating each component from most important to least important.

Table 1. Patient and health professional semi-structured interview/focus group questions.

Semi-structured interview/focus group questions
Patients
What would you like your pain management journey to look like in the future?
What would you change about your pain journey?
How would you like your opioid use to be different in the future?
What would be the benefits/downsides to making changes to your opioid use?
What suggestions do you have for increasing people's motivation to make a positive change to their opioid use?
How do you suggest we help patients to use opioids more safely including programs and interventions that are available?
What are the strategies that might change people's beliefs about pain medication or change their expectations that they will need opioid medications in the future?
How would health professionals, services might help people to better manage their opioid therapy?
How would we reach those that might be using opioids unsafely?
What are your preferred modes for accessing support?
Health Professionals
What are your initial impressions of the digital brief intervention?
What digital resources and programs do you use in your clinical practice?
How easy it is to access digital resources?
Which patients would best respond to digital brief intervention?
When, where and who should deliver it?

How would you integrate the digital BI into your practice?
What are the barriers/enablers to implementation in practice?
What recommendations/other considerations do you have to support the success of the intervention?

Health professional semi-structured focus group questions

Health professionals were first introduced to the background and rationale for the digital BI, the main components, and identified themes of patient lived experiences from a previous study (under review). They were then asked about their impressions of the themes and the digital BI. See Table 1 for a summary of the questions.

Procedure

Interviews and focus groups were completed June – December 2020. Patients completed an initial phone screening interview to determine eligibility for individual interviews and health professionals expressing interest via email were invited to one of two focus groups. Eligible patients and health professionals completed an online questionnaire prior to the interview for descriptive purposes; and to provide background to guide the interview. All individual patient interviews were conducted via phone by R.E., a clinical psychologist, K.B., a psychologist, and S.P., all with expertise in chronic pain and/or qualitative research. Patient focus groups were then conducted in person on-site at the clinic with one patient participating via Zoom. Health professional focus groups were conducted via Zoom. Interviews and focus groups were audio-recorded and professionally transcribed verbatim. Patients received a $50 gift voucher for each session attended. All participants provided informed written consent. Ethics was approved from the relevant institutional boards (HREC/2020/QMS/60695).

Data analysis

An iterative approach to data analysis was used. Transcripts from the patient interviews and patient and health professional focus groups were thematically analysed using grounded theory [8]. Two coders (R.E. and S.P.) coded line-by-line and then grouped the codes into subthemes and themes; referred to as suggestions from patient reports. Theme refinement was facilitated by a third clinician-researcher (KB), who assisted in integrating interviewer field notes to aid interpretation and reduce coder bias. All researchers were asked to review the themes and sub-themes. The audio recordings were referred to as needed to examine patient quotes and clarify content. Main features of the digital BI were ranked by patients in the workshops.

Results

Characteristics of the patient and health professional samples

Patient characteristics (*N* = 18; 55% female; M_{age} = 49.5 years, SD = 6.91) are presented in a previous study (under review). We provide an overview in Table 2; for a detailed summary of each individual, please refer to a previous report (under review). In the sample of patients interviewed, half met the threshold for current unsafe opioid use (misuse) on a validated psychometric scale (COMM; [11]). Most health professionals (*N* = 5; 40% female; M_{age} = 40.2 years, *SD* = 5.97) were psychologists working in both the private and public sectors, with an average of 9.8 years of clinical experience. See Table 3.

Table 2. Patient (*N* = 18) demographic and clinical characteristics

Variable	Count	%		
Gender				
Female	10	55%		
Male	8	45%		
Ethnicity				
Australian	14	77.9%		
British (English, Welsh, Irish)	2	11.1%		
New Zealander	1	5.5%		
Greek	1	5.5%		
Pain location				
Head/face	4	9.5%		
Neck	6	14.3%		
Shoulder/upper limbs	6	14.3%		
Back/spine/sacrum	12	28.6%		
Lower limbs	4	9.5%		
Whole body	5	11.9%		
Abdomen/pelvis/groin	5	11.9%		
	Mean/median	St Dev	Min.	Max.
Age (years)	49	11.5	25	62
Pain duration (years)	11.6	11.5	0.5	42
Pain intensity (past week)	5.8	1.5	2.3	8.0
Pain interference (past week)	5.8	1.9	2.7	9.1
Kessler Psychological Distress Scale (K6)	9.7	4.8	4	18
Depression, Anxiety and Stress (DASS-21)				
Depression	10.8	9.1	0	30
Anxiety	9.2	8.9	0	34
Stress	13.9	9.1	0	32

Opioid use duration (years; *N* = 16[a])	8.0	8.7	0.6	26
Oral Morphine Equivalent (OME; *N* = 13[a, b])	114.2/45	166.8	1.2	480
Current Opioid Misuse Measure (COMM; *N* = 16[a, c])	11.7	7.89	1	27

Note. Min. = Minimum, Max. = Maximum score; SD = Standard Deviation. [a]2 participants were not currently using opioids; [b]3 participants currently using Methadone. [c]8 participants scored ≥ 9 indicating risk of opioid misuse[11].

Table 3. Health professional demographic and background information

	Sex	Age	Profession	Years of practice	Work sector
HP1	Male	44	Psychologist	17	Public & private
HP2	Female	29	Psychologist	3	Public
HP3	Female	39	Psychologist	15	Public
HP4	Male	42	Nurse	8	Public
HP5	Male	47	Psychologist	6	Private

HP = health professional.

Patient preferences

Guiding content, principles, and process suggestions for the proposed digital BI emerged from the individual patient interviews and were further refined in the patient focus groups. There were nine suggestions related to the content of the BI (Suggestions 1-9) and six related to the process and guiding principles (Suggestions 10-15). Please refer to Table 4 for a summary.

Intervention content

Suggestion 1: Need for non-pharmacological strategies

Participants confirmed a need for non-pharmacological strategies other than use of opioids such as relaxation, exercise, engaging in pleasant activities and pacing. PID8 said, “there's got to be something out there that covers everything but doesn't actually interfere with life itself, because you know the opioids make you stupid”. This was reported by some participants as important to “take back control” (PID4) from doctors who “should stop giving out opioids and recommend other non-pharmacological alternatives” (PID8). One participant (PID4) wished not to be drug dependent, as they feel reliant on pain medication, “If [the BPI could] teach you not to be drug dependent. Because that’s pretty much what I rely on. If that just stopped, I don't know what would happen”.

Suggestion 2: Personalised medication/tapering plans and regular monitoring

There was a focus on medication-related goals that are achievable. PID8 said, “reduce your dose by I don't know 2mg, that’s achievable...just little things you know make sure you go for a 10min walk once a week…10mins once a week should be achievable and not overdo it. You know just little things, it’s like the compound effect book... you make such a small change that you don't really notice it but its compounded over 12 months.... small achievable goals that compound.” For some people, goals were related to a reduction in medication dose, while for others, using medication more safely. Opportunities to revise goals over time (e.g., weekly) was identified as essential. Participants discussed a tailored, stepped and ‘SMART’ (Specific, Measurable, Achievable, Relevant, and Time-Bound) approach to goal setting. Monitoring of personalized medication plans was reported by some participants as necessary to checking patient response to treatment and provide an opportunity to identify any concerns (e.g., withdrawal). One participant (PID1) suggested a patient medication diary could assist in the monitoring process. Collaboration amongst health professionals and with patients was highlighted to ensure that everyone is aware of the patient’s individual medication plan and working together to support the patient.

Suggestion 3: Opioid use reflection and education

Some participants reported that opportunities to reflect on their response to opioid therapy (benefits vs harms) would be important and could offer an avenue to provide opioid use education. Patients indicated that more knowledge of the potential harms of opioids was needed. One participant (PID9) described how education that opioids can increase pain sensitivity and that tapering opioids do not necessarily result in increased pain was helpful when reducing opioids: “I never attempted to come off it because I just thought what am I going to do with my pain, it’s just going to get worse and he said no, as you reduce your pain sensitivity will reduce and he was right....[knowing that] it took the fear away from tapering off” (PID9). Related to Theme 11, use of trivia and quizzes, as a regularly updated semi-competitive activity was suggested to engage patients in education and motivation to continue with the digital BI.

Some participants suggested that education about opioid addiction and dependency would be important as well as taking into consideration people with pain who may have had a history of substance use problems. One participant said, “I'm clean. and even when I broke my shoulder and I had to take fentanyl in the hospital I phoned my sponsor first to make sure that it was okay for me to have it.” (PID8).

Suggestion 4: Biopsychosocial model provides a relevant framework for understanding pain experience

Participants agreed that the biopsychosocial model of pain provides a relevant framework for explaining the unique individual experience of pain and how it can change over time. The patient experience interview was the first time three of the four focus group participants were introduced to this model (under review).

Most participants reported a number (>10) of varied biological and psychological influences of pain. It was important for participants that how the pain started was explored (e.g., surgery, injury, gradual/unknown, stress). For one participant (PID4), the continuation of pain, despite recovery from physical injury resonated. One participant reported that they had moved towards acceptance that pain was mostly perpetuated by psychological factors including stress and tension (PID1) as they had exhausted all reasons for their pain; they were now using mindfulness, breathing and monitoring their own posture to relax and manage pain having ceased opioids in the past eight weeks (a significant change from individual interview). Social factors were considered less influential. One participant (PID8) described how Covid has impacted their ability to go to church and that church often resulted in feeling better in terms of her overall wellbeing and pain; “I feel better when I come out of church then I did when I go in, and you know pain wise and all over wise”. Another discussed the role of carer responsibilities on her pain management experience; “[social factor] well I can’t try medical marijuana even though a doctor offered it to me because I said to him I have to roll out of bed at 2 in the morning if her [elder mother who they care for] alarm goes off so I can't be taking that.” (PID9). This facilitated patient understanding of how individualised social factors can influence pain experience.

Suggestion 5: Pain psychology education

Closely related to Theme 3, participants reported that education should be focused on pain processes. One participant (PID4) described how it was helpful to understand how pain impacts the nervous system over time and how the body “holds” pain, especially because their injury had healed, and that they now wanted to understand more about the influence of mental health. Another participant was open to discussing the role of mental health in pain with psychologists or psychiatrists because their injury had gone, and pain was persisting (PID9).

Suggestion 6: Assessment measures and feedback need to be holistic and patient-inclusive

Participants reported that assessment measures could focus on pain, its impact, medication use, and personality styles. It was important to all that measures are inclusive in terms of language and are non-judgemental. Participants reported that they liked how items on some measures asked about how you feel (e.g., capturing feelings of anger, frustration) and the impact of pain on relationships (for example, arguments in the COMM).

Participants reported that they did not think the measures provided captured the pain journey (historical factors) as well as personality factors; though the research team communicated that this was probably a function of only providing participants with opioid-related measures. Focusing on opioid use in the past 30 days (as noted in the COMM) was viewed as restrictive: “This is all in the past 30 days, yet it says holistic there [on whiteboard], peoples pain experience, you know a holistic pain experience isn't just in the last 30 days it’s in the last years….people have ups and downs, you might have had a really great 30 days. It doesn't really represent somebody’s holistic pain experience...” (PID1)

The items were reported to result in some participants feeing judged (e.g., taking opioids illegally or outside of their prescription; counting pills) and that they were a “drug addict” (PID9). Participants discussed a sense of relating the pill counting questions more to anxiety than misuse; “[SOAPP-R] counting pills, only reason I would count them is because I’m anxious about not having enough, not because...its anxiety related not accumulative.” (PID1).

It was suggested that the wording of some of the items could be modified to be less stigmatizing or measures could be introduced to participants and sensitivities flagged. One suggestion was to ask participants how they felt about questions about opioid use and give them a free text box response option (PID8).

Suggestion 7: Inclusion of broader goals that target the whole person

Participants suggested that goals should target the whole person in addition to focus on medication action plans. One participant (PID9) discussed that she felt able to focus on improving physical fitness in the context of having an achievable plan for reducing her tramadol and managing withdrawals already in place. It was also discussed that goals should empower patients, facilitating a sense of control and autonomy, consistent with a biopsychosocial mindset (Theme 4; e.g., success = confidence + mood boost = reduced pain): “Once you achieve something and you've got that little bit of success, that endorphin release also helps with your pain. [PID9 yeah yeah]. So, you've achieved something and that feel good feeling is yeah” (PID8).

Suggestion 8: Goal is to increase happiness and level of comfort rather than a focus on being pain-free

As part of the ‘peeling the onion’ exercise (to gradually work towards deeper understanding of the problem to be solved), patients reported that the goal of the intervention could be to make someone’s life better and to increase their happiness. It ideally would help people to lead a “normal” lifestyle. Interestingly, participants did not focus on the goal of being pain-free, but rather being “comfortable”. Most had moved towards acceptance of pain and that they may never be pain-free. See Figure 2 for a summary of the exercise and key discussion points.

[Insert Figure 2 here]

Suggestion 9: Varied approaches to coping skills training could be applied

Participants reported that the concept of a person’s personality playing a role in their pain and opioid use was considered important (e.g., “Are you a 100mile person or are you slow and steady, you know, it misses that completely (PID1).” The majority of participants reported that they identified with both depressive- and anxiety-prone personality characteristics. There were a range of coping strategies that participants identified could target depressive-proneness and also pain such as listening to music, deep breathing, doing enjoyable things, and taking action. Coping strategies targeting anxiety-proneness included relaxation and releasing tension in the body (e.g., gentle stretching/yoga), mindfulness and meditation, distraction, set a challenge goal to face the anxiety head-on, ask for help. There were also additional strategies that could target both personality styles including going for a walk, talk to someone about how you feel, and surround yourself with supportive people. See Figure 3 for a summary of this exercise.

There were varying perspectives on using a personality-targeted approach; some participants liked the targeted approach and wanted to be directed to the strategies corresponding to their personality style. Others preferred to be offered a full range of options and an opportunity to select the strategies themselves appealed to them. PID8 said, “Yeah because you like to be told what to do and I like to choose what I do. But that’s different personalities. I’m the boss of me, no body be telling me what to do, you know.” PID 1 said, “I don't know if the selection will work because if you're feeling anxious and stressed, being told to pick one of them is going to be overwhelming itself. You know if you're lonely and depressed, you might not necessarily want to choose you might just want someone to say right you’re doing this. Like a decision might actually contribute to this [all agreed with this].”

[Insert Figure 3 here]

Intervention process and guiding principles

Suggestion 10: Therapist-guided when needed and accountable

Participants highlighted opportunities for connection and support from health professionals and peers were important. There was a need for “good advice” when called on and someone to talk to on bad pain days. Suggestions for resources (e.g., website links) on topics of interest as well as use of social media groups (e.g., Facebook pain groups) were also viewed as helpful. A chat box feature was suggested as one way to connect with health professionals (see Figure 3). Immediate responses from health professionals and options for where to seek further help were also seen as important (e.g., drug and alcohol phone service). Participants agreed that the BI needs to be therapist-guided rather than a self-management approach. It was suggested that a therapist-guided approach would provide both extra support and also accountability: “You'd want it to feel like there is that actual support” (PID9); “I guess if it’s not being monitored then you think what's the point?” (PID11). Participants discussed value in health professional contact at initial onset of the BI; in completing assessments and pain journey discussion.

Suggestion 11: Engaging easy to use features including peer support

Suggestions for how to best engage patients included the engaging colour schemes, use of games and competition like ‘scoreboards’ and the ‘steps challenges’ were viewed as motivating. Reading and sharing of patient stories would help to normalise experience and provides ideas for what has worked for others. PID9 described the value of Facebook support groups. Hearing others’ stories were highlighted as important: “Even just hearing everyone’s story, just feel not as alone” (PID4). There were examples of chat boxes, website links, chat rooms, and forums to facilitate this. There was a suggestion that this support would be very helpful particularly on bad pain days. One participant suggested that access to journal articles that were translated into simple summarises for patients would be helpful, or videos of user-friendly up-to-date evidenced based research summaries. It was important that the brief intervention is simple and easy to use.

Suggestion 12: Compassionate, responsive, and person-centred care

Participants reported a need for compassionate and personalized care from all treating health professionals. It was important that they were seen as a person and not as a number (PID11) and that care is tailored to each unique individual with pain. Comments about "being told pain was all in my head" (PID7) were viewed by participants as invalidating and unhelpful to treatment discussions. Empathy was agreed as a necessary ingredient to care as was responsivity of health professionals. Some participants suggested that greater access to health professionals particularly on bad pain days via digital means could better meet their support needs (e.g., GP contactable on facetime, he does tele[health], emails [PID11]).

Suggestion 13: The option of digital BIs was new and exciting, maximizing reach

All participants had not come across a digital brief intervention for CNCP in their searching for effective treatment solutions. They said they were excited for a new option that could potentially help themselves and other patients. Participants discussed hope that their experiences would inform the design and development of the BI that could offer more support to patients and earlier intervention. A digital platform was seen as an ideal way to deliver the intervention for maximum reach and access in a way tailored to patient's needs. One patient had experience using apps (e.g., Smiling Mind) which was reported to give them more confidence in the potential use and acceptability of a digital BI.

Suggestion 14: Educate and normalize challenges navigating the health system and policy

Participants discussed difficulties navigating the health system and indicated value in providing education on the rationale for policies and legal restrictions that may impact on their opioid and pain management. Including this social environment and medico legal background may serve the function of normalising challenging experiences (e.g., changes in opioid use), acknowledging differences in the treatment they received in the past (20 years ago) to current best practice, and reducing perceived judgement from care team and BI harm reduction strategies (e.g., methadone associated with feeling judged as "a drug addict").

Suggestion 15: BI engagement suited to a variety of settings

Participants suggested that disseminating or promoting the BI would be suited to a primary care setting, with use of flyers in the waiting room or to those on specialist waitlists. Additional suggestions for engaging potential participants in the intervention included use of social media, Google advertising, as well as BI advocates and word of mouth. Because it was discussed that everyone is on their phone, there was agreement that online promotion may be more effective than hardcopy leaflets. Health professional and particularly GP education and awareness of the program was seen as key.

Patient ranking of importance of intervention components

Patients ranked the importance of seven digital BI components from most important (1) to (7) least important:

1. Support
2. Coping strategies
3. Education
4. Assessment
5. Feedback and monitoring
6. Goals and action plans
7. Fun

Table 4. Guiding content, principles, and process suggestions from the individual patient interviews/focus groups

Suggestions	Brief description	Key examples from patient interviews
Content		
1. Non-pharmacological treatments other than opioids for pain are necessary	Pain management strategies not just strategies to manage opioid use (e.g., relaxation, exercise, pleasant & valued activities, pacing; accessing to psychology & multidisciplinary team approaches).	I'd rather just not use the opioids at all and get help in other ways like ether it be therapy…I think Drs should be careful in prescribing them….and look at other things they could do for you (PID7) They'd have to find some other way to deal with the pain whether it's psychological or medical, I don't know… You've got to give them options. You can't say "no, you can't take this anymore" ... I'd like it to be none (PID10) But if you're suffering obviously mentally, it kind of puts your body through a bit of stress, stressful situation that can cause like tension or psychologically it will inflict pain…So who knows, maybe a psychologist or whatever that was in pain, to help them mentally think about their pain in a different way, that would probably help…(PID5)
2. Personalized medication plan & regular monitoring	Medication plans that are individualised to the person's circumstances & includes achievable goals & regular monitoring by	Refer to someone who can help taper in a personalised way… clear taper program with options to increase dose again if needed … More regular monitoring by GP e.g. every month instead of 6 months (PID9)

	health professionals over time to assess progress and identify concerns.	They want to come off them, if they think that they no longer have a physical use for them and might only be psychological they would need something to help them get through withdrawal symptoms (PID10) I don’t feel the GP’s support is enough…GP never asks me to keep a diary…they are not actually checking on if you have taking too many (PID1)
3. Opioid use reflection and education	Opportunities to reflect on if opioids are working for them and providing the necessary education.	Explore potential problem in a non-judgemental way… I think finding out what the reason is and why it is important… But I think it's very important for the doctors, as the ones prescribing the medication to actually sit there and go, all right, here’s the side effects (PID5) After seeing that program on the TV about the ‘pharmacist’ [context], I realised how bad they really are. I didn’t realise before …I'm clean. and even when I broke my shoulder and I had to take fentanyl in the hospital I phoned my sponsor first to make sure that it was okay for me to have it. (PID8).
4. Education on the biopsychosocial model of pain	The biopsychosocial model provides a relevant framework for understanding pain experience.	It [biopsychosocial model] does make sense because I never connected it until I actually spoke to you on the phone. Because I had a good think about it and when there were family issues or when we moved house or anything really stressing my back pain would flare up. and it was almost like my pain levels, like my back was dealing with the stress. I had no control over that, I was just feeling what was going on and the pain levels go up... it’s interesting, I didn't know that stress impacted and now when I think way back to when my back pain really kicked in it was a really stressing time.” (PID9). I can definitely relate to what you were talking about earlier that even when you've recovered your body still holds onto the pain because I feel that that’s very much what's happening to me… long term pain puts stress on your nervous system and you can hold your pain because I've noticed lately that ever since I've had this when I get shoulder pain or something like that even just muscular pain it stays for a very long time because my body is in this constant state of alertness that it just holds pain. So, if I get a sore neck or something like that instead of it going in two days which it would 5 years ago, it now stays for weeks or even months because of my like nervous system (PID4).
5. Pain psychology	Education on pain	I'm really looking forward to speaking to like a

education	processes & the influence of psychosocial factors on opioid use.	psychologist/psychiatrist about the mental side of it because my injury is gone. I'd had the injury years ago. My injury is gone and my pain is still there so I want to talk to somebody because I think it might also be a lot to do with mental as well. So yeah, I'm actually looking forward, I've never talked to anyone, so like [PID1] was saying, she just had a moment (PID4).
6. Holistic assessment measures & feedback	Assessment measures & feedback are holistic and patient inclusive.	“I like how it [COMM] asks a lot of questions about how you feel and relationships like arguments... because I think pain effects so many things. It effects your relationships. it affects how you communicate with people. If you're in a lot of pain you can’t think clearly. You are and you get angry at anything you get ticked off or annoyed or frustrated. So I think a lot of these comments if you know people are in pain they could relate to this very very (*sic*) a lot of these questions...very relevant.” (PID4)
7. Broader goals that target the whole person	Broader, personal goals that target the whole person should be included.	[Facilitator: not just medication focused goals?] Because I think it all comes to, its holistic, it’s all encompassing, every part of your life needs to be looked at [– group agreed] (PID8)
8. Goal is to increase happiness and level of comfort	Goal is to increase happiness and level of comfort rather than a focus on being pain-free.	[Success would look like] A happy person... a well-adjusted person. A person who's not in constant pain. The list goes on… I would be happy with it making me comfortable (PID8).
9. Varied approaches to coping skills training	Varied approaches (individual choice vs personality-targeted) to coping skills training could be applied.	Yeah because you like to be told what to do and I like to choose what I do. But that’s different personalities. I’m the boss of me, no body be telling me what to do, you know (PID8) I don't know if the selection will work because if you're feeling anxious and stressed, being told to pick one of them is going to be overwhelming itself. You know if you're lonely and depressed, you might not necessarily want to choose you might just want someone to say right you’re doing this. Like a decision might actually contribute to this [all agreed with this] (PID1)
Principles and process		
10. Therapist-guided when needed and accountable	Guidance from health providers preferred rather than self-management approach to facilitate patient motivation and ensure accountability.	Could lose motivation very quickly if doing it yourself (PID11) Maybe having a drug counsellor or someone they can speak to on phone or online when they feel they are struggling with their medication (PID7) Psychologist to your house and the house visits for people that can't get out. That would be ideal, you

		know… Video for a psychologist would be good…. I just get all tense to probably just when I'm in front of someone talking to, but that's just me (PID3) If someone willing to reduce that (opioids), if they're willing then they will (PID11)
11. Engaging easy to use features including peer support	A combination of engaging features (visual, verbal) including peer support to share similar experiences and ideas with and provide moral support when needed.	Even just hearing everyone's story, just feel not as alone (PID4). Sponsor like AA where if they want to take an extra tablet, they talk you out of it (PID9) Someone I could talk to, relate to, be there, just for the psychological side of it. People to talk to… Moral support was a big part of it. I reckon if I had someone to talk to a lot, when I was going through it wouldn't have been so bad. Just having friends that are going through the same thing (PID11)
12. Compassionate, responsive and person-centred care	Treat the person not the number, providing non-judgemental and care personalized and responsive to the patient's needs.	I would have appreciated at the start not being told it was all in head and having just opioids thrown at me (PID7) Support, having someone see them as a person and not see them as a number (PID11) It's not a one size shoe fit all (approach to pain management) (PID5) Goes back to the training that doctors get, "if you don't fit in this box, I'm sorry, we don't have a solution for you but try this". That's just my initial feeling. And there's too many people…everyone is different… Because it's a very individual thing I think. Handling pain, dealing with pain…(PID10) With our other doctor, at least we could drop in and say, oh, my God, it's freaking hurting today (PID2)
13. Digital solution for maximizing reach	The new and exciting option of digital brief interventions maximizes reach.	If there was sort of like a program available and then that was part of it, so if I ever went to the doctor and said I want to reduce my tramadol slowly over time he could say "well, here's the website" and he'll register me for it and sort of he communicates with that website as well so when I go back to him he can see that I've done all the criteria and then he can reduce my medication (PID9) because the pain was so bad and the depression was so out of hand, it was very hard to use the CBT. So having something like an online resource, like you're talking about would have been fantastic… if these

		things are easy to access and you don't have to wait six months and be still waiting to see someone, to talk someone. That would be marvelous (PID7) PID7) It would be really really good to be able to have something where you could be like, what can I do now? That would be really good because then you feel someone is on your side, someone is trying to help you plan. You’re not just being left (PID15)
14. Educate and normalize challenges navigating the health system and policy	Education about policy changes and normalizing the challenges of navigating the health care system.	The GP put me on tramadol in 2007 and when the government brought that thing on the first of June, I had a new doctor and all of a sudden it’s like oh no you can’t be on this, you’ve got to be off, and I’d actually just switched to a new GP and he thought I was doctor shopping. He was quite judgmental (PID9)
15. Brief intervention engagement suited to a variety of settings	Disseminating or promoting the brief intervention is suited to a variety of settings (e.g., primary care; specialist wait lists; word of mouth; social media).	To be honest I have told my followers [on social media] that I am here today (PID13) My GP just quickly prints stuff, for me to take home, if they know about it, it is a matter of ‘try this’ (PID9)

Health professional perspectives

Five themes were identified from the data as important considerations by health professionals to the development of the digital BI and its implementation in clinical practice. Barriers and enablers were also identified.

Theme 1: Use of digital health interventions/resources within clinical practice was rare but desired

Health professionals described that they do not tend to integrate apps/digital interventions into their clinical practice. One health professional said, “it would be rare that I’d use a program in the clinic with someone I’m actually treating”. Instead, they were generally viewed as an adjunct to treatment. For example, health professionals would recommend online programs for pain such as Mindspot Chronic Pain program or more general mental health apps (e.g., Headspace, Smiling Mind). Health professionals also recommended patients’ access TED talks, podcasts, and educational videos (e.g., Brainman videos), as well as resources they had developed themselves (e.g., mindfulness audio files; sleep hygiene information). Most only recommended resources that they have evaluated themselves. Some health professionals highlighted that integration of digital health into their practice was practically challenging: "I've never really tried to integrate an app into treatment because it's always been a bit too challenging in terms of working out how to get the feedback and what to do with it then.''

There was recognition amongst health professionals that it is important to point patients to digital resources that are free and easily accessible: "They are not all free, or only free for a while and then a subscription is required." It was also acknowledged that some patients may not have access to the Internet and that digital resources were generally not inclusive of culturally and linguistically diverse patient populations. Some health professionals reported that they would like to use digital health resources more in their clinical practice: "Depending on the demographic as in CALD (culturally and linguistical diversity), not really many resources I can use but I don't use it as much as I would like to."

Theme 2: Digital health useful for patient monitoring of symptoms and access to support on the run

Health professionals reported that apps can be useful for patients to monitor their symptoms over time as well as their use of other treatments (e.g., cannabis). There were reports that digital health can increase access to support such as coping strategies and resources. One health professional said, "Can be useful to access it remotely such as if they are in a shopping center and feel anxious they can sit down and do some calming exercises." Another said, "24-hour access is important for middle of the night etc. They don't need to ring a 1800 number to get access to information." While benefits were mentioned, some health professionals reported that their clients preferred to minimize the use of digital health: "Many of my clients just prefer to keep it simple, won't even use video [during telehealth], just want a phone call consultation."

Theme 3: Patient motivation to use digital health resources is important

Patient motivation to use digital health was considered important in whether these were successful in clinical practice. One health professional said, "I find that that apps are only as good as the client's motivation to use them" and another said, "Sometimes we recommend things and they don't get acted on… take a lot of prompting to use themselves". There was acknowledgement that patient motivation can be influenced by several factors (e.g., how easy it is to download an app) and that some patients may not be motivated to change behavior, try something new, or use digital health resources.

Theme 4: Digital BI app for this complex problem may be beneficial and at multiple points in the health care *journey*

Overall, health professionals agreed that a digital BI for the complex problems of CNCP and risk of opioid-related harm may be beneficial for patients. Health professionals reported that the digital BI could be helpful for patients to complete prior to referral to pain specialist services: "I see it as helpful before come to me [specialist pain clinic] because it will shift their readiness for change and make more open to when they come to me. Would use this as a pre-intervention". There were also reports that the digital BI may be "Useful to bridge gap between primary care and pain services, so not waiting for so long.". One health professional said, "Good for those on the waiting list for specialist services… it might mean that by the time they get to that service they might be more ready, knowledgeable, more open to alternatives… help to set up expectations of treatment approaches".

Others reported it could fit within a primary care setting, or even be used for prevention of opioid use problems: "I think it could be useful across the board. In my clinic though, patient selection is important if you want to get best results. Could help to move people who are at the pre-contemplation stage." The patient's stage of change/motivation was reported as important in considering best intervention point (linked to Theme 3). There was also suggestion that the digital intervention could be delivered by private psychologists, mental health professionals, multidisciplinary pain clinics or in primary care by nurses or physicians: "the GP could refer patients to or deliver the app before they prescribe."

Health professionals reported that patients would prefer to access the intervention via a mobile app or device rather than a desktop website, due to convenience and portability. There was also recognition that a digital intervention would have challenges for some patients and there was a need for therapist-guiding: "Both (app and website) have access issues. Would be good to have an option to do the program somewhere; in the GP office, at the MDT (multidisciplinary team) clinic while they're waiting on the wait list etc. Either way patients would need health professional support for access and troubleshooting as well as for the monitoring and goal setting."

Theme 5: Realistic patient goals focused on safe use of medications and managing pain

Patients' goals that are focused on safe use of opioid medications including increased willingness or openness to change unsafe use were supported. Health professionals also reported that goals related to use of alternative pain management strategies and pain acceptance may also be achievable: “Can we get to them to move a little bit on changing behavior - willingness to change opioid use and use alternative strategies.” Setting realistic goals were important: “I’d work on positive wins towards the overall goal. So much going on for patients, other things to manage.”

Barriers to implementation

Some health professionals reported that more than four hours of intervention may be required to achieve the patient’s goals. Costs related to who would deliver the intervention were identified as a barrier as well as clinicians setting aside time for support (e.g., viewing patient monitoring). There was also concern that some patients may be defensive about making changes to their opioid use and that some patients do not trust health professionals to talk about their opioid use.

Intervention enablers

Health professionals viewed that the underlying philosophy of the digital BI (motivational interviewing, enhancing patient self-efficacy) was consistent with how they approach their clinical work. There was recognition that implementation of the digital BI would be most effective if considered within a stepped care model (i.e., primary care à digital BI à specialist care; related to Theme 4). There were also reports that feedback to patients (about their opioid use, pain, and mood) is “always helpful”, as is patients’ response to this information. This information can then be used to troubleshoot/problem solve.

Discussion

This study aimed to understand patient and health professional preferences, including implementation considerations for a new digital BI to reduce opioid-related harm for patients with CNCP. We found nine suggestions related to intervention content and six related to guiding principles and processes from patient reports. Based on reports of five experienced health professionals, we identified five themes as well as several barriers (including intervention intensity, potential costs, and patient responsiveness) and implementation enablers (including consistency of theoretical underpinnings with current practice, patient feedback, and the digital BI as part of a stepped care model). See Table 5 for an overview of the patient and health professional suggestions and themes.

Table 5. Summary of suggestions and themes

Patients
Intervention content
1. Non-pharmacological pain treatments other than opioids are necessary
2. Personalized medication plan and monitoring
3. Opioid use reflection and education
4. Education on the biopsychosocial model of pain
5. Pain psychology education
6. Holistic assessment measures and feedback
7. Broader goals that target the whole person
8. Goal is to increase happiness and level of comfort
9. Varied approaches to coping skills training
Guiding principles and processes
10. Therapist-guided when needed and accountable
11. Engaging easy to use features including peer support
12. Compassionate, responsive, and person-centered care
13. Innovative digital solution for maximizing reach and engagement
14. Educate and normalize challenges navigating the health system and policy
15. Intervention engagement suited to a variety of settings
Health professionals
1. Digital health use rare but desired
2. Digital health useful for patient monitoring/accessing support
3. Patient motivation is important
4. Digital brief intervention app likely beneficial and at multiple care points
5. Safe medications use/managing pain goals

Overall, both patients and health professionals reported that a digital BI to reduce opioid-related harm in a CNCP population could be beneficial. Health professionals also highlighted that digital health may be particularly useful for patient monitoring of symptoms and access to coping skills support (e.g., deep breathing exercise) *on the run*. Patients agreed that a digital solution could enhance reach of BIs to people who need it. Certainly, there is growing interest and evidence for the role of digital BIs in treating pain [15; 19; 54].

Several aspects of intervention content were identified as important to future co-design and co-development of the digital BI. In line with clinical guidelines that recommend multidisciplinary and behavioral treatment approaches as first-line [e.g., 9; 23], patients reported that inclusion of non-pharmacological pain management strategies would be welcomed, rating this as one of the most important features of the digital BI. These included relaxation, exercise, pleasant and valued activities, and pacing as well as access to psychology & multidisciplinary team approaches. Patients also indicated that personalizing coping skills training to patient personality characteristics (e.g., impulsivity traits) and pain-related factors (e.g., depression) could benefit some patients, while others may prefer to direct themselves to coping skills that resonate with them. Individual choice could be built into the digital BI to recognize patient differences in autonomy. Notably, non-pharmacological approaches can achieve similar or even greater improvements in pain and functioning without the potential harms of dependence, adverse side effects and overdose. This is especially important as patients generally report that opioid therapy has modest effects on levels of pain and functioning [1; 10; 40].

There were educational needs identified by patients in the areas of pain psychology, the biopsychosocial model of pain and opioid therapy. These findings are in line with the high levels of interest and increased need for patient education about the role of psychology in the management of pain [14; 17]. Educating patients in the biopsychosocial model of pain forms part of multidisciplinary rehabilitation and discipline-specific treatments that can be effective in reducing pain and disability in the short to medium term [e.g., 44; 52]. Helping patients to reconceptualize pain can also enhance their ability to cope with their condition [51]. The importance of safe opioid use education is highlighted in clinical guidelines [23; 29]. Few studies have examined the effectiveness of opioid use education for patients with chronic pain. Based on the evidence available, opioid-related education can lead to safer behaviors (e.g., less stockpiling [30]) and reduced opioid use post-surgery [55]. Gaps in educating patients in pain management, influential biopsychosocial factors, and safe use of opioid medications continues to put patients at risk of poor recovery and exposure to detrimental opioid-related harms. Ongoing weighing up of the benefits of opioid therapy in the treatment of CNCP versus risks could be facilitated by a health professional-delivered digital BI. This could be embedded within review of the patients personalized medication plan and be supported by regular monitoring and assessment of medication use as well as related symptoms that consider the *whole person* (e.g., pain, mood, functioning). Health professionals considered digital health as an optimal platform to facilitate patient monitoring of symptoms. Patients also report that one of the top three activities that they want to do on their mobile device is manage their medication and track their health [2]. Digital BIs that aim to reduce opioid-related harm have the potential to meet this need.

Patients tended to focus on the potential of the digital BI to meet general well-being goals and reduce pain discomfort to facilitate safer use of opioid medications. Health professionals indicated that patients would be likely interested in pain reduction goals but suggested that goals related to safe use of opioid medications could also be important. If goals are to encompass the needs of the whole person, then it will be important to explore patient pain-related goals, opioid medication harm reduction goals, as part of holistic goals related to relationships, work and lifestyle. To facilitate behavioral change, knowledge transfer and patient engagement, different innovative approaches (e.g., gamification, serious games) could be explored in future studies.

Health professionals reported a desire to integrate digital health interventions into their clinical practice in a more conscious way. Real-world implementation of DHIs have often failed, often because they are not used by patients or health professionals [38]. Engaging health professionals in the co-design process has potential to enhance digital BI feasibility and acceptability in translation into practice, as digital BI success in health care settings relies heavily on engagement of key stakeholders in the design and implementation of DHIs [46]. Our results could inform development of a broader digital BI implementation strategy that considers barriers identified by health professionals (e.g., costs; time; compatibility between the digital BI and their current workflow) and enablers (e.g., perceived fit of the digital BI approach to current practice), which are common across DHIs and healthcare settings [42]. Further consideration of the systems used (e.g., mobile app vs website; health professional assistance) and adaptability, policy/guideline support, resourcing, health professional knowledge and beliefs, and involvement of digital BI *champions* to support patient motivation [42] may help plan and undertake effective digital BI implementation. Most psychologists and mental health professionals (72%) have little or no formal training in pain management and more than 50% report feelings of a lack of confidence in treating pain [17]. Training and education for health professionals in delivering digital BIs could be particularly important in supporting implementation and effectiveness.

Similar to other digital BI studies [20], a therapist-guided digital BI was preferred amongst patients and health professionals rather than self-guided approach. According to patients, therapist guidance would enhance patient motivation and engagement as well as provide accountability. Health professionals also identified a need to consider potential patient-related factors in digital BI uptake such as patient motivation as well as patient sensitivities to opioid medication use discussions. Evidence indicates guided digital cognitive behavioral therapy and face to face therapy for psychiatric and somatic conditions produce equivalent overall effects [12] and when therapist support is included, this has a positive impact on engagement and treatment effectiveness [6]. Therapist-guided digital BIs provide opportunities for establishing mutual trust which can be a barrier to intervention success [5]. This may be critical as health professionals report that discussions about chronic pain management including medication use can be challenging; with patients reporting the context of opioid policy change can further fuel mistrust. Guided digital BIs allow for therapists to foster a strong therapeutic alliance, with empathy and compassion, treating patients as partners in their health pain care – providing the foundation that's necessary for successful intervention implementation and effectiveness. Further consideration of how patients can communicate and share relevant information and updates to health professionals and how health professionals can consume this information efficiently to further personalize their services and facilitate multidisciplinary collaboration is needed. When asked to rank the importance of the BI features, patients reported *support* was the most important feature, while *fun* was the least. Future co-design opportunities could explore meaningful ways to integrate gamification and digital peer support to facilitate patient engagement.

Both patients and health professionals reported that the digital BI could be best placed and adopted in primary care, multidisciplinary pain centers while patients wait for treatment, addiction services where it could be an adjunct to in-person treatment; and that it could be tailored to prevent opioid related harm in people with acute pain. There was also suggestion that digital BIs could form part of a stepped care model. Future research is needed to determine whether digital BIs for treatment of opioid-related harm are effective and for whom and in what setting.

Strengths and Limitations

Most previous studies have not included the views of key stakeholders in the design of DHIs [36; 53]. We advanced co-design of a digital BI to reduce opioid related harm in people with CNCP by examining both patient and health professional perspectives on their intervention needs and preferences. Our study adds to the growing literature on co-design in digital health interventions [50] and extend research into the CNCP field.

We included data from 18 individual patient interviews as well as data from 7 patients and 5 health professionals in focus group workshops. While there are no guidelines on the minimum number of key stakeholders or frequency/intensity of engagement that is needed in co-design, it is possible that our results may not generalize to the broader CNCP, prescription opioid-using population or beyond the Australian context where patients have access to a relatively high standard of public health care and access to heavily subsidized medications. Continual engagement of different patients and health professional perspectives in the subsequent steps of co-design and co-development of digital BIs could increase customizability of the solution, to fit a wider range of users. Investigations in countries with different health systems are needed. Further, there remains a power differential between patients, health care providers and researchers. It is unknown how this may have influenced our findings. Future work should explore jointly developed guiding ethical principles to address the relationship power imbalances in co-design. We examined patient needs and preferences for design of a digital BI.

Conclusion

Partnering with patients who have CNCP to identify their intervention preferences is critical to the co-design of new and innovative digital treatments. Patient and health professional reports indicated that digital BIs are highly desired. We identified key content areas, principles, enablers and barriers to guide development of such programs. This co-design approach has the potential to enhance translation of digital BIs into practice and improve clinical effectiveness. The next phases in co-designing personalized digital BIs involve the generation of later design concepts (e.g., journey mapping; persona development) and prototyping, whilst considering development of an implementation strategy. Continual genuine bringing together of scientific, patient, clinical, and technical expertise to solution design could address the urgent need for better patient-centered, CNCP care while minimising the risks of opioid medication-related harms.

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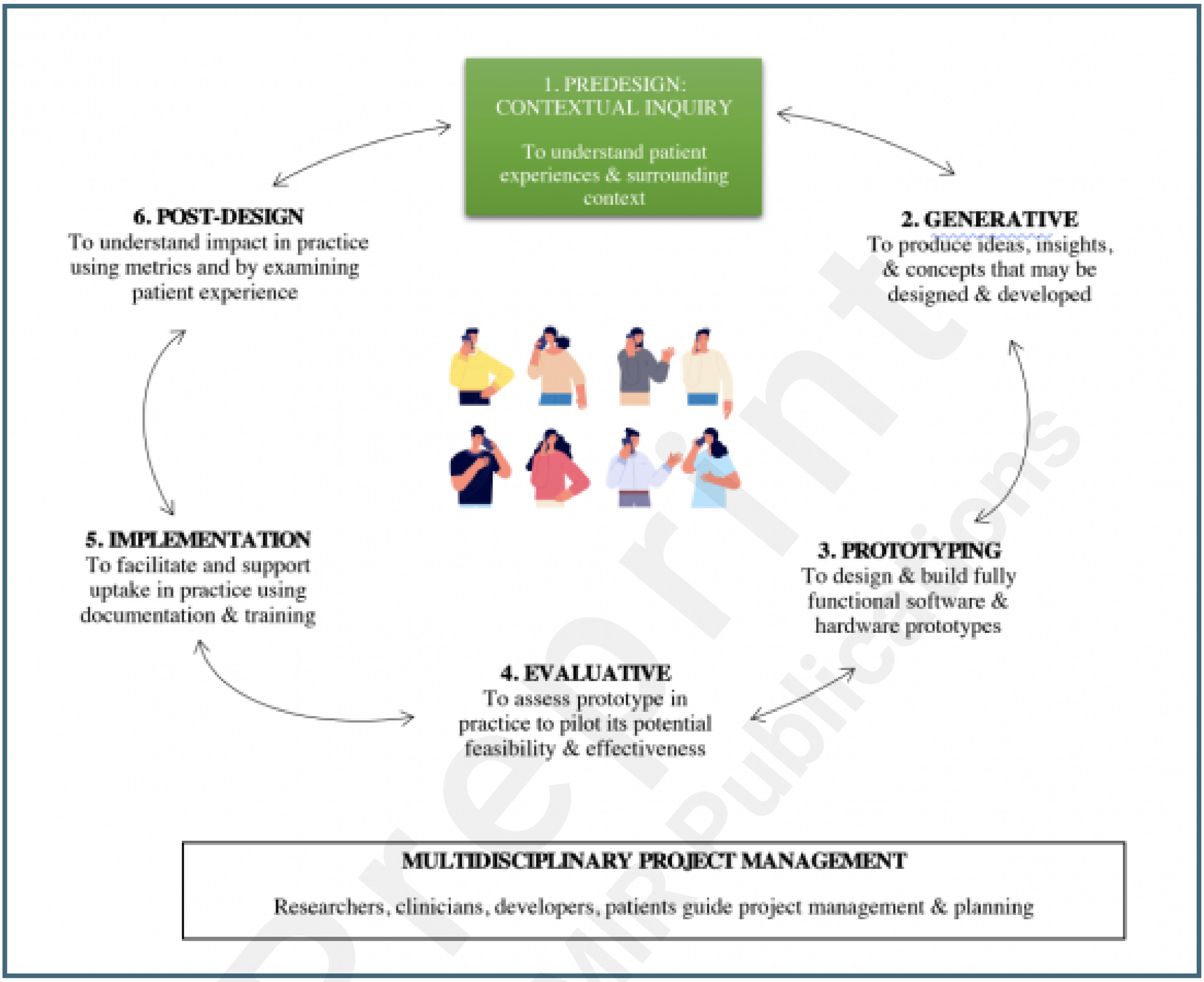
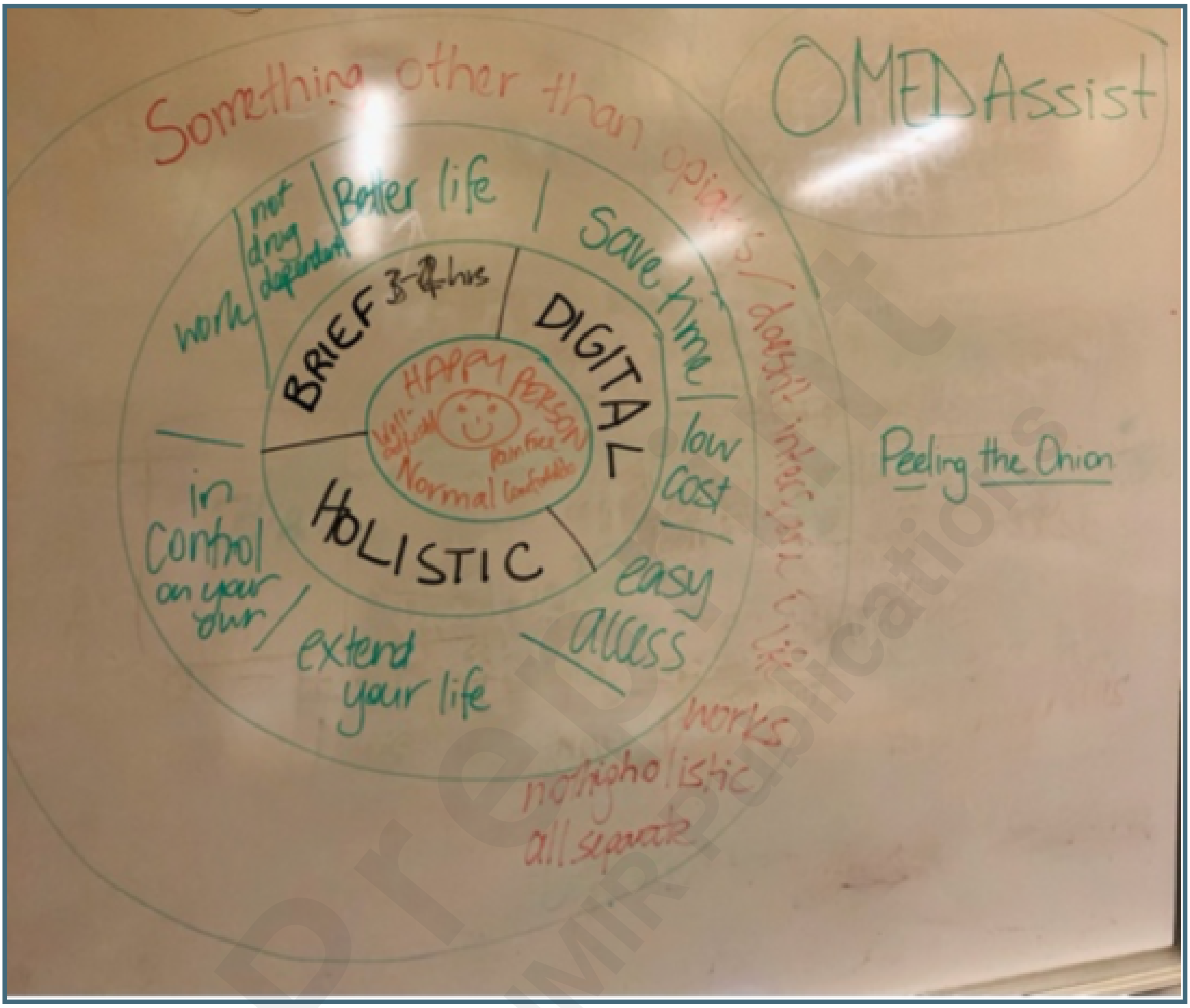
Supplementary Files

Figures

Project co-design stages. Phase 2 reported in this study highlighted in green.



‘Peeling the onion’ activity to explore the potential goal of the intervention.



Exploring personality-targeted coping skills training.