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REVIEW ARTICLE

Multidisciplinary management of persistent pain in primary care—A systematic review

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Abstract

Background and Objective: A multidisciplinary approach is the gold standard in the management of persistent pain and is current practice in tertiary pain clinics. However, such approaches seem to be a rarity in primary care, although pain is the most common reason for visiting a primary care physician. A comprehensive systematic review was conducted to explore whether studies on multidisciplinary management programs for persistent pain exist in primary care.

Databases and Data Treatment: PubMed, Ovid MEDLINE, Scopus, CINAHL, and PsychINFO were searched from inception to October 2022, and supplementary research was conducted in June 2023. Screening, data extraction, and quality assessment were independently carried out by two researchers. The inclusion criteria were (1) adult patients (age >18 years); (2) non-cancer pain, persisting over 3 months; (3) multidisciplinary intervention (treatment included ≥3 heath-care professionals); (4) intervention conducted in a primary care setting; and (5) reports published in English.

Results: Of the 1250 initially identified studies, 17 were selected for final analysis. Only studies reporting empirical data were included (cohort, case–control, randomized controlled trial, and observational). The study settings and intervention characteristics showed great heterogeneity. The primary care practices also varied across different countries and cultures. Overall, the quality of the studies was rather low and sample sizes were relatively small.

Conclusions: The review revealed that studies about such treatment interventions for persistent pain patients are scarce. The existing studies were heterogeneous in terms of intervention characteristics, population, outcome variables, and study methodology. Future studies are urgently needed.

Significance: Persistent pain is a growing challenge to the health care system, and most patients are treated in primary care. The biopsychosocial concept is the basis for the multidisciplinary management of pain. The review revealed that studies about treatment interventions for persistent pain patients are scarce. Existing studies were heterogeneous in terms of intervention characteristics,

population, outcome variables, and study methodology. There is an urgent need for further studies on systematic multidisciplinary treatment protocols for managing persistent pain in primary care.

1 | INTRODUCTION

Persistent pain is a major health care problem, and, based on previous studies, it seems that nearly half of all patients suffering from persistent pain receive inadequate pain management (Breivik et al., 2006). First established in 1970s, the multidisciplinary approach is currently the most effective and cost-effective practice in managing persistent non-malignant pain (Bujak et al., 2019; Gatchel & Okifuji, 2006; Mäntyselkä et al., 2001). Recent studies highlight the need for progress towards systematic multidisciplinary and patient-centred care also in primary care (Lewis et al., 2019). Multidisciplinary pain management in primary care settings has the potential of providing easily accessible, high-quality service to the constantly growing population (Debar et al., 2012; Pietilä-Holmner et al., 2020). Even though the multidisciplinary approach is the gold standard in the management of persistent pain, it is not known how widely it is offered to primary care patients (Lewis et al., 2019).

The principles of treating persistent pain are based on the biopsychosocial model of persistent pain, including medical, physiotherapeutic, psychological, and social interventions. Treatment goals have thus shifted towards improving an individual's general health, as well as their physical, psychological, and social functioning and quality of life, instead of a mere reduction in pain intensity. The treatment goals need to be discussed with the patient. A holistic approach in which the patient has an active role will most likely have a positive effect also in preventing possible opioid use disorder (Bujak et al., 2019; Gauthier et al., 2019; Greene & Pearson, 2020; Joypaul et al., 2019a; Vartiainen et al., 2019).

There is a continuous need for evidence on how to provide optimal treatment programs and services for patients with persistent pain, especially in the primary care setting, as primary care has an important role in managing persistent pain (Gauthier et al., 2019; Hooten et al., 2017; Mäntyselkä et al., 2001; Mills et al., 2019). Comprehensive systematic reviews on this topic have not been published before. The objectives of the present systematic review were to examine (1) whether studies on multidisciplinary treatment programs exist for persistent pain patients in primary care, (2) which health care professionals are delivering the care and which components the treatment is consisted of, and (3) which outcome measures are used to examine the effectiveness of treatment and whether the interventions have an impact on the measured outcomes.

2 | METHODS

2.1 | Data sources and searches

A systematic literature review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). The PRISMA checklist is presented in Figure 1. Review is not registered in The International Prospective Register of Systematic Reviews (PROSPERO). The data sources PubMed, Ovid MEDLINE, Scopus, CINAHL, and PsycINFO were searched comprehensively from inception to October 2022.

The search strategies were modified for the different bibliographic databases. The search strategy is presented in Appendix 1. The comprehensiveness of the search strategy was peer-reviewed by an informatician at the Terkko National Library of Health Sciences of the University of Helsinki and Helsinki University Hospital.

The search strategy was developed to adhere to the population, intervention, comparison, and outcome (PICO) descriptors. Four domains were set: multidisciplinary, persistent pain, intervention, and primary care. These domains were joined with the operator 'AND'. Regarding each domain, encompassing terms were determined and used in the searches.

The requirement for the included articles was that they were original articles written in English and published in full text in a peer-reviewed journal. Regarding study design, only studies reporting empirical data (cohort, case–control, randomized controlled trial [RCT], and observational) were included.

Studies were eligible for inclusion in the review if they met the following criteria: participants aged ≥18 years; experiencing non-cancer pain ≥3 months; utilizing multidisciplinary interventions (including a minimum of three separate professional groups, such as a physician, physical therapist, psychologist, dietarian, and occupational therapist); and treated in a primary care setting (IASP Terminology, 1994). The primary care setting was defined as a unit dealing with an unselected general, community-based population of all ages (all the patients, only excluding the ones using occupational health or when treatment given in specialized health care).

Two authors (M.H. and M.M.) independently screened titles and abstracts from the literature search to determine

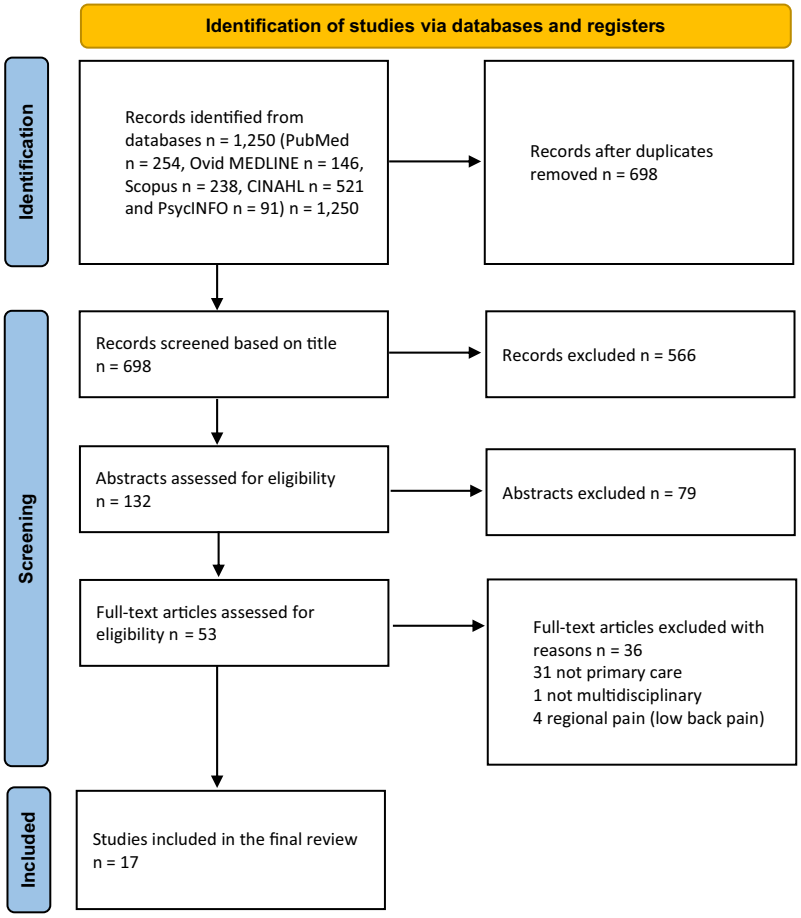

FIGURE 1 Prisma flowchart of study inclusion.

eligibility. Full texts were independently assessed by two authors (M.H. and M.M.). A pre-defined protocol for data extraction was defined and used by all reviewers. Two reviewers (M.H. and M.M.) extracted the data according to the protocol.

The methodological and reporting quality of the included studies was assessed using the National Heart, Lung, and Blood Institute's (NHLBI) Study Quality Assessment Tool for Observational Cohort and Cross-sectional Studies and Controlled Intervention Studies (National Heart, Lung, and Blood Institute, 2019). Two authors (M.H. and M.M.) independently performed the quality assessment.

3 | RESULTS

3.1 | Study characteristics

A total of 17 studies met the inclusion criteria after the supplementary search conducted in June 2023 resulted in one additional study. Figure 1 illustrates the inclusion process.

The 17 included studies were conducted in 1999–2023. Seven studies had a prospective cohort design, three a retrospective cohort design, another two a retrospective observational design (combined individual interviews and questionnaires), and five were RCTs. Eight studies had control groups. The reports by Nordin et al. and Calner et al. were based on the same RCT data. The data were collected from primary health care centers in the Norrbotten county of Sweden in 2011–2014 (Calner et al., 2017; Nordin et al., 2016). The studies by Pietilä-Holmner et al. and Eklund et al. were also both based on the same data; data from 11 primary health care centers in Sweden, collected in 2012–2015 (Eklund et al., 2020; Pietilä-Holmner et al., 2020). Two studies by Mårtensson et al. were included, both of which were conducted using the same data, yet reporting different outcomes (Mårtensson et al., 1999; Mårtensson et al., 2004). Nine of the 17 studies included were conducted in Sweden (Calner et al., 2017; Eklund et al., 2020; Gustavsson et al., 2018; Mårtensson et al., 1999; Mårtensson et al., 2004; Nordin et al., 2016; Pietilä-Holmner et al., 2020; Sennehed et al., 2020; Stein & Miclescu, 2013), three in the United States (Dobscha et al., 2009; Seal et al., 2020), two in Canada (Angeles et al., 2013; Barry & Chris, 2019), one in Australia, one in England, and one in the Netherlands (Bults et al., 2023; Clare et al., 2019; Joypaul et al., 2019b; Table 1).

TABLE 1 Overview of the characteristics of included studies.

Author (year)	Study design and setting	Participants	Intervention	Follow-up time	Outcome measures
Angeles et al. (2013)	RCT; McMaster Family Practice and Stonechurch Family Health Centre, Hamilton, Ontario, Canada; 2009–2010	Persistent pain; Intervention $n=29$; control group $n=34$	Group-based; 8-week program, 2 hours per week; mindfulness; pain education; physical activity	6 months	Number of visits; QoL (SF-36)
Barry et al. (2019)	Retrospective cohort; Multidisciplinary primary care clinic, Chilliwack, British Columbia, Canada; 2014–2018	Persistent pain; complex or unattached patients $n=70$	Non-pharmacological methods; Pain education	[a]	Health care utilization; Opioid administration
Calner et al. (2017) Nordin et al. (2016)	RCT; Primary healthcare centers, Norrbotten county, Sweden; 2011–2014	Persistent pain; MMR + web program $n=60$; MMR only $n=49$	MMR = two or three treatment sessions per week for at least 6 weeks; Web-BCPA = behaviour change program for activity	4, 12 months	Pain disability (PDI); Pain intensity (VAS); QoL (SF-36); Work-related aspects (WAI) Activity adherence; Activity feasibility; Coping (CSQ); Pain intensity (VAS); Self-efficacy (ASES; GSE); Treatment satisfaction
Clare et al. (2019)	Retrospective observational; Lewisham & Greenwich NHS Trust, London, England	Persistent pain; $n=50$	Group-based; 10 weeks (30 h); CBT; Pain education	6 weeks, 6 months	Catastrophizing (PCS); Depression (BDI-II): Kinesiophobia (TSK); Pain (BPI); Physical assessment Self-efficacy (PSEQ)
Dobscha et al. (2009)	RCT; five primary care clinics of one Department of Veterans Affairs Medical Center, US.; 2006–2008	Persistent pain; Intervention $n=187$; Treatment as usual $n=214$	Group + individual; Clinician education program (Assessment, education and activation, symptom monitoring, feedback and recommendations to clinicians, facilitation of specialty care)	3, 6, 12 months	Depression (PHQ-9); Pain disability (RMDQ); Pain intensity (CPG); QoL (EQ-5D)
Eklund et al. (2020) Pietilä-Holmner et al. (2020)	Prospective cohort; 11 primary health care centers, Sweden; 2012–2015	Persistent pain; $n=234$	Group+individual; 6–10 weeks; Coping strategies; Pain education; Physical activity; Relaxation	12 months	Cost-effectiveness (EQ5D); Sickness absence Activity (FRI); Anxiety (HADS-A); Catastrophizing (PCS); Depression (HADS-D); Pain Acceptance (CPAQ); Pain intensity (NRS); QoL (LiSat-11, EQ-5D); Sickness absence
Gustavsson et al. (2018)	RCT; six primary health care centers, Sweden; 2011–2013	Persistent pain; ALAR + MMR $n=34$; MMR only $n=31$	Individual; ALAR: 10 weeks, ten sessions and homework MMR: psychological methods, physical activity	12 months	Anxiety (HADS-A); Catastrophizing (PCS); Cost-effectiveness; Depression (HADS-D); Kinesiophobia (TSK); Pain disability (PDI); QoL (EQ-5D); Self-efficacy (SES); Sickness absence
Joypaul et al. (2019b)	Prospective observational; Gold Coast Primary Health Network, South-East Queensland, Australia; 2015–2016	Persistent pain; $n=252$	Group + individual; six monthly sessions; pain education; self-management resources	12 months	Analgesic administration; Functioning; Hospitalization; QoL; Self-efficacy (PSEQ)

Author (year)	Study design and setting	Participants	Intervention	Follow-up time	Outcome measures
Kwon et al. (2021)	Retrospective cohort: Academic military family medicine clinic, Virginia, US 2015	Persistent pain; $n = 54$	Three visits. Biopsychosocial management. Complementary treatments (acupuncture, dry needling, cranial electrical stimulation, and gua-sha)	12, 36 months	Opioid consumption (Opioid Risk Tool), Disability (ODI), Self-efficacy (PSEQ-2), depression (PHQ-9)
Mårtensson et al. (1999)	Prospective longitudinal cohort; Primary health care setting, Sweden	Persistent pain; $n = 70$	Group-based; 6 weeks; ego-strengthening psychotherapy	6, 48 months	General well-being; influence of intervention (PPC); pain management ability; perceived complaints (VAS)
Mårtensson et al. (2004)		Persistent pain; $n = 54$		12, 24 months	disability; health care utilization; sickness absence
Seal et al. (2020)	Prospective cohort; Veterans Affairs Medical Center, Northern California, US.; 2015–2018	Persistent pain; IPT $n = 147$; Treatment as usual $n = 147$	Individual; no specific program; short-term biopsychosocial management	3, 6 months	frequency of adverse clinical events; opioid administration
Sennehed et al. (2020)	Retrospective cohort; registry study; Skåne Health Care Register, Sweden; 2010–2011	Persistent pain; MMR $n = 2874$; Treatment as usual $n = 603$	Group-based; 8 weeks	24 months	Sickness absence
Stein and Miclescu (2013)	Prospective cohort; Primary health care unit in Arvika, Sweden; 2008–2011	Persistent pain; $n = 51$	Group-based; 6 weeks; CBT; body awareness and mindfulness; pain education; physical activity	12 months	Depression and anxiety (HADS); health care utilization; opioid consumption; pain (SF-36; NRS, MPI); QoL (EQ-5D, SF36); sickness absence
Bults et al. (2023)	Prospective cohort; primary health care setting, Netherlands	Persistent pain; multidisciplinary treatment $n = 43$; treatment as usual = 46	Individual; PNE psychological treatment, physical therapy 5–20 sessions	12 months	Pain intensity (NRS); Widespread Pain Index (WPI); HR-QoL (RAND-36); central sensitization (CSI); catastrophizing (PCS); Satisfaction (CQ-Index Module Pain) Post hoc analysis: Illness perceptiona (IPQ-B), depression and anxiety (HADS)

Abbreviations: ALAR, activity and life-role targeting rehabilitation program; ASES, Arthritis Self-Efficacy Scale; BDI-II, Beck Depression Inventory-II; BPI, Brief Pain Inventory; CBT, cognitive behavioural therapy; CPAQ, Chronic Pain Acceptance Questionnaire; CPG, Chronic Pain Grade; CSI, Central Sensitization Inventory; CSQ, two-item Coping Strategies Questionnaire; EQ-5D, European Quality of Life Instrument; FRI, Functional Rating Index; GSE, General Self-Efficacy Scale; HADS, Hospital Anxiety and Depression Scale; IPQ-B, Brief Illness Perception Questionnaire; IPT, Integrated Pain Team; LiSat-11, Life Satisfaction Questionnaire; MMR, multimodal rehabilitation; MPI, Multidimensional Pain Inventory; NRS, Numeric Rating Scale; ODI, Oswestry Disability Index; PCS, Pain Catastrophizing Scale; PDI, Pain Disability Index; PHQ-9, Patient Health Questionnaire 9; PNE, Pain Neuroscience Education; PPC, Personality-Physical-Cognitive Questionnaire; PSEQ, Pain Self-efficacy Questionnaire; QoL, quality of life; RCT, randomized controlled trial; RMDQ, Roland Morris Disability Questionnaire; SES, Self-Efficacy Scale; SF-36, 36-item Short-Form Health Survey; TSK, Tampa Scale for Kinesiophobia; WAI, Work Ability Index; Web-BCPA, Web behaviour change program for activity; WPI, Widespread Pain Index.

[a]Data not available.

3.2 | Quality assessment of included studies

The quality of the included studies is summarized in Table 2. Overall, the internal quality of the studies was relatively low or not reported.

The number of participants varied between 50 and 3477. The median number of participants in the studies was 99. Only three of the studies reached good reporting quality upon quality assessment. Most of the studies had fair reporting quality. A few of the studies were assessed to have poor reporting quality (Table 2).

3.3 | Intervention characteristics

Both the team compositions and contents of the interventions were revealed to be very heterogeneous. A total of 10 different professions were involved in the different interventions: psychologist, physical therapist, physician (general practitioner, internist, geriatrician, and psychiatrist), occupational therapist, pharmacist, social worker, nurse, dietician, exercise physiologist, and behavioural health consultant. The median number of professions contributing to each treatment group was 5. A physical therapist and physician were the most commonly involved professions (both involved in 94.1% of all interventions), and the majority of the interventions also included a psychologist's contribution (58.8%). All multidisciplinary team compositions are presented in Table 3.

The duration of the defined interventions varied from 6 to 10 weeks. Six of the interventions were group-based (Angeles et al., 2013; Clare et al., 2019; Joypaul et al., 2019b; Mårtensson et al., 1999; Mårtensson et al., 2004; Stein & Miclescu, 2013), 6 were individual (Barry & Chris, 2019; Bults et al., 2023; Dobscha et al., 2009; Gustavsson et al., 2018; Kwon et al., 2021; Seal et al., 2020), and 5 included both group and individual sessions (Calner et al., 2017; Eklund et al., 2020; Nordin et al., 2016; Pietilä-Holmner et al., 2020; Sennehed et al., 2020). All interventions entailed a psychoeducational component in addition to physical activity. Cognitive–behavioural techniques were used in eight interventions (Barry & Chris, 2019; Bults et al., 2023; Calner et al., 2017; Clare et al., 2019; Nordin et al., 2016; Seal et al., 2020; Sennehed et al., 2020; Stein & Miclescu, 2013).

The application of self-guided digital educational software was reported in two studies, which both used the same data (Calner et al., 2017; Nordin et al., 2016). In one study, the focus was on educating professionals in addition to patient-related outcome measures (Dobscha et al., 2009). Table 1 illustrates the main contents of each intervention.

3.4 | Clinical outcome measures

In the majority of the studies, the aim was to examine whether pre-defined therapeutic sessions have an effect on pre-defined outcomes. The outcome measures of the included studies showed great variability. Health-related quality of life (HRQoL) was used as a primary or secondary outcome measure in 6/17 studies, pain intensity or disability in 8/17 studies, and specific psychological measurements in 5/17 studies, while depression and/or anxiety were examined in 6/17 studies, work-related aspects in 7/17 studies, physical functioning in 3/17 studies, opioid consumption in 5/17 studies, and economic aspects (cost-utility; number of clinical visits) in 5/17 studies. Other examined parameters included satisfaction with treatment, as well as pain management abilities, general well-being, perceived symptoms, and the perceived influence of the intervention (Bults et al., 2023; Mårtensson et al., 1999; Nordin et al., 2016).

An overview of the results of the studies in terms of primary and secondary outcome measures is provided in Table 4. None of the included studies reported a statistically significant deterioration in the considered parameters.

3.4.1 | Quality of life

The European Quality of Life Instrument (EQ-5D), Short Form Health Survey Questionnaire (SF-36), and Life Satisfaction Questionnaire (LiSat) were used to measure the quality of life (QoL). Improvement in the QoL was seen in two studies, both of which were based on the same data (Eklund et al., 2020; Pietilä-Holmner et al., 2020). According to Pietilä-Holmner and colleagues, the mean EQ-5D Index increased from 0.23 (interquartile range [IQR] 0.60) to 0.62 (IQR 0.53) during the 1-year follow-up, $p < 0.001$, and the mean EQ-5D VAS increased from 44.0 to 50.0, $p < 0.001$. However, despite the increase in EQ-5D scores, no significant improvement was seen in Li-Sat life or vocation domains (Pietilä-Holmner et al., 2020). RAND-36 survey was used by Bults and colleagues, and at 6 months, the intervention group rated their overall health statistically significantly better than the control group, but at 12 months, they did not see a significant change anymore (Bults et al., 2023).

TABLE 2 Assessment of study quality (National Heart, Lung, and Blood Institute [NHLBI] Study Quality Assessment Tool for Observational Cohort and for Cross-sectional Studies and Controlled Intervention Studies; Pietilä-Holmner et al., 2020).

Author (year)	NHLBI assessment tool	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Quality rating
Angeles et al. (2013)	CIS	Yes	Yes	Yes	CD	CD	Yes	Yes	Yes	Yes	No	No	No	Yes	No	P
Barry and Chris (2019)	OCCSS	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	CD	No	P
Calner et al. (2017)	CIS	Yes	Yes	Yes	CD	CD	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	F
Nordin et al. (2016)	CIS	Yes	Yes	Yes	CD	CD	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	F
Clare et al. (2019)	OCCSS	Yes	Yes	Yes	Yes	No	NA	Yes	NA	Yes	Yes	Yes	No	CD	Yes	F
Dobscha et al. (2009)	CIS	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	G
Eklund et al. (2020)	OCCSS	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	F
Pietilä-Holmner et al. (2020)	OCCSS	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	No	Yes	G
Gustavsson et al. (2018)	CIS	Yes	Yes	No	No	CD	Yes	No	Yes	Yes	No	No	No	No	No	P
Joypaul et al. (2019b)	OCCSS	Yes	No	Yes	Yes	No	NA	Yes	No	Yes	No	Yes	Yes	Yes	Yes	F
Kwon et al. (2021)	OCCSS	Yes	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	CD	Yes	Yes	F
Mårtensson et al. (1999)	OCCSS	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	F
Mårtensson et al. (2004)	OCCSS	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	F
Seal et al. (2020)	OCCSS	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	G
Sennehed et al. (2020)	OCCSS	No	Yes	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	P
Stein & Miclescu, 2013	OCCSS	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	NR	Yes	Yes	F
Bults et al., 2023	OCCSS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	CD	F

Abbreviations: CD, cannot determine; CIS, NHLBI controlled intervention studies tool; F, fair reporting quality; G, good reporting quality; NA, not applicable; NR, not reported; OCCSS, NHLBI observational cohorts and cross-sectional studies tool; P, poor reporting quality.

Quality Assessment of Controlled Intervention Studies (CIS)1. Was the study described as randomized, a randomized trial, a randomized clinical trial, or an RCT?

2. Was the method of randomization adequate (i.e., use of randomly generated assignment)?

3. Was the treatment allocation concealed (so that assignments could not be predicted)?

4. Were study participants and providers blinded to treatment group assignment?

5. Were the people assessing the outcomes blinded to the participants' group assignments?

6. Were the groups similar at baseline on important characteristics that could affect outcomes (e.g., demographics, risk factors, and comorbid conditions)?

7. Was the overall drop-out rate from the study at endpoint 20% or lower of the number allocated to treatment?

8. Was the differential drop-out rate (between treatment groups) at the endpoint 15 percentage points or lower?

9. Was there high adherence to the intervention protocols for each treatment group?

10. Were other interventions avoided or similar in the groups (e.g., similar background treatments)?

11. Were outcomes assessed using valid and reliable measures, implemented consistently across all study participants?

12. Did the authors report that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power?

TABLE 2 (Continued)

13. Were outcomes reported or subgroups analysed prespecified (i.e., identified before analyses were conducted)?
14. Were all randomized participants analysed in the group to which they were originally assigned, i.e., did they use an intention-to-treat analysis?

Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (OCCSS)1. Was the research question in this paper clearly stated?
2. Was the study population clearly specified and defined?
3. Was the participation rate of eligible persons at least 50%?
4. Were all subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?
5. Was a sample size justification, power description, or variance and effect estimates provided?
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
10. Was the exposure(s) assessed more than once over time?
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
12. Were the outcome assessors blinded to the exposure status of participants?
13. Was loss to follow-up after baseline 20% or less?
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?

3.4.2 | Pain intensity and disability

Pain intensity was measured with the Visual Analogue Scale (VAS), Numeric Rating Scale (NRS), and the Chronic Pain Grade Scale (CPG) pain intensity subscale. Pain disability was measured with the Pain Disability Index (PDI), Roland Morris Disability Questionnaire (RMDQ), and Oswestry Disability Index (ODI). The measurements used to account for both pain intensity and pain-related interference were the West Haven-Yale Multidimensional Pain Inventory (MPI), Brief Pain Inventory (BPI), and the SF-36 bodily pain subscale. Improvement in terms of pain intensity was seen in one study: Dobscha and colleagues reported a decrease in the CPG pain intensity subscale (change from baseline to 12-month follow-up point being −4.7 [95% CI −6.9 to −2.5] in the intervention group and −0.6 [95% CI −2.6 to 1.5] in the control group, $p = 0.01$) (Dobscha et al., 2009). Therein, pain disability as measured by the RMDQ also decreased: −1.4 versus −0.2, $p = 0.004$, respectively (Dobscha et al., 2009). Improvement in the BPI interference subscale, but not in the intensity subscale, was reported in one study (Clare et al., 2019). Additionally, Angeles and colleagues reported improvement in SF-36 bodily pain (9.2-point increase in the early intervention group vs. 3.9-point decrease in the delayed intervention group, $p < 0.01$ [score of 100 representing no pain in SF-36 scoring]) (Angeles et al., 2013).

3.4.3 | Psychological measurements

The scores used to measure psychological factors included the Arthritis Self-Efficacy Scale (ASES), Pain Catastrophizing Scale (PCS), Pain Self-Efficacy Questionnaire (PSEQ), Coping Strategies Questionnaire (CSQ), General Self-Efficacy Scale (GSE), Chronic Pain Acceptance Questionnaire (CPAQ), and Brief Illness Perceptions Questionnaire (IPQ-B).

Both two studies using PCS found a significant decrease in catastrophizing (Pietilä-Holmner et al.: 21.0 at baseline and 18.0 at 1 year, $p < 0.001$; Clare et al.: 33.4 at baseline and 24.4 at the end of the intervention, $p < 0.001$) (Connell et al., 2022; Pietilä-Holmner et al., 2020). Joypaul and colleagues reported a significant increase in self-efficacy (PSEQ) after the intervention (23.1 at baseline and 35.3 at 8 months, $p < 0.001$), whereas Clare and colleagues as well as Kwon and colleagues found no statistically significant change in PSEQ (Clare et al., 2019; Joypaulet al., 2019b; Kwon et al., 2021). Pietilä-Holmner and colleagues found a positive effect on the subscales of both CPAQ activity engagement and pain willingness (Pietilä-Holmner et al., 2020).

TABLE 3 The health care disciplines included in the multidisciplinary intervention in each study.

Study	Physician (gp)	Physical therapist	Psychologist	Occupational therapist	Nurse	Pharmacist	Social worker	Dietician	Others[a]
Angeles et al. (2013)	X	X		X		X	X	X	
Barry & Chris et al. (2019)	X	X	X		X	X			
Calner et al. (2017)	X	X	X	X	X				
Nordin et al. (2016)									
Clare et al. (2019)		X	X		X				
Dobscha et al. (2009)	X	X	X						X
Eklund et al. (2020)	X	X	X	X			X		
Pietilä-Holmner et al. (2020)									
Gustavsson et al. (2018)	X	X		X					
Joypaul et al. (2019b)	X	X	X		X	X		X	X
Kwon et al. (2021)	X	X			X	X			X
Mårtensson et al. (1999)	X	X		X	X		X		
Mårtensson et al. (2004)									
Seal et al. (2020)	X		X			X			
Sennehed et al. (2020)	X	X	X	X					
Stein and Miclescu (2013)	X	X	X	X					
Bults et al. (2023)	X	X	X						
% Of studies	94,1	94,1	58,8	41,2	29,4	29,4	17,6	11,8	17,6

[a]Exercise physiologist (Joypaul et al., 2019a, 2019b), internist (Dobscha et al., 2009), behavioural health consultant (Joypaul, et al., 2019a; Joypaulet al., 2019b), psychiatrist (Kwon et al., 2021).

TABLE 4 Analysed outcomes, tools of assessment, and summary of results.

Analysed outcome	Tool of assessment (scale/measure)	Results (statistically significant improvements $p < 0.05$)
QoL ($n = 6$) Angeles et al. Calner et al., Dobscha et al., Eklund et al. + Pietilä-Holmner et al., Bults et al.	Short Form Health Survey Questionnaire (SF-36) EuroQol-5D (EQ-5D) Life Satisfaction Questionnaire (Li-Sat) Rand 36-Item Health Survey (RAND-36)	QoL improved in **1/5** studies (Eklund et al.)
Pain intensity ($n = 6$) Calner et al. + Nordin et al., Dobscha et al, Mårtensson et al., 1999. Stein et al., Bults et al.	Visual Analogue Scale(VAS) Numeric Rating Scale (NRS) Chronic Pain Grade Scale(CPG)	Pain intensity decreased in **2/5** studies (Dobscha et al., Mårtensson et al., 1999)
Pain disability ($n = 6$) Calner et al. Dobscha et al Gustavsson et al. Pietilä-Holmner et al. Kwon et al. Bults et al.	Pain Disability Index (PDI) Roland Morris Disability Questionnaire (RMDQ) Functional Rating Index (FRI) The West Haven–Yale Multidimensional Pain Inventory (MPI) Oswestry Disability Index (ODI) Widespread Pain Index (WPI)	Improvement in **2/5** studies (Dobscha et al., Pietilä-Holmner et al.)
Psychological factors ($n = 8$) Clare et al. Gustavsson et al. Joypaul et al Nordin et at. Pietilä-Holmner et al. Kwon et al. Bults et al.	Pain Catastrophizing Scale (PCS), Brief Pain Inventory (BPI), Pain Self-Efficacy Questionnaire (PSEQ), Coping Strategies Questionnaire (CSQ), General Self-Efficacy Scale (GSE), and Chronic Pain Acceptance Questionnaire (CPAQ) Arthritis Self-Efficacy Scale (ASES) Brief Illness Perceptions Questionnaire (IPQ-B)	Improvement in **3/7** (Clare et al., Joypaul et al., Pietilä-Holmner et al.)
Depression ($n = 7$) Clare et al. Dobscha et al Gustavsson et al. Pietilä-Holmner et al. Kwon et al. Stein et al. Bults et al.	Beck Depression Inventory (BDI), Patient Health Questionnaire (PHQ-9), and Hospital Anxiety and Depression Scale (HADS)	Improvement in **4/6** (Clare et al., Dobscha et al., Pietilä-Holmner et al., Stein et al.)
Work-related aspects ($n = 7$) Calner et al. Eklund et al. Gustavsson et al. Mårtensson et al., 2004 Pietilä-Holmner et al. Sennehed et al. Stein et al.	Working Ability Index (WAI), sickness absence	Decrease in sickness absences **5/7** (Eklund et al., Gustavsson et al., Mårtensson et al. (2004) Pietilä-Holmner et al., Stein et al.)
Opioid consumption ($n = 5$) Barry et al. Joypaul et al. Seal et al. Stein et al. Kwon et al.	Mean opioid dose, prescriptions	Decrease in **3/5** (Barry et al., Seal et al., Kwon et al.)
Physical functioning ($n = 2$) Clare et al. Gustavsson et al.	Tampa Scale of Kinesiophobia (TSK) Number of sit-to-stands in 1 min	Improvement in **1/2** (Clare et al.)

(Continues)

TABLE 4 (Continued)

Analysed outcome	Tool of assessment (scale/measure)	Results (statistically significant improvements $p < 0.05$)
Economical aspects ($n = 6$) Angeles et al., Clare et al., Eklund et al., Gustavsson et al., Mårtensson et al. (2004), Stein et al.	Number of clinic visits Cost-effectiveness	Decrease in clinic visits **3/6** (Angeles et al., Clare et al., Mårtensson et al.) Positive results in cost-utility analyses in **2/6** (Eklund et al., Gustavsson et al.)

Bults and colleagues reported a significant effect on illness perceptions, with the intervention being significantly more effective in decreasing negative illness perceptions and increasing perceived health. However, the changes in illness perceptions in the intervention group were not deemed clinically relevant (Bults et al., 2023).

3.4.4 | Depression and anxiety

Depression was measured by the Beck Depression Inventory II (BDI-II) in one study, the Patient Health Questionnaire-9 (PHQ-9) in two studies, and the Hospital Anxiety and Depression Scale (HADS) in three studies. In the study by Pietilä-Holmner et al., the level of depression improved in four studies (Clare et al., 2019; Dobscha et al., 2009; Pietilä-Holmner et al., 2020; Stein & Miclescu, 2013). The level of anxiety decreased in one study (HADS anxiety subscale 9.0 at baseline and 8.0 at 1 year, $p < 0.001$); in the other study, statistical significance was not reached (8.71 at baseline vs. 7.0 at 12 months, $p > 0.05$) (Pietilä-Holmner et al., 2020; Stein & Miclescu, 2013). One study did not report numeric results and only established that there was no statistically significant change (Kwon et al., 2021).

3.4.5 | Opioid consumption

The mean daily opioid dose in morphine equivalents was most commonly used as an analgesic-related outcome measure. According to Barry and colleagues, 89% of intervention participants reduced their daily opioid dose. Therein, the mean daily opioid dose was reduced from 183 to 70 mg morphine equivalents (Barry & Chris, 2019). Similar results were observed in a study by Seal and colleagues: those receiving intensive pain management reduced their opioid dose from a mean of 124.1 mg morphine equivalents at baseline to 68.4 mg morphine equivalents at 6 months, compared to the reduction from 124.5 mg to 107.1 mg among those receiving treatment as usual (Seal et al., 2020). According to Kwon and colleagues, morphine equivalent daily dosage decreased from 31.5 mg to 20.5 mg at 12 months post-intervention, representing a 35% decrease (Kwon et al., 2021).

3.4.6 | Physical functioning and ability to work

Physical functioning was measured with the Tampa Scale of Kinesiophobia (TSK) in one study, the Functional Rating Index (FRI) in one study, and the EQ-5D physical functioning subscale in one study. Improvement was seen in the TSK (43.2 at baseline vs. 35.9 after intervention, $p < 0.001$) by Clare and colleagues and in the FRI (60.0 at baseline vs. 55.0 at 1 year, $p < 0.001$) by Pietilä-Holmner and colleagues (Clare et al., 2019; Pietilä-Holmner et al., 2020).

Sickness absences were significantly reduced in five of the six studies examining this parameter (Eklund et al., 2020; Gustavsson et al., 2018; Mårtensson et al., 1999; Mårtensson et al., 2004; Pietilä-Holmner et al., 2020; Stein & Miclescu, 2013). Pietilä-Holmner and colleagues reported that the proportion of those on full-time sick leave was reduced from 20.9% to 15.0% 1 year after intervention, $p = 0.027$. They identified variables associated with the probability of not being on sick leave at the 1-year follow-up—pain intensity last week (OR 0.83 [95% CI 0.72–0.97], $p = 0.021$); FRI (OR 0.96 [95% CI 0.95–0.98], $p < 0.001$); and self-related working ability (OR 1.27 [95% CI 1.14–1.41], $p < 0.001$) emerged as explanatory factors (Pietilä-Holmner et al., 2020).

3.4.7 | Economical aspects

All six studies examining economic aspects found positive effects related to the interventions in terms of either the number of clinical visits or calculated cost-effectiveness (Angeles et al., 2013; Clare et al., 2019; Eklund et al., 2020; Gustavsson et al., 2018; Mårtensson et al., 2004; Stein & Miclescu, 2013). According to Eklund and colleagues, the costs per quality-adjusted life year (QALY) of a multimodal rehabilitation program were 18,704 euros at 1 year in comparison with

treatment as usual. However, as they extrapolated their results using results from previous long-term studies, the incremental cost–utility ratio was 20%–25% of the incremental cost–utility ratio at 1 year's follow-up, and multimodal rehabilitation was thus suggested to be cost-effective (Eklund et al., 2020). A study examining the cost-effectiveness of combining an activity and life-role targeting rehabilitation program (ALAR) with multimodal pain rehabilitation demonstrated higher costs in the short term but favourable heath-economic effects in the long term (Gustavsson et al., 2018).

3.4.8 | Other considered variables

The patient experience was considered in two studies. In their study examining multimodal rehabilitation combined with a Web Behaviour Change Program, compared with multimodal rehabilitation alone, Nordin and colleagues found higher treatment satisfaction among those receiving web-based treatment at 4 months (mean VAS score 85 vs. 65, $p < 0.01$) and at 12 months (82 vs. 66, $p = 0.003$) (Nordin et al., 2016). In a study by Gustavsson and colleagues, over half of the participants receiving ALAR in addition to multimodal rehabilitation felt that they had participated in the planning of their rehabilitation, as opposed to the one in four among those receiving only multimodal rehabilitation (Gustavsson et al., 2018).

Mårtensson et al. (1999) found that the self-rated general well-being showed a significant increase in the test (VAS; PPC) immediately after the intervention. This change also persisted in the long-term test. Furthermore, pain management ability showed a significant increase in the long-term test when compared with the rating before the intervention. Eighty-five percent reported an increased ability to influence the symptoms through knowledge gained during the intervention. This change persisted in the long-term test at 48 months' follow up (Mårtensson et al., 1999).

4 | DISCUSSION

The aim of the present systematic review was to explore whether studies about multidisciplinary persistent pain management programs exist and how the interventions have been arranged in primary care. The review revealed the scarcity of studies about multidisciplinary programs for managing persistent pain arranged in primary care. The contents, settings, as well as study protocols and outcomes of existing programs showed great heterogeneity. It was not possible to analyse the results of the existing studies quantitatively. The quality of the studies was relatively low.

Recent estimates have suggested that the prevalence of persistent pain is approximately 20%, and the prevalence of high-impact persistent pain is 8% among adults in the US (Dahlhamer et al., 2018). According to Mäntyselkä and colleagues, 40% of primary care visits in Finland are due to pain (Mäntyselkä et al., 2001). Multiple medical, social, and lifestyle factors are known to associate with persistent pain (Marttinen et al., 2018; Mills et al., 2019). Within this framework, primary care, which is accessible to everyone, could provide an ideal environment for organizing the holistic treatment of the majority of patients suffering from persistent pain. Cost-effectiveness estimates support this concept (Angeles et al., 2013; Clare et al., 2019; Eklund et al., 2020; Gustavsson et al., 2018; Mårtensson et al., 2004; Stein & Miclescu, 2013). Therefore, it is surprising that, herein, so few structured treatment programs emerged. It may be hypothesized that most treatment teams in primary care have traditionally been based on general practitioner and nurse collaboration, and it may be a challenge to build a multidisciplinary team for persistent pain management. Also, financial resources may not have been optimized for more versatile teams. It is also possible that this review does not provide a comprehensive view of the availability of multidisciplinary programs, which may exist but have not been studied and reported on. In general, research activity in primary care is low compared to that in specialized care. This may be due to under-resourcing and workload, yet, probably most likely, to lack of culture of research.

According to the results presented herein, the quality of the studies appeared to be rather low. The sample sizes were low in clinical studies. The participation rate of all eligible patients was under 50% in a relatively large proportion of the studies (Table 2). Moreover, as regards controlled intervention studies, only one of the five studies reported that the sample size was sufficiently large to be able to detect a difference in the main outcome between groups with at least 80% power (Dobscha et al., 2009). Patients suffering from persistent pain may have poor resources in terms of participation in clinical studies, which may partially explain the low participation rates (Tait, 2009). However, primary care may also lack systematic scientific protocols, experience, and resources.

Connell et al. conducted a systematic review in 2022 including 13 RCTs, their aim was to identify key features of interdisciplinary team structures and processes associated with improved pain outcomes for patients experiencing chronic pain in primary care settings. Inclusion criteria determined that teamwork was identified if intervention

included at least two clinicians. This review included two same studies as our review. They discovered that the most common clinician role in interventions with some clinical effect was of a nurse care manager; five interventions with some effect on pain included a care manager. In our study, half of the intervention had a nurse involved (Connell et al., 2022).

The International Association for the Study of Pain (IASP) defines multidisciplinary pain management as "multimodal treatment provided by practitioners from different disciplines" (IASP Terminology, 1994). According to the studies considered herein, there are many options for how to provide multidisciplinary pain management in practice, as regards team composition, the content of the intervention, and program duration. As early as in 1999, Mårtensson and colleagues highlighted the important role of pain education in the management of persistent pain, which, also according to the latest consideration, has been suggested as a key element in interventions (Joypaul et al., 2019a; Mårtensson et al., 1999). Pain education was included in the vast majority of the interventions considered in the current systematic review. Additionally, physical therapy and psychological/mindfulness techniques were present in nearly all interventions. However, referring to the heterogeneous results herein, it was difficult to conclude which specific characteristics make an intervention effective and feasible. Additionally, as highlighted by Connell and colleagues, team structures and processes may affect on program outcomes. It may be hypothesized that an interdisciplinary approach, in which team collaboration has a central role, lead to more positive outcomes in comparison to a multidisciplinary approach. However, the current review was not able to identify whether in the study programs presented herein the approach was multidisciplinary or interdisciplinary (Connell et al., 2022).

The focus in managing persistent pain should be on improving an individual's quality of life and functioning (Vartiainen et al., 2019). In the studies included in the present review, multiple outcome variables were considered. It is difficult to determine whether changes in pain intensity, physical functioning, economic aspects, or self-efficacy, for example, should be emphasized when evaluating intervention effectiveness. Therefore, the clinical and health-related effectiveness of the interventions considered herein was not comparable. For example, Stein and colleagues found improvement in multiple outcome variables but not in pain intensity, when the effects of a 6-week program including physical therapy, body awareness, training, ergonomics, pain education, CBT, and mindfulness were examined. A decrease in the number of GP visits, for example, may suggest improvement in self-efficacy and may be regarded as a positive effect of an intervention despite no significant change in pain intensity (Stein & Miclescu, 2013).

Recommendations concerning a multidisciplinary intervention for patients with persistent pain in primary care cannot be provided based on the current systematic review. However, with the large number of patients suffering from persistent pain worldwide, primary care will have a key role in the prevention and treatment of persistent pain. Therefore, a multidisciplinary, holistic treatment approach should be pursued for persistent pain patients also in primary care. Future systematic and individualized treatment interventions as well as long-term effectiveness studies are needed to specify the optimal treatment protocols for persistent pain patients in the primary care setting.

To the best of the authors' knowledge, the present systematic review is one of the first to examine studies that exist about multidisciplinary programs for managing persistent pain in primary care. The systematic review was conducted in adherence to good practice and the PRISMA checklist (IASP Terminology, 1994). Some limitations occurred regarding the included data. Due to the great heterogeneity of study designs, intervention contents, and outcome measures, it was not possible to conduct a meta-analysis. The majority of the studies were conducted in European countries that have a public health care system, and, therefore, applying the results to other health care systems should be done with caution. It is possible that the data search was not able to find all available studies, yet, covered multiple datasources which had partial overlap. Additionally, some studies were based on the same data.

5 | CONCLUSION

The current systematic review was designed to explore whether studies about multidisciplinary programs for the management of persistent pain exist. The review revealed that studies about such treatment interventions for persistent pain patients are scarce. The existing studies were heterogeneous in terms of intervention characteristics, population, outcome variables, and study methodology. Furthermore, the study quality was mostly fair or poor. There is an urgent need for further studies on systematic multidisciplinary treatment protocols for managing persistent pain in primary care.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there were no conflicts of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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