

Outcomes of a veteran-specific pain management programme by remote technology-based delivery: an observational study

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Abstract

Introduction

A residential pain management programme for military veterans with high medical and psychological co-morbidity was adapted for remote delivery. This study evaluates the outcomes of the remote technology-delivered pain management programmes (rPMP).

Methods

Veterans with chronic pain, referred to a pain management programme, were assessed using online video calling. Veterans were suitable if they had chronic pain that affected their quality of life. Veterans were referred elsewhere when their needs were not best met by the programme. Eligible veterans attended a 9-day interactive online interdisciplinary programme and a 9-month follow-up. An experienced team of a psychologist, physiotherapist, nurse, and medical consultant, delivered the programme. Pain, mood, self-efficacy, and medication were assessed at the beginning and end of the programme and at 9-month follow-up.

Results

107 veterans were treated in 16 rPMPs; results are from 92 complete sets of data. Statistically significant gains were observed from day 1 to day 9 (effect size Cohen's d): average pain $d = 0.71$, pain interference $d = 0.82$; mood, $d = 0.99$; self-efficacy, $d = 0.85$; reduction in catastrophic thinking, $d = 1.22$; overall health, $d = 0.52$; and changes in medication use. 72 veterans attended 9-month follow-up online; results are from 59 complete sets of data. Statistically significant gains were maintained at 9-month follow-up, effect size: mood, $d = 0.71$; self-efficacy, $d = 0.80$; reduction in catastrophic thinking, $d = 0.95$; and overall health, $d = 0.52$. Attendance was 97%, with positive feedback on programme content and delivery.

Conclusions

Veterans made significant improvements on all outcomes. Remote technology-delivered pain management for veterans with chronic pain appeared equally effective as in-person delivery, and suited veterans whose circumstances made it difficult to attend in-person treatment. Veterans who attended the 9-month follow-up largely maintained treatment gains.

Keywords: chronic pain; rehabilitation; armed services.

1. Introduction

Chronic pain remains a significant burden for UK military veterans. A veterans' mental health charity ($N = 403$) in the United Kingdom reported that 41% had chronic pain and 34% poor mobility as the predominant conditions, and veterans with post-traumatic stress disorder (PTSD) were more than twice as likely to report chronic pain [1]. Almost one fifth of uninjured and injured UK members of

the armed forces reported pain some years after deployment to Afghanistan, with greater severity of pain in the injured group [2]. Musculoskeletal problems were the main reason for medical discharge of military personnel and reservists (part-time military members) who served in the UK Armed Forces between April 1991 and October 2014, with a significant proportion also experiencing mental health difficulties [3]. These mental health problems can render veterans ineligible for pain management programmes within the NHS. UK data is comparable with that from Canada [4], and in a US population study, 66% of military veterans reported chronic pain compared to 56% of the adult civilian population, with more severe pain in veterans, especially younger ones [5].

In the veteran population, pain is associated with PTSD, anxiety, and depression, in addition to poorer perceived health [2, 6, 7]. The interaction between pain and post-traumatic stress symptomatology is complex and conclusions regarding mutual maintenance require further investigation [8].

A systematic review and meta-analysis, evaluating interdisciplinary multimodal pain treatment programmes for patients with chronic primary musculoskeletal pain, reported significant treatment benefits that were generally maintained at follow-up [9]. Multidisciplinary pain management programmes empower individuals suffering from chronic pain through self-management strategies, offering alternatives to the escalation of interventional treatments [10]. A comprehensive review of treatment outcomes for patients suffering from chronic pain illustrated the effectiveness and cost-effectiveness of intensive pain management programmes [11]. This model is applicable to veterans with chronic pain: interdisciplinary pain rehabilitation programmes for American military veterans showed significant patient gains on self-reported measures such as pain intensity and interference, pain catastrophising, and sleep [12].

The Covid-19 pandemic necessitated the development of innovative ways for health services to provide care for patients, and remote delivery methods were rapidly developed. The World Health Organization defines this as healthcare delivered using information and communication technologies for the benefit of individuals and their communities, and reports on the possibilities of remote technology-based delivery of health services to overcome geographical and other obstacles [13]. The Covid-19 pandemic brought new challenges to treatment delivery for the chronic pain population with mental health comorbidity. Social isolation in people with chronic pain was associated with self-reported higher levels of pain and interference than before social distancing, with sociodemographic factors contributing [14]. During the pandemic, veterans with mental health difficulties that started pre Covid-19 experienced a deterioration in mental health, including post-traumatic stress symptoms, and increased social isolation with difficulty accessing medical services [15, 16].

Many pain services switched to remote delivery during the Covid-19 pandemic. Remote technology-based delivery in pain services during Covid-19 was reported to be safe and acceptable to many patients [17], with accessibility and technical issues identified as potential concerns [17, 18]. The Veterans Health Administration (VA), the US's largest integrated health care system for military veterans, compared use of remotely delivered healthcare 12 months before and 12 months after the onset of Covid-19, and found that remotely delivered pain management significantly increased patient attendance (82.5% reduction in missed appointments) and decreased costs, despite some access and technical problems [19, 20]. Systematic reviews and meta-analyses of the effectiveness of remote technology-based delivery of treatments for chronic pain and mental health showed promising treatment outcomes and good accessibility for patients [21, 22, 23]. It was also suggested that this way of treatment delivery may be cost-effective [24].

In a UK study, military veterans with and without PTSD completed a residential veteran-specific interdisciplinary pain management programme, making clinically and statistically significant improvements. This demonstrated the feasibility of treating veterans with both chronic pain and PTSD using a PMP model of care [25]. Here we describe the adaptation of this in-person pain management programme for remote technology-based delivery of veteran-specific pain management programmes. Content was adjusted, and extended to include navigating the technological requirements; opportunities were created for veterans to speak to clinicians individually outside the group, and possible safeguarding issues were addressed. The aim of this study is to evaluate the outcomes of this remote technology-delivered pain management programme.

2. Methods

2.1 Participants

The veteran-specific pain management programme was established with charitable funding in a private hospital in London in 2015. To our knowledge, it is the first and only intensive interdisciplinary veteran-specific pain management programme in England. Adjustments have been made to the delivery of the programmes to accommodate the specific needs of the veteran population, especially in optimising safeguarding and safe practice, including greater collaboration with NHS services and charities specialising in mental health services for veterans, for example for assessing and treating Complex PTSD. Veterans suffering from Complex PTSD were included; 53% reported a previous diagnosis of PTSD. The majority of veterans reported adjustment difficulties to civilian life following discharge from the forces and the loss of the military culture and camaraderie, impacting negatively on mood, family and other relationships. A proportion of the veterans on the rPMP described feeling lost and isolated in the civilian world, experiencing a lack of support, financial concerns, accommodation issues, ongoing adjustment difficulties, and often feeling misunderstood by civilian health services. Mental health comorbidity and suicidality are prevalent. A study specific to Northern Ireland veterans confirmed that military veterans suffering from chronic pain are more prone to poorer mood, quality of life, and PTSD, with a greater probability of being unemployed and receiving disability payment [26]. See Table 2 for a description of the demographics of the veterans who attended the rPMP.

84% of the veterans who attended the rPMP reported that their pain started during armed service, including training, and combat-related injuries such as improvised explosive devices, bullet, blast, shrapnel, and non-freezing cold injuries. 93% of veterans who attended the rPMP presented with more than 1 site of pain, 25% presented with pain in 5 sites or more. The clinicians delivering the PMP observed that this multi-site presentation was significantly higher when compared to NHS PMP's that they had all delivered. Studies confirm the significant prevalence of chronic pain within the military population, including US active duty participants and veterans; suffering from high medical and mental health comorbidity, and evidence-based chronic pain management is recommended [27, 28, 29].

The programme ran as a residential programme until Covid-19 lockdown, when remote PMPs (rPMPs) were developed. The rPMPs were advertised through veteran organisations, military charities and NHS services in the UK. Veterans could self-refer or be referred by military charities, other veteran organisations, and UK health and mental health services. Attendance was free for veterans.

Referred veterans were invited to attend remotely-delivered assessments with the Consultant in Pain Medicine, the Consultant Psychologist and the Specialist Physiotherapist, and a telephone appointment with the Consultant Psychiatrist. Ten percent (5) of veterans chose to wait for in-person appointments, or asked to be contacted in 6 months when service provision might have changed. Of this 10%, 75% (3) later decided to have remotely delivered assessments. Veterans were found suitable for the programme if they presented with persistent pain with a negative impact on their quality of life. Veterans were found unsuitable for the programme at assessment when their needs would not be best met by a group-based self-management model: unsuitability included significant ongoing alcohol and drug misuse, serious psychiatric illness, and/or needing medical treatment for other health conditions whose treatment would help current pain.

2.2 Programme content and delivery

The rPMP was 9 days delivered over 6 to 8 weeks, with a follow-up 9 months after the starting date, a total of 60 hours. Prior to the Covid pandemic, 9-day pain management programmes were delivered over 6 months to allow sufficient time between programme days for the veterans to manage the travel demands, plus a 9-month follow-up day. The clinical team observed that during the extended gaps between programme days, life events such as mental health crises, medical appointments, and needs of families or work undermined programme attendance. By delivering the programme remotely, the rPMP could be consolidated to 6-8 weeks, mitigating these concerns. Group size was reduced from 10 to 7 veterans to help veterans to manage the often unfamiliar technology of remote delivery, and to provide opportunities to address mental health concerns. Group size is under review as the platform becomes more familiar.

In order to facilitate veterans' use of the remote technology, time was spent explaining how the group would work and providing technical instructions on navigating the platform, Zoom [30]. Team members were available to support individuals experiencing difficulties with Zoom. About 20% of the veterans were new to remote technology-based delivery, requiring time to brief them on its use, but in later programmes, more veterans were familiar with the platform and less preparation was required. Ground rules were established: keeping video on; muting when not speaking (although this was balanced with encouraging easy engagement); confidentiality and privacy concerns, and the use of headphones where space was shared with other household members. Veterans were encouraged to move and change position on a regular basis rather than to sit still during sessions. To encourage and support engagement between veterans, the clinical team muted and turned their videos off during all breaks, providing a private and confidential space for the veterans to communicate with each other.

Content of the programme was adapted: for example, delivery of the relaxation sessions used shorter breath-focused techniques rather than more traditional relaxation techniques requiring the veteran to lie down, which would preclude team members' observation of difficulties. Pre-recorded videos of stretches and exercises were used to maximise the ease of following and participating with instructions on the screen.

A key component of the pain management programme was providing veterans with time to speak with the clinicians individually. Individual time with each clinician was offered to the veterans via telephone conversations on days 3, 5 and 8 of the rPMP, and scheduled as part of the programme.

Safeguarding concerns were addressed for veterans with particular mental health needs by involving staff from the associated psychiatric hospital. A senior mental health specialist met the veterans on day 1 of the programme, and a 24-hour support telephone number was provided for mental health crises during the programme. Veterans were encouraged to have the contact details of their local medical and mental health support in place.

2.3 Components of the rPMP

The rPMP is an interactive remotely-delivered group-based programme facilitated by expert clinicians, including a psychologist, physiotherapist and nurse. Information about chronic pain mechanisms and research is being shared by the pain management team, enabling the veterans to develop a greater understanding of their condition, in addition to practical strategies to assist the veterans attending the programme with chronic pain management.

The content is described in detail in Table 1, and the aim is to introduce a range of pain management strategies that can help with the day-to-day management of chronic pain.

The chosen three psychological models enjoy a strong evidence base [31, 32, 33]. The focus of these three compatible models on the rPMP is as follows:

Cognitive-Behavioural Therapy model: veterans are being guided to develop a greater awareness of the impact of negative automatic thoughts on mood and their pain experience, and how to reframe these thoughts, including using their newly-learnt understanding of the mechanisms of chronic pain.

Mindfulness-based Cognitive Therapy (MBCT): each programme day starts with a MBCT practice, guiding veterans to observe thoughts and feelings without judgement or engagement as much possible. Veterans are being provided with references to guided MBCT practices.

Compassion-Focused Therapy (CFT): veterans are being introduced to the three emotional regulatory systems as described in CFT – the threat, drive and soothing systems. Veterans are encouraged by the interdisciplinary team throughout the rPMP to apply self-compassion and soothing in relation to the impact of their pain experience, when applying the various strategies on the rPMP and during goal-setting sessions.

Veterans attending the rPMP have the opportunity to develop a working knowledge of the three models that can be applied to their pain experience. The psychologically informed interdisciplinary team cross-reference throughout the rPMP to the rationale of these models and veterans are invited to apply these strategies amongst others, during sessions about pain mechanisms, physiotherapy-led stretch exercises, nurse-led sessions about pain-related medications, psychology-led sessions on the impact of pain on mood, and activity management.

The physiotherapist guides veterans suffering from chronic pain to gradually return to meaningful activities and build up their fitness and strength despite ongoing pain. The nurse encourages

veterans to evaluate the benefits and disadvantages of their pain-related medications and consider reducing or discontinuing pain-related medications that they no longer find helpful or that has unwanted side-effects. The pain management team works collaboratively throughout the programme and the psychologist, physiotherapist and nurse are present for all sessions. Group discussion is encouraged across sessions and for all components. The Pain Management Consultant was involved in education as well as providing medical cover.

Table 1 Components of the rPMP

Key: psychologist (ψ), physiotherapist (P) and nurse (N)

Week 1 Days 1-4	Administration of questionnaires (ψ). Introduction to pain -what is it, acute and chronic pain (P), veterans' experiences (N), psychological strategies (ψ), activity planning (P), pain related medications (N), stretch/moving (P), mechanisms of chronic pain (medical consultant). Individual calls to all group members (ψ , P, N). Psychological strategies: Introductions to Cognitive-Behavioural Therapy, Mindfulness Based Cognitive Therapy (ψ).
Week 3 or 4 Days 5- 7 (includes friends and family)	Building on strategies from days 1-4, information on sleep (N), impact of activity on bodies (P), psychological strategies (ψ). Individual calls to all group members (ψ , P, N). Psychological strategies: Introduction to Compassion-Focused Therapy, session on communication (ψ).
Week 6 or 7 Days 8-9	Maintenance strategies, long-term goals, recap of central messages facilitated by all clinicians. Individual calls to all group members (ψ , P, N). Repeat questionnaires (ψ).
Follow-up 9 months from day 1	Questionnaires (ψ). Feedback, problem solving, recap of central messages, planning long term goals (facilitated by all clinicians).

2.4 Data collection

Data were collected on days 1 and 9 (last day), and a reduced set at 9-month follow-up. Veterans completed standardised questionnaires, the same as on the residential pain management programme [25]; on pain, pain interference, and psychological function, widely used on pain management programmes and in pain research.

2.4.1 Brief Pain Inventory (BPI) The BPI assesses severity of pain; only average pain are reported here. It also assesses interference of pain with seven areas of life; the total of these is used as a score of pain interference. Each item is rated on a 0-10 scale, where 0 is no pain/no interference, and 10 is pain as bad as you can imagine/complete interference. A recent systematic review shows high-to-moderate internal consistency for its use in MSK populations [34]. The psychometric properties of the BPI were examined in 440 patients with chronic pain, providing a Cronbach α of 0.85 for pain and 0.88 for interference, with a stable structure, and sensitivity to change with treatment [35]. Although data were collected at 9-month follow-up, administrative changes to data entry for the remote programme were not fully in place and data were lost.

2.4.2 CORE (Clinical Outcomes in Routine Evaluations CORE)

(<https://www.coresystemtrust.org.uk/home/about-core-and-cst/>). This mental health scale has a 10-item short version and a 34-item long version, covering wellbeing, problems, functioning and risk. Both short and long versions were used: the CORE-34 covers risk of self-harm or violence to others in more detail. For those completing CORE-34, the CORE-10 items were extracted and the scoring protocol for CORE-10 followed. Items are worded negatively or positively, and are answered in terms of how often they applied in the last week, on a 5-point scale from 0 = “not at all” to 4 = “all the time”. The scale shows good psychometric properties and suitability for longitudinal assessment [36, 37]; the internal consistency of the CORE-10 was .90, supporting strong covariance, with the alpha .90 [37].

2.4.3 Pain Catastrophizing Scale (PCS) Catastrophising describes a negative bias in thinking about pain and is associated with a negative emotional response to pain [38]. It has 13 items, scored according to the degree to which thoughts and feelings are associated with pain, from 0, not at all, to 4, all the time. Although the term pain catastrophising is contentious as it can be perceived as a psychological diagnosis and patient-blaming [39], it remains the most widely used in clinical and research settings, with good internal consistency (Cronbach α 0.92) [40].

2.4.4 Pain Self-Efficacy Scale (PSEQ) Self-efficacy refers to confidence in activity despite pain. It has 10 items, scored from 0, not at all confident, to 6, completely confident, concerning domains such as daily household activities, social life, work, leisure activities, and coping with pain without medication [41]. Internal consistency is excellent (Cronbach’s α ranged from 0.79 to 0.95), and it has shown sensitivity to change [42].

2.4.5 EuroQol Five Dimension (EQ-5D) is a self-reported measure of health-related quality of life, developed by EuroQol, a group of international researchers [43]. EQ-5D covers 5 dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, in addition to a vertical 0-100 scale on which respondents report their health, between best health (100) and worst health (0) [44]. The validity, reliability and responsiveness of the EQ-5D showed moderate to high correlations with impairment measures and high correlations with disability measures [45].

2.4.6 Medication Information was collected on medication use by self-report, and classified by the nurse as opioid analgesic, non-opioid analgesic, or adjuvant such as tricyclic antidepressant, anticonvulsant, hypnotic or muscle relaxant.

2.4.7 Feedback on programme Veterans were also asked on day 9 to provide anonymous written feedback about the rPMP regarding the content of the programme and to rate which aspects of the

programme they found helpful, the acceptability of the pain management programme being delivered remotely, and whether they would recommend the rPMP to other veterans.

The **Impact of Events Scale (IES-6)**, a widely used trauma questionnaire, was also completed for clinical use so is not described here. Veterans were given a choice to fill out the trauma questionnaire (IES) or not, as completing it caused significant distress for some.

2.5 Data analysis

Missing data were handled as follows. Questionnaires not completed were excluded. For the CORE-10, the protocol for missing items was followed, prorated where 10% or less of scores were missing. Data inspection showed adequate normality of distributions. Repeated measures ANOVAs were conducted in JASP for each of the outcomes; different numbers of missing cases gives different totals across outcomes in Table 3.

3. Results

Between March 2020 and February 2022, 186 veterans were offered remotely-delivered assessments: 172 completed an assessment, and 14 did not attend or cancelled. Of the 172, 139 (81%) were found suitable for the rPMP. Of the 33 (19%) found unsuitable, 18 were directed elsewhere for serious mental health problems, and 15 were referred for additional assessment and treatment in NHS pain and/or medical services.

Of the 139 veterans offered a rPMP, 107 have so far been treated in 16 programmes, with an average 7 veterans per programme. One-hundred-and-two veterans completed the programme, 5 veterans dropped out, two who gained employment and three with mental health crises; we present results from 92 complete sets of data. Attendance was 97%, with positive feedback on programme content and delivery. Consent for data use was requested from all participants, in line with ethical approval (King Edward VII's Hospital, London, Ethics Committee 24/03/2021). Non-responders were considered not to have given consent for their data to be included. Six veterans did not give consent for their data to be used in research, and four provided incomplete data. Description of the 92 who agreed to their data to be used is provided in Table 3. Seventy-two veterans attended the 9-month follow-up day; results are from 59 completed sets of data.

Table 2 Demographic Details rPMP N = 92

Sex	79 males, 13 females
Duration of pain: median, range	18 years, 1-55 years
Age: median, range	51 years, 30 - 80 years
Presenting pain sites %	93% more than one
Spine	55 (60%)
Lower limb	24 (26%)
Total body pain (≥ 5 sites)	24 (26%)

Upper limb	16 (17%)
Abdomen/Pelvics	8 (9%)
Head/face	5 (5%)
Chest	2 (2%)
Current employment status %	
Not working	29 (32%)
Work full time (paid or unpaid)	19 (21%)
Work part time (paid or unpaid)	9 (10%)
Employed, off work sick	13 (14%)
Retired	18 (20%)
In training/student	4 (4%)
Rank %	
Officer: non-officer	5 (5.5%): 87 (94.5%)
Pain started %	
During service including training /not during service	77 (84%) / 15 (16%)
Partnership status %	
Married or living with partner / neither	70 (77%) / 22 (23%)

Table 3 Change in mean (s.d.) scores from day 1 to day 9 of rPMP, effect size and statistical test

Outcome, scale and range	Day 1 mean (s.d.)	Day 9 mean (s.d.)	N	T	P	Effect size Cohen's d
BPI average pain 0-10	6.3 (1.4)	5.5 (1.6)	65	5.74	<0.001	0.71
BPI pain interference 0-70	48.3 (15.2)	40.4 (16.5)	63	6.53	<0.001	0.82
Mental health problems, CORE-10, 0-40	19.0 (7.5)	14.0 (8.1)	65	7.95	<0.001	0.99
Self-efficacy, PSEQ 0-60	21.5 (11.6)	29.9 (12.8)	65	-6.83	<0.001	0.85
Catastrophic thinking, PCS 0-54	30.8 (11.6)	19.9 (12.4)	65	9.80	<0.001	1.22
EQ-5D overall health 0-100	44.4 (18.6)	54.9 (21.0)	62	-4.17	<0.001	0.52

Key: N = number, s.d. = standard deviation

Repeated measures t tests from the start of the programme (day 1) to the last day (day 9) showed statistically significant improvements at the group level, with small or medium effect sizes (Table 3): improvements in average pain, pain interference (BPI), mood (CORE-10), self-efficacy, i.e. confidence in engaging in activity despite the pain (PSEQ), and a reduction in pain catastrophising (PCS). The results of the rPMP compare favourably with that of the residential PMP (table 4).²⁵ A minority of veterans reduced or stopped their medication (table 5).

Table 4 Scores at beginning and end of treatment for all self-reported outcomes of the residential PMP [25].

	<i>N</i>	Day 1		Day 10		<i>F</i>	<i>Df</i>	<i>p-Value</i>	Interaction <i>p</i> (time*PTSD group)
		Mean	SD	Mean	SD				
BPI Worst Pain (0-10)	115	7.5	1.6	6.6	2.2	15.18	1,113	<.001	.92
BPI Average Pain (0-10)	115	6.2	1.4	5.5	1.8	10.38	1,113	<.001	.68
BPI Interference (0-10)	116	6.9	1.8	5.8	2.3	42.38	1,114	<.001	.53
CORE-10 (0-40)	118	18.6	7.7	16.7	9.3	5.72	1,116	.018	.77
PSEQ (0-60)	117	22.3	11.3	30.4	13.8	60.93	1,115	<.001	.77
PCS (0-52)	119	27.3	11.1	17.2	12.6	98.65	1,117	<.001	.95
IES-6 (0-24)	96	12.9	7.0	11.4	7.3	1.69	1,82	.198	-

The results of the rPMP compare favourably with that of the residential PMP [25].

Table 5 Change in medication

Medication type	Day 1 N taking	Day 9 N stopped	Day 9 N reduced
Opioid including compound analgesic	55	5	16
Non-opioid analgesic	43	3	11
Adjuvant (e.g. tricyclic antidepressant)	45	4	6

84% of veterans who completed the rPMP were taking at least one pain-related medication on day 1, analgesics and/or adjuvants. A minority of veterans reduced or stopped their medication.

Table 6 Change in mean (s.d.) scores from day 1 to 9-month follow-up of rPMP, effect size and statistical test

Outcome, scale and range	Day 1 mean (s.d.)	9 mth follow-up mean (s.d.)	N	T	P	Effect size Cohen's d [95% CI]
Mental health problems, CORE-10, 0-40	18.6 (7.2)	14.1 (8.0)	54	0.80	0.44	0.30 [-0.24 to 0.70]
Self-efficacy, PSEQ 0-60	22.3 (11.7)	31.0 (12.7)	54	-5.89	<0.001	-0.72 [-1.01 to -0.42]
Catastrophic thinking, PCS 0-54	29.7 (11.5)	18.4 (12.9)	54	7.01	<0.001	0.92 [0.60 to 1.24]
EQ-5D overall health 0-100	44.4 (18.7)	54.9 (21.0)	48	-3.67	<0.001	-0.58 [-0.88 to -0.27]

Repeated measures t tests on data from day 1 to 9 month follow-up, controlled for in-person correlation, also showed statistically and clinically significant changes, albeit on a reduced set of assessment scales and with substantial attrition compared to the end of the programme (day 9).

Veterans were asked during the 9-month follow-up about their pain-related medication use, and those who commenced a reduction whilst attending the rPMP largely maintained these changes or indeed reduced further. Dosage specific data was not collected.

3.1 Nine-month follow-up: attendance and missing data

There was substantial attrition at follow-up, of 42% of the population who completed the programme. Reasons for non-attendance were mixed, with some positive reasons (work and family commitments, holidays), and some negative reasons (pain-related or incidental illness), and others such as childcare, and medical appointments. Not all veterans volunteered explanations for non-attendance and this was respected.

4. Discussion

All evaluated outcomes improved over the course of the rPMP: average pain, pain interference, self-efficacy, catastrophic thinking about pain and general mental health. Scores at the start of the programme were comparable with those of people attending inpatient programmes in the UK [46], that is, those more severely affected by chronic pain. Although changes were smaller than those achieved by a face to face residential pain management programme [47], they compare well with pooled outcomes of remotely delivered pain management in a recent systematic review [48]. The changes were clinically meaningful, except for the average pain score which is not expected to reduce by a large amount given the chronic nature of veterans' pain. A smaller percentage of rPMP

veterans reduced or discontinued their medication than veterans who attended the residential programme. Possible explanations for this include the restricted access to primary care, the prescribers of the medication, to negotiate reduction; and delivering the programme over the same number of days but over a shorter period of time being less compatible with gradual reduction/discontinuation. In addition, concerns about difficulty accessing GP services may have reduced veterans' confidence in making changes to their pain medication regimen. Nevertheless, this study achieved substantial and meaningful changes in veterans with chronic pain, drawing on extensive clinical experience of the treatment team. This is consistent with findings of a study in which competent treatment delivery showed a much larger patient response to treatment, with the authors concluding that without understanding the quality of treatment delivery, results may be misrepresented [49].

Of all veterans assessed for the rPMPs, 53% reported a previous diagnosis of PTSD. It is our clinical impression that this figure is an underestimate, as many veterans reported post-traumatic stress symptomatology but had not received a formal assessment or diagnosis. A systematic review showed a relationship between post-traumatic stress symptomatology and the development of chronic pain [50]. The rPMP and the earlier residential programme [25] outcomes suggest that it is clinically appropriate treating veterans suffering from chronic pain, with and without PTSD, using interactive remote technology-based delivery. The Impact of Events Scale (IES-6), a widely used trauma questionnaire, was also completed for clinical use, and is not described here. Veterans were given a choice to fill out the trauma questionnaire (IES) or not, as completing it caused significant distress for some.

5. Strengths and limitations

Although a small amount of data are missing at the end of the programme and substantially more at 9-month follow-up, most treated veterans made real gains and maintained them. Loss of data (other than attrition) was variously due to withheld consent, incomplete questionnaires, and transition from paper to electronic databases, with delays in questionnaire administration by new IT systems. We cannot know to what extent non-responders or non-consenters, made comparable or smaller gains than those who completed assessments. Adaptation to remote working posed challenges both for staff and for patients: it enabled patients who found travel too demanding to enrol in the programme. However, for staff, concerns about safeguarding and the mental health of patients were sometimes difficult to contain or act upon because of the lack of personal contact.

6. Implications

Military veterans with chronic pain and high medical and psychological co-morbidity, with or without PTSD, can be treated on a residential or interactive remote PMP, adapted for their specific needs by an experienced clinical team. This opens pain management programmes to veterans who were rendered ineligible for pain management programmes within the NHS or would not otherwise have been able or willing to attend a residential programme. Extension of remote technology-based options in the delivery of pain management services is possible, with greater flexibility in terms of hospital appointments for people with chronic pain and related disability, and for those with mental health and PTSD comorbidity. There are also potential cost savings for health services. However, consideration should be given for the impact on clinicians working remotely, in terms of additional training, with continuing support and supervision, and adaptations to materials. Delivering clinical content remotely is a relatively novel way of working, particularly for physical therapists, and necessitates innovation to

maintain team cohesiveness, such as protected time for team meetings and regular review of how best to maximise patient engagements.

7. Conclusions

Remote technology-based PMPs were delivered by the same staff and with largely the same content as the in-person programmes, with adjustments to delivery, and treatment gains were statistically and clinically significant, and largely comparable with in-person pain management. The gains made by veterans on the rPMP demonstrate the utility of the remote technology-based delivery of pain management programmes.

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Ethical approval

The research related to human use complies with all the relevant national regulations, institutional policies and was performed in accordance with the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent committee.