




# BMJ Open Evaluating acceptability and feasibility of a mobile health intervention to improve self-efficacy in prescription opioid tapering in patients with chronic pain: protocol for a pilot randomised, single-blind, controlled trial

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**To cite:** Magee M, Gholamrezaei A, McNeillage AG, *et al.* Evaluating acceptability and feasibility of a mobile health intervention to improve self-efficacy in prescription opioid tapering in patients with chronic pain: protocol for a pilot randomised, single-blind, controlled trial. *BMJ Open* 2022;**12**:e057174. doi:10.1136/bmjopen-2021-057174

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-057174>).

Received 07 September 2021  
Accepted 17 March 2022



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## ABSTRACT

**Introduction** Opioid medications are no longer recommended as long-term therapy for chronic non-cancer pain, and many patients are advised to reduce or discontinue opioid medications. Many patients report difficulties in tapering opioid medications, necessitating supporting interventions. This protocol describes a pilot randomised controlled trial (RCT) to investigate the acceptability, feasibility and potential efficacy of a mobile health intervention to improve the opioid tapering self-efficacy of patients with chronic non-cancer pain.

**Methods and analysis** The trial will be a single-blind (clinician, data collector and statistician-blinded) pilot RCT with two parallel arms. Forty adult patients with chronic non-cancer pain who are voluntarily reducing their prescribed opioid medications under medical guidance will be recruited from two tertiary pain clinics (Start date 25 August 2021). Participants will be randomly assigned to an intervention or control group. Both groups will receive usual care, including multidisciplinary pain management. In addition to usual care, the intervention group will receive a short informational and testimonial video about opioid tapering and will receive two specifically text messages per day for 28 days. The intervention is codesigned with patients and clinicians to provide evidence-based informational, motivational and emotional support to patients with chronic pain to taper opioid medications. Feasibility of the intervention and a future definitive RCT will be evaluated by measuring patient acceptability, delivery of the intervention, rates and reasons of exclusions and drop-outs, completion rates and missing data in the study questionnaires, and obtaining estimates for sample size determination. Potential efficacy will be evaluated by comparing changes in opioid tapering self-efficacy between the two groups.

**Ethics and dissemination** The study protocol was reviewed and approved by the Northern Sydney Local Health District (Australia). Study results will be published in peer-reviewed journals and presented at scientific and professional meetings.

## Strengths and limitations of this study

- This article describes the protocol for a pilot randomised controlled trial with the clinicians, investigators, outcome assessors and statistician being blind to the group allocation.
- The mobile health intervention was co-designed with input and feedback from patients with chronic non-cancer pain who had experienced tapering opioid medications and with clinicians experienced with providing support to patients who are tapering opioid medications.
- The feasibility and acceptability measures and the pilot trial design (randomised controlled) will offer insight on whether a future definitive trial can be done and if so how.
- Repeated weekly measures of opioid tapering self-efficacy, pain intensity and interference, and mood will offer insight into the potential effects of the intervention on participants' outcome trajectories.
- The pilot study sample is recruited from two tertiary care multidisciplinary pain clinics, limiting the generalisability of the results to patients in primary care.

**Trial registration number** ACTRN12621000795897.

## INTRODUCTION

### Background and rationale

Chronic pain (defined as a pain that persists or recurs for longer than 3 months)<sup>1</sup> is the leading cause of disability worldwide.<sup>2 3</sup> Until recently, opioid medications have commonly been prescribed for the management of chronic pain.<sup>4-6</sup> However, prescribing guidelines have changed in response to the evidence for dose-related harms associated with long-term opioid therapy and

evidence supporting the efficacy of non-pharmacological approaches in chronic pain management.<sup>7–9</sup> Consequently, many people with chronic pain are now being advised to reduce or discontinue opioid medications.<sup>9,10</sup>

Many people with chronic pain report some difficulties in tapering opioid medications, although experiences vary considerably.<sup>11–13</sup> In the short term, opioid dose reductions can lead to unpleasant withdrawal symptoms and can adversely affect mood and pain.<sup>13–15</sup> However, these adverse effects of opioid tapering are less likely when opioid doses are reduced voluntarily, slowly and on a schedule that is negotiated with the patient.<sup>9,16</sup> In addition, the trajectory of patients' experiences during opioid tapering has been associated with access to a variety of supports, including access to pain education, routine monitoring, a strong patient–provider relationship, social support and strategies for managing pain and withdrawal symptoms.<sup>16–19</sup> However, access to these supports for opioid tapering is a pervasive challenge.<sup>14,15,20,21</sup>

Digital health interventions using mobile phones (mobile health or mHealth interventions) are emerging as a solution to the global challenge of providing patients with access to support for health behaviour change.<sup>22–24</sup> They are relatively cost-effective, scalable, and can be readily adapted to the needs of diverse demographic groups and chronic health conditions.<sup>22,25</sup> A recent systematic review found that digital health interventions can help to improve pain interference and severity, psychological distress and health-related quality of life in people with chronic pain.<sup>26</sup> However, evidence for the effectiveness of digital interventions to support patients with chronic pain to successfully reduce or discontinue prescription opioid medications is limited.<sup>27</sup>

Magee *et al* surveyed patients with chronic pain who had recently commenced a voluntary opioid taper to explore their attitudes towards using a digital health intervention (text messaging and mobile App) to support them with opioid dose reduction.<sup>28</sup> This research revealed two key findings: First, the majority of participants felt that mobile phone-based interventions (specifically text messaging, SMS) would be useful as a means of providing support for opioid tapering.<sup>13,28</sup> Participants indicated that text messages about the nature of chronic pain, pain self-management strategies, withdrawal symptoms and the benefits of tapering would provide them with instrumental, informational, motivational and emotional support. Second, participants indicated that the content of text messages should be familiar, acting as a reminder of helpful concepts and coping strategies rather than being the primary source of information.<sup>28</sup>

Videos may be an effective means of providing patients with information about chronic pain, pain self-management strategies and opioid tapering.<sup>29,30</sup> Darnall *et al* found that women undergoing breast cancer surgery who received a 90 min pain education and pain coping skills video (in addition to a downloadable personalised plan and digital relaxation audio file) discontinued opioid pain medications on average 5 days earlier than

women who received written web-based general health information.<sup>31</sup> More recently, Feng *et al* found that a brief video about opioid tapering including patient testimonials increased the opioid-tapering self-efficacy of people currently on long-term opioid therapy for chronic pain.<sup>29</sup>

Based on the foregoing research, we codesigned a mobile (video and SMS-based) health intervention to provide support for patients with chronic pain who are tapering opioids under the guidance of a healthcare provider. This study describes the protocol of a pilot randomised controlled trial (RCT) designed to evaluate the feasibility and potential efficacy of this mHealth intervention.

## Objectives

The primary objectives of this pilot RCT are to (1) evaluate the acceptability of a mHealth intervention designed to improve opioid tapering self-efficacy in patients with chronic non-cancer pain and (2) evaluate the feasibility of the intervention and a future trial methodology. For these aims, we will measure delivery of the intervention, rates and reasons of exclusions and drop-outs, and completion rates and missing data of the study questionnaires.

The secondary objectives of this trial are to (1) evaluate the potential efficacy of the intervention and (2) obtain estimates to be used in designing the future definitive trial. These aims will be followed mainly by comparing opioid tapering self-efficacy between the intervention and control groups over the study period (4 weeks).

Other measures including pain intensity, pain interference, mood (depression and anxiety), satisfaction with care, pain catastrophising, pain self-efficacy, opioid dose and experience of withdrawal symptoms are measured to (1) better understand the context in which the intervention is being delivered, (2) obtain estimates for secondary outcome measures and potential mediators and moderators to be used in the future trial and (3) evaluate the feasibility of such assessments.

## METHODS

The report is prepared according to the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT, see multimedia online supplemental appendix A for the SPIRIT checklist)<sup>32</sup> and adapted based on a guide to the reporting of protocols of pilot and feasibility trials.<sup>33</sup>

## Patient and public involvement

This pilot trial and development of the mHealth intervention was in response to research indicating that patients with chronic pain who are tapering opioid medications have a need and desire for support above and beyond that provided by their healthcare providers (ie, 'out of office hours').<sup>28,34</sup> The initial mHealth intervention prototype and trial design (procedures and measures) were developed in close collaboration with clinician-researchers with expertise in pain management and opioid tapering (AS,

MF and BD) and a consumer representative (LD). The initial intervention design was then revised in response to feedback from panels of consumers and clinical experts (see Section 2.5. Interventions). Finally, we received feedback on the intervention implementation and study procedures from a patient who was tapering their opioid medications.

### Trial design

The pilot trial will be a single-blind (treating clinician, data collector and statistician-blinded) RCT with two parallel arms, mHealth intervention plus usual care (intervention group) and usual care alone (control group), with a 1:1 allocation ratio. This design is based on our primary and secondary objectives relevant to the feasibility of conducting a future definitive RCT (ie, trial methodology, drop-outs in each study arm, obtaining estimates and evaluating potential efficacy).

### Study setting

Participants will be recruited from two outpatient multidisciplinary pain management clinics, located within public hospitals in metropolitan Sydney in New South Wales, Australia. Usual care in both clinics includes chronic pain assessment and management by a multidisciplinary team of specialist pain medicine physicians, clinical psychologists, physiotherapists and nurses. Approaches to pain management are multidisciplinary, typically involving a combination of medical (procedural, pharmacological), psychological (group or individual cognitive-behavioural therapy for pain), and physiotherapy (exercise programmes delivered individually or in a group). Participants in the current study are those who are tapering their opioid medication under the guidance of the pain specialist physician. The decision to taper and tapering schedules are negotiated between the patient and pain physician, often in consultation with the psychologist and physiotherapist. Hence, the rate of opioid tapering is patient-centred and is not standardised. The pain specialist physician is responsible for the monitoring and management of withdrawal symptoms and other possible adverse events of opioid tapering.

The recruitment and participant enrolment was commenced on 25 August 2021 and is expected to continue until 1 May 2022, with the date of last data collection expected to be 1 June 2022.

### Participants

Clinicians at each study site will identify eligible patients (box 1) who are voluntarily tapering their opioid medications. The clinician will elicit patient interest in participating in ‘a study investigating patients experiences of opioid tapering and ways of supporting patients with chronic pain who are reducing their opioids’. With their permission, patients who are interested in further study information will be contacted by a research team member (MM) who will provide detailed study information (multimedia online supplemental appendix B), conduct

## Box 1 Eligibility criteria

### Inclusion criteria

- ▶ Age 18 years or older.
- ▶ Diagnosed with a chronic (>3 months) pain condition according to the International Classification of Diseases-11th Revision.<sup>1</sup>
- ▶ Have been using opioid analgesics at a dose of at least 40 mg/day mg/day oral morphine equivalent for at least 4 weeks (ie, participants are likely to have developed a certain level of physical tolerance).<sup>49 64</sup>
- ▶ Have been advised by a clinician to taper opioids.
- ▶ Are voluntarily tapering opioid medications, as indicated by verbalised willingness and consent.
- ▶ Be currently tapering or will be tapering their opioid medications at the time of enrolment. There is no restriction on how many times patients may have attempted opioid tapering, nor is there any restriction of the time participants may have been tapering before entering the study.
- ▶ Able to understand written and spoken English.
- ▶ Own a mobile phone that receives specifically text messaging.
- ▶ Able to give written informed consent and comply with study procedures.

### Exclusion criteria

- ▶ Cognitive impairment or intellectual disability preventing adherence to the study procedure.
- ▶ Evidence of severe opioid use disorder, based on the Diagnostic and Statistical Manual of Mental Disorders.<sup>35</sup> Illicit substance use, including illicit opioid use, is not an exclusion criterion, however, if it fits a wider pattern of symptoms indicating a severe opioid use disorder it may inform a decision that the participant is ineligible for the study.
- ▶ History of primary psychotic disorder, bipolar affective disorder, bipolar disorder with psychotic features, depressive disorder with psychotic features, borderline personality disorder, antisocial personality disorder or positive family history (first degree relative) of psychotic disorder or bipolar affective disorder such that participants might be at more than low/negligible risk by participating in the study.
- ▶ Any other major, poorly controlled medical or mental health comorbidity.
- ▶ Participation in another clinical trial concurrently, since this will not constitute ‘usual care’ and can interfere with the study’s primary and secondary objectives by increasing the burden to patients and influencing estimates.

eligibility screening and if eligibility criteria are met, will provide consent forms for the participant to complete online.

### Screening

Patients who are interested in participating in the study will be asked to complete an eligibility screening interview (multimedia online supplemental appendix C) with a research team member (MM) who is a registered clinical psychologist. If eligibility is not certain, this will be discussed with a specialist pain medicine physician (PG).

Assessment of the current mental health will be based on the Diagnostic and Statistical Manual of Mental Disorders fifth edition (DSM-5).<sup>35</sup> Participants will be asked about their current and historical mental health



diagnoses, and current mental state and treatments (eg, medications). Where symptoms may indicate ineligibility or diagnosis is not clear, further evaluation will be done based on the Structured Clinical Interview for DSM-5 Disorders-Clinical Trials Version.<sup>36</sup>

There are debates over the appropriateness of opioid use disorder (OUD) as a diagnosis within opioid medication misuse when prescribed for chronic pain. For this study, the diagnostic criteria (including severity) will be based on the DSM-5 OUD,<sup>35</sup> similar to other studies.<sup>17</sup> Any participant who may meet the DSM-5 diagnostic criteria for severe OUD, or where there may be concerns about OUD would be reviewed with the specialist pain medicine physician (PG).

## Interventions

### Person-centred development and preliminary testing of video and SMS content

The content of the video and text messages was guided by patients' recommendation<sup>28</sup> and synthesised from evidence-based secondary pain management and opioid tapering texts that have proved effective and popular with patients worldwide.<sup>13–16 19 28 31 37 38</sup> The video script and a library of 200 text messages were initially drafted by members of the research team (MM, CA-J, PG and AM) before being reviewed by a consumer representative (LD) from the PainAustralia Consumer Advisory Group<sup>39</sup> and members of the research team with experience developing digital pain management intervention content (AS, BD and MF). Following an internal review, the wording and structure of the video script and message length and framing were further revised before being evaluated for appropriateness and likely effectiveness by a panel of 12 clinicians (physician, physiotherapist, psychologist) with expertise in pain management and 12 patients with chronic pain who had experience tapering opioid medications. After collating and evaluating consumer and expert feedback, the video script and messages were further revised. Patient and clinician ratings of each message were used to select 56 messages (2 per day for 28 days).

### Intervention overview

The Template for Intervention Description and Replication guidelines have been used to describe the intervention.<sup>40</sup> The intervention group will receive an informational video and 28 days of text messages (2 SMS per day, See multimedia online supplemental appendix D). The informational video is designed to provide brief informational, motivational and emotional support for opioid tapering. The video is composed of narrated, animated PowerPoint slides. Three core content areas covered in the video include (1) information about chronic pain and pain self-management strategies, (2) motivations to taper (benefits of tapering and risks of opioid use) and (3) information about opioid tapering and strategies for managing withdrawal symptoms. In addition, the video includes patient testimonials. Four

patients who have successfully reduced their opioid dose (two female, two male) describe their initial fears about tapering, their experience of the benefits of tapering, how they managed pain flare-ups and the importance of support. Second, participants will receive text messages which reinforce the information provided in the video (18 messages from each of the three core content areas, in addition to a welcome message on day 1 and a closing message on day 28).

### Intervention delivery

The mHealth intervention is delivered in addition to the usual care provided at the multidisciplinary pain clinic (see 2.3. Study Setting). Participants in the intervention group will be provided with the video (web link sent via email) and will receive two text messages per day (mid-morning and mid-afternoon) for 28 days. The messages are standardised in their content and delivery (by day of intervention and by the time of day). However, participants' first names are used in a selection of messages to maintain engagement (eg, 'Hi John,'; 'Hi again John,'). An unblinded research team member will send the messages using the Message Media software,<sup>41</sup> a secure automated messaging system that requires a computer. If a message was not delivered a second message will be sent. Participants will be informed that any replies they send will not be monitored (one-way message) but will be saved for later evaluations. However, they can reply 'STOP' to a text message to cease receiving text messages. They will be then contacted by a research team member to assess if they are withdrawing from the trial.

## Outcomes

Table 1 includes the participant timeline and a full list of the study (outcome) measures and when they will be assessed.

### Acceptability and feasibility measures

To assess the acceptability of the intervention, participants in the intervention group will be surveyed at the end of week 4 to capture their feedback on the intervention (perceived usefulness, engagement, perceived barriers and facilitators, messages read, feasibility of frequency and timing). This will provide essential insight into acceptability and feasibility considerations for a future definitive trial. The main question in this survey reflecting acceptability is whether participants would recommend the intervention to be used for supporting patients with chronic non-cancer pain during opioid tapering.<sup>42</sup> The survey contains Likert scales, descriptive and open responses, and is adapted from the TEXT4MYBACK pilot study.<sup>43 44</sup> This survey was specifically developed for evaluating the acceptability of mHealth interventions (text messaging) for patients with chronic pain.

Several feasibility measures will be evaluated in this pilot trial. Objective feasibility will be assessed as the delivery of messages sent. The text messaging intervention in this study is designed to be one way and the current SMS

**Table 1** Participant timeline and data measurement plan

	Description	Study period						
		Enrolment	Allocation	Baseline	Week 1	Week 2	Week 3	Week 4
Eligibility	Inclusion/exclusion criteria	X						
Informed consent	Contact information (name, phone no, email)	X						
Allocation			X					
Interventions								
Video and SMS+usual care	Video, 2 SMS day, multidisciplinary pain management			X	X	X	X	X
Usual care	Multidisciplinary pain management			X	X	X	X	X
Assessments								
Feasibility and acceptability measures								
Acceptability	Feedback survey							X*
Feasibility	Dropouts, message delivery, missing data, adherence and fidelity to the study protocol							X
Potential efficacy measures								
Opioid tapering self-efficacy	Single Item Scale			X†	X	X	X	X
Pain intensity and interference	PEG			X	X	X	X	X
Mood (depression)	PHQ-2			X	X	X	X	X
Mood (anxiety)	GAD-2			X	X	X	X	X
Opioid dose	Self-reported, converted to TDD in OME. Open-ended question for weekly assessments.			X	X	X	X	X
Withdrawal symptoms	Open-ended question				X	X	X	X
Pain cognitions	CAP-6 and PSEQ			X				X
Satisfaction	Single item scale							X
Other measures								
Demographic and clinical characteristics	Age, gender, socioeconomic, pain duration, attribution, patient-reported pain diagnosis, comorbidities, opioids and other medications, previous tapering attempts.			X				
Readiness to taper	Single item scale			X				
Tapering expectations	Expected impact of tapering on pain, function and mood			X				
Physician-patient relationship	PDRQ-9			X				
Social support	OSSS-3			X				

\*Only for the intervention group.

†OTSEQ will be completed after the video presentation only in the intervention group.

CAP-6, Concerns about Pain Scale-6 items; GAD-2, Generalised Anxiety Disorder-2; OME, Oral Morphine Equivalents; OSSS-3, Oslo Social Support Scale; OTSEQ, Opioid Tapering Self-Efficacy Questionnaire; PDRQ-9, Patient-Doctor Relationship Questionnaire; PEG, Pain, Enjoyment, General Activity; PHQ-2, Patient Health Questionnaire-2; PSEQ, Pain Self-Efficacy Questionnaire; SMS, specifically text messaging; TDD, total daily dose.

software is unable to record whether a message is read. As a process evaluation measure and to evaluate the feasibility of the future trial methodology, the numbers and reasons of exclusions (at enrolment step) and dropouts (at the end of the study) will be recorded. Other feasibility measures include completion rates and missing data in each study questionnaire.

### Potential efficacy measures

The main outcome measure we will use to evaluate the potential efficacy and obtain estimates for a future definitive trial is opioid tapering self-efficacy. Based on Bandura's self-efficacy theory and guides for constructing self-efficacy scales,<sup>45</sup> with input and feedback from clinicians and patients, we have designed a one-item measure of general self-efficacy to taper prescription opioid in the presence of chronic pain: 'How confident are you at the present time that you can reduce your dose of opioid medication?'. Participants rate their confidence by selecting a number from 0 (anchored as 'not at all confident') to 100 (anchored as 'completely confident'). The face validity of the questionnaire was evaluated by a panel of clinicians during the codesign process and cognitive debriefing was done by interviewing six patients with chronic non-cancer pain who had experienced opioid tapering. In both groups, opioid tapering self-efficacy will be measured at baseline before randomisation and then at the end of each week of the trial. The intervention group (but not control) will complete this measure after watching the video.

Other measures to evaluate the potential efficacy and to obtain estimates include changes in pain intensity, pain interference and mood which are measured at baseline and at the end of each week. Short-form versions of previously validated questionnaires will be used to minimise the burden on participants. Pain intensity and interference will be measured by the three-item Pain, Enjoyment of Life and General Activity scale (PEG).<sup>46</sup> Anxiety will be measured with the Generalised Anxiety Disorder 2-item<sup>47</sup> and depression will be measured with the Patient Health Questionnaire-2.<sup>48</sup>

We will also measure changes in opioid dose, pain catastrophising, pain self-efficacy, the experience of withdrawal symptoms and satisfaction with care. For the change in opioid dose, participants will self-report their medication (drug names, doses, regimen) at baseline. Each week during the trial, participants will be asked whether they had any change in their opioid dose in the past week using an open-ended question and if yes, to explain. The total daily opioid use will then be converted to mg of oral morphine equivalents.<sup>49</sup> We are not expecting a statistically significant change in opioid dose in the short duration of this trial (4 weeks). Typically, in a tertiary pain setting, patients reduce their dose very slowly to avoid withdrawal symptoms (eg, 10% reduction in dose per month) and it is important for tapering plans to be flexible.<sup>50</sup> Therefore, we have included change in opioid

dose as a secondary outcome measure for descriptive and exploratory purposes.

Similarly, to monitor withdrawal symptoms, participants will be asked weekly with an open question if they had experienced any withdrawal symptoms in the past week, and if yes, to explain. They also will be asked if they felt unwell in any other way in the past week and, if yes, to explain. Based on this information, the cumulative incidence of withdrawal symptoms will be measured. Participants will complete the six-item Concerns about Pain Scale (CAP-6),<sup>51</sup> a new measure of pain catastrophising developed using a modern psychometric methodology. They will also complete the 10-item Pain Self-Efficacy Questionnaire (PSEQ) which assesses confidence in ability to do tasks and activities despite pain.<sup>52</sup> The CAP-6 and PSEQ will be administered at baseline before randomisation and then at the end of week 4 of the trial. Participants will rate their current level of satisfaction with care on a 7-point Likert scale ranging from 'very dissatisfied' to 'very satisfied' at the end of week 4.<sup>17</sup>

### Exploring factors associated with opioid tapering self-efficacy

To further explore factors that may be associated with opioid tapering self-efficacy,<sup>13 27 53 54</sup> we will measure patient expectations regarding tapering, patient autonomy in the decision to taper, readiness to taper, doctor-patient relationship and social support at baseline in all participants. Participants will rate their current level of readiness using a single item 6-point Likert scale, with responses ranging from 'not ready' to 'very Ready', adapted from the EMPOWER study.<sup>17</sup> Patient expectations regarding tapering will be measured by asking participants to report 'What would you expect to happen to the following (PEG and mood) as a result of reducing your opioid medications over the next 4 weeks?', with response options including 'better', 'no change', 'worse', 'not Sure'. Participant autonomy (perceived degree of choice) to begin an opioid taper was measured with one item: 'To what extent was it your decision to reduce your dose of opioid medications?' ('completely my decision', 'shared decision' or 'not at all my decision'). The Patient-Doctor Relationship Questionnaire<sup>55</sup> and Oslo Social Support Scale<sup>56</sup> will be used for measuring doctor-patient relationship and perceived social support, respectively. A range of demographic and clinical characteristics will also be collected (see [table 1](#)).

### Sample size

The sample size was considered 20 in each study arm. This sample size is appropriate for the study's primary and secondary objectives. Aiming for the intervention to be acceptable by 70% of the participants with 20% precision (ie, at least 50% would recommend the intervention), 18 participants are required in the intervention arm. To evaluate the potential efficacy of the intervention as compared with the control and assuming a medium standardised effect size (0.5), 12 participants are required in each group with 80% one-sided CI approach which is suggested for pilot trials.<sup>57</sup>

To gather data to obtain estimates and calculate sample size for the future definitive trial, the recommended sample size for each study arm is 15 for a medium (0.5) standardised effect size.<sup>58</sup> We also expect a lost to follow-up rate of 10% during the study period. Accordingly, the total sample size was calculated as 40.

### Assignment of interventions

#### Allocation (sequence generation, allocation concealment mechanism, implementation)

Participants identified as eligible who have provided informed consent will be enrolled into the study by a study research assistant number 1 (RA1) and will receive a consecutive study identification number (SIN). The RA1 will create a record in the Research Electronic Data Capture (REDCap)<sup>59</sup> software for each participant and assign the SIN to the record. RA1 will send the REDCap link to the participant's email for consenting online and completing the baseline assessments. After completing the baseline assessments, RA1 will randomly allocate the participant to the study groups based on the randomisation table in the REDCap.

The randomisation table (using block randomisation based on the study site) will be generated at the beginning of the study by an independent member of the Clinical Trial Unit at the Pain Management & Research Centre (PMRC) using the Research Randomiser software.<sup>60</sup> The table will be imported into the REDCap before the trial starts. Only the independent member of the PMRC Clinical Trial Unit will hold a copy of and have access to the randomisation table (access to this table in REDCap will be limited for the research team members). RA1 has no access to the randomisation table and only can see the assigned group after allocation by REDCap. Only RA1, who has access to the REDCap records and is aware of the group allocation, will be responsible for uploading the participant's details into the text message system (for the intervention group) but will not be involved in weekly data collection to prevent bias.

Participants will be notified by email of their trial group allocation within 24 hours of completing baseline measures. Participants in the control arm will be informed that 'you have been randomly allocated to the weekly assessment group. This means we will send you some short questionnaires to complete each week via email. This will help us to understand your experience over the next 4 weeks.' Those in the intervention arm will be advised that 'you have been randomly allocated to receive daily SMS-delivered support for opioid tapering over the next four weeks. Please use the link below to watch a 10-minute video (please turn your audio on) for some helpful information, and one question for you to answer.'

### Blinding

Participants will be informed that they will be randomly allocated to either the intervention arm or the control arm of the trial. Participants cannot be blinded to the study arms due to the nature of the intervention. Treating

clinicians will be blinded to the study arms. To improve blinding integrity, participants will be asked to not discuss their participation in the study or their intervention allocation with the clinician supervising their opioid tapering.<sup>61</sup> The independent member of the PMRC clinical trial unit who generates the table of randomisation for the REDCap will not have access to the participants' identities. The study RA1 who is involved in enrolment and putting participants' information into the SMS system will not be blinded to the group allocation but will not be involved in data collection. Data collection will be done by participants and online. If necessary, for data collection by phone call, the study RA2 who will perform data collection will be blinded to the study arms. Participants will be asked to not provide information about the group allocation to the study data collector. The statistician will be blinded to the study arms. Only SINS will be used in the database. At the end of the study, a group variable will be added to the study database and each group will be labelled as A or B (but not intervention and control) before sending the database to the statistician for statistical analyses. Unblinding the groups will be done after all analyses are done by the statistician.

### Data collection, management and analysis

#### Data collection methods

All data collected for this study is by self-report. Following the creation of a REDCap record for each participant all outcome measures and data collection will be managed by the REDCap system hosted at the University of Sydney. REDCap will send questionnaires and scales to participants by email. Participants will be given the option to complete them over the phone if they anticipate difficulty accessing the internet or completing online questionnaires during the study. Only if a phone call is required for data collection purposes will RA2 contact the participant. They will be reminded, if needed, with SMS or phone call.

#### Data management

To ensure participants' privacy is protected, all data will be recorded in spreadsheets using only the patient's SIN. All data will be securely stored in line with the North Shore Local Health District Research and Ethics and University of Sydney protocols and procedures regarding data management.

#### Statistical methods

For feasibility and acceptability measures, descriptive statistics will be used. To maintain blindness, a separate database of these measures will be generated without record ID, demographic data or group ID.

For the comparison of the potential efficacy measures between the study groups, all analyses will be blinded to the group status. In this pilot trial, the focus is on descriptive statistics and estimation, using CIs, rather than formal hypothesis testing. Therefore, the CI will be adjusted to 80% and one sided.<sup>57</sup> Descriptive statistics of demographics and all study variables over the 4 weeks will



be reported. The mixed-model analysis will be used to test for the effect of group  $\times$  time interaction for dependent variables of opioid tapering self-efficacy, pain intensity and interference, and mood. In all mixed model analyses, the normal distribution of the residuals will be tested, and data will be transformed if needed to approximate residuals to normality. Mann-Whitney U test will be used for comparing the cumulative incidence of withdrawal symptoms and satisfaction. Correlation analysis (Pearson or Spearman correlation coefficients) will be done to find factors associated with opioid tapering self-efficacy. All analyses will be done using SAS software (V.9.4).

## Monitoring

### Data monitoring and auditing

On-site data management procedures comply with Good Clinical Practice.<sup>62</sup> Deidentified data will be retained in REDCap and managed in line with study policy, procedures and governance. The University of Sydney, the study sponsor and the Northern Sydney Local Health District Ethics Committee agreed no onsite or offsite data monitoring outside the study procedures was required.

## Harms

The research described in this protocol was considered ‘negligible risk research’, with no foreseeable risk of causing harm or discomfort. Foreseeable risk is the inconvenience of completing the study questionnaires. The intervention (educational video and supportive text messages) is not expected to cause any physical harm, anxiety, pain, psychological disturbance, devaluation of personal worth, or social disadvantage to participants.<sup>63</sup> Participants in both arms will continue to work with their pain specialist and other health practitioners on ‘usual care’, which will typically mean clinician guidance of opioid tapering schedule while learning and practicing non-pharmacological pain management (physiotherapy combined with cognitive-behavioural therapy).

## ETHICS AND DISSEMINATION

### Research ethics approval and protocol

This study has ethics approval from the North Shore Local Health District Research and Ethics (2020/ETH03288). The current protocol version is 1.02 and all changes are approved by North Shore Local Health District Research and Ethics and updated on the trial registry. The full list of changes and their reasons are provided in multimedia online supplemental appendix E.

### Consent and data confidentiality

Informed consent will be obtained via the procedures outlined above. Patients’ privacy will be protected for archiving, storage, and publication by allocating them an SIN. While the data are being collected, the participants would be reidentifiable via the name and SIN. Once their data collection is completed, identifiable information will

be deleted so that stored study data can never be linked back to any of the participants.

## Declaration of interests

This study is supported by a philanthropic donation to The University of Sydney from the Ernest Heine Family Foundation. The funding foundation has no role in the study design nor the interpretation of, or the decision to publish, the results.

## Ancillary and post-trial care

Both the study groups will continue to receive usual care from the multidisciplinary team (and any other provider involved in their care).

## Dissemination

Study results will be published in peer-reviewed journals and presented at scientific and professional meetings.

## DISCUSSION

This study describes the protocol for a pilot RCT for a digital health intervention to support prescription opioid tapering. Specifically, the mHealth intervention will consist of a video and 4 weeks of twice-daily text messages. The intervention is designed to be a relatively cost-effective and scalable mode of support for patients with chronic pain who are voluntarily reducing or discontinuing their prescription opioid medications under the guidance of a healthcare provider. The pilot RCT’s primary objectives are to evaluate the feasibility and acceptability of the mHealth (video and SMS) intervention and the trial methodology (recruitment, measures and methods). As a secondary objective, an analysis of potential efficacy will be conducted primarily on opioid tapering self-efficacy.

## Potential benefits and limitations

This study protocol will inform the development of a future definitive (well-powered) RCT to test the efficacy of the piloted mHealth intervention to support people with chronic non-cancer pain who are tapering opioids. The protocol has been codesigned in collaboration with patients with chronic pain and clinicians specialising in chronic pain management. Future research conducted to trial strategies for supporting patients to taper opioids may find it helpful to use the methodology described in this protocol to inform their own design and collaboration with patients.

As a pilot RCT, the protocol we have described primarily aims to answer questions of feasibility and acceptability. For this reason, we have not powered the study to formally test the hypothesis of efficacy, nor have we powered the study to adequately understand sources of individual differences in intervention efficacy. We acknowledge that some of the measurement instruments (eg, the opioid tapering self-efficacy scale) in this trial have not been previously validated. Hence, we will need to evaluate the distribution of the data generated by these measures prior to conducting statistical analyses. We also acknowledge that there may be substantial



variation in opioid dose changes attempted by participants over the 4-week study period, and there is likely to be significant variation in participants' satisfaction, engagement with and adherence to the 'usual care'. The benefit of heterogeneity in participants' opioid tapering schedules and usual care is that it maximises our opportunity to capture potential feasibility risks. The pilot RCT is also designed to be practical. It would be impractical and indeed antithetical to the principle of patient-centred care to standardise 'usual care' or standardise opioid tapering schedules. We also acknowledge that weekly changes in opioid medication use is self-reported, which is prone to bias. This method of assessment reflects the reality of clinical care delivered in the current study setting (Australia), where patients' adherence to opioid prescribing and tapering advice is not enforced or closely supervised but relies on patient self-report. To minimise the risk of social desirability effects on opioid dose reporting, participants are reminded that their weekly assessments, including medication reporting, will be confidential and not reported back to their clinician.

Finally, the pilot protocol informs the development of a definitive RCT including patients with chronic pain who are receiving care in multidisciplinary pain clinics. The majority of people with chronic pain who are tapering their opioid medications are likely to be guided by a primary care provider (general practitioner). Only a small proportion of people with chronic pain receive multidisciplinary care from a tertiary pain clinic. Hence, at this early stage of research and development, the feasibility, acceptability and potential efficacy of the mHealth intervention described in this protocol for patients in primary care, or patients who are tapering in the community without close supervision from a primary care provider, will remain unknown.

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**Contributors** MM and AG contributed equally to this paper, including the conception and design of the work, acquisition, analysis and interpretation of data for the work, and manuscript drafting and revision. AGM and AS contributed to the acquisition and interpretation of data for this work and revised it critically for intellectual content. LD, a patient representative, contributed a critical intellectual review of the content and form of the intervention, as well as the acquisition of data. MF and BD contributed to the conception and design of the work and provided critical revisions to the manuscript. PG and CA-J contributed to the conception and design of the work, the interpretation of data for the work, and contributed to the drafting and revising of the manuscript. All authors have provided final approval of this version of the manuscript to be published and have agreed to be accountable for all aspects of the work including questions related to accuracy and integrity.

**Funding** This study was supported by a philanthropic gift to the University of Sydney from the Ernest Heine Family Foundation.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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