Development of an interdisciplinary training program about chronic pain management for healthcare professionals: part of an effectiveness-implementation study

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Abstract

Background

Many applied postgraduate pain training programs are monodisciplinary, while interdisciplinary training programs potentially improve interdisciplinary collaboration, which is favorable within the management of patients with chronic pain. However, there is limited research on the development and effectiveness of interdisciplinary training programs, especially in the context of chronic pain.

Methods

This study aimed to describe the development and implementation of an interdisciplinary training program regarding the management of patients with chronic pain, which is part of an implementation project. The training program contained two workshops of seven hours each and two e-learning modules and was targeted at general practitioners, (home)nurses, psychologists, physiotherapists, occupational therapists, dentists and pharmacists. An interdisciplinary expert panel was organised to prioritise learning objectives, rate healthcare professionals’ current compliance with the learning objectives and formulate the barriers and needs relating to training content and the implementation of chronic pain management in clinical practice.

Results

The interdisciplinary expert panel considered the learning objectives as very important and current compliance was rated as relatively low. A wide variety of barriers and needs for Belgian healthcare professionals were formulated within the COM-B domains; capability, opportunity, motivation and behaviour. The interdisciplinary program about the management of patients with chronic pain aimed to promote and facilitate the implementation of the biopsychosocial model and pain science education into clinical practice.

Conclusion

We designed an interdisciplinary training program regarding the management of patients with chronic pain that can be used as a foundation for developing future training programs to enhance the quality of future training programs.

Introduction

Chronic pain affects approximately 20% of the population worldwide (Breivik et al., 2006). Chronic pain has a tremendous personal and socioeconomic impact: it causes the highest number of years lived with disability (Global Burden of Disease Study, 2015) and is the largest cause of work-related disability.
The intensity, functional impact and persistence of pain are influenced by biopsychosocial factors (Fillingim, 2005; Lumley et al., 2011; McLean et al., 2005; Meeus & Nijs, 2007; A. J. Wijma et al., 2016). Factors such as comorbidities, physical well-being, behaviour, psychosocial well-being and environmental aspects can all influence the pain a person experiences (Fillingim, 2005; Lumley et al., 2011; McLean et al., 2005; Meeus & Nijs, 2007; A. J. Wijma et al., 2016). This understanding of chronic pain has shifted management strategies from pure biomedical treatments to multimodal approaches acknowledging the complex biopsychosocial nature of chronic pain.

Pain science has taught us that pain can be present without tissue damage, that pain is often disproportionate to tissue damage, and that tissue damage (and nociception) does not per se result in the feeling of pain (Raja et al., 2020). Transferring this knowledge to people with pain is a cognitive-behavioural therapy intervention called pain science education (PSE) (Tegner et al., 2018). This approach incorporates contemporary pain science to educate a patient about the nature of the pain experience and associated contributing factors, so that the patient can reconceptualise the meaning of the pain experience (Moseley & Butler, 2015). PSE facilitates the patient to gain a broader biopsychosocial understanding of his pain experience, including the role of neurophysiological, psychological, social and environmental factors in addition to biomedical factors (Moseley & Butler, 2015; Nijs et al., 2011).

Clinical guidelines for the treatment of chronic pain emphasise the importance of a biopsychosocial approach and recommend PSE to improve maladaptive pain beliefs, decreasing pain and disability in patients with various chronic pain disorders (Louw et al., 2011; Moseley, 2002; G. L. Moseley, 2003; Moseley, 2004; Moseley, 2005; Moseley et al., 2004; Nijs et al., 2011; Van Oosterwijck et al., 2011). More specifically, in patients with chronic low back pain, chronic neck pain, fibromyalgia, chronic fatigue syndrome, osteoarthritis and postsurgical pain, PSE appears to result in favorable outcomes (Louw et al., 2011; Nijs et al., 2011). It has proven to be effective in changing pain beliefs and coping strategies and improving health status (Louw et al., 2011; Moseley, 2002; G. Lorimer Moseley, 2003; Moseley, 2004; Moseley, 2005; Moseley et al., 2004; Nijs et al., 2011; Van Oosterwijck et al., 2013; Van Oosterwijck et al., 2011). However, implementation of the biopsychosocial model and PSE is complex. Currently, many applied treatments are biomedically oriented and defined as low-value care (Hartvigsen et al., 2022), resulting in poorer pain, activity and work-related outcomes (Chibnall et al., 2006; Christe et al., 2021; Darlow, 2016). In addition, patients often consider their treatment to be inadequate (Breivik et al., 2006; Smalbrugge et al., 2007; van Herk et al., 2009; Voerman et al., 2015). With decades of education, dozens of guidelines and many good intentions to improve care, the gap between science and clinical care remains, which limits the implementation of the biopsychosocial model and PSE in clinical practice. There are multifactorial reasons why clinical guidelines are poorly adhered to by HCPs, e.g. lack of knowledge regarding pain and pain management (Darlow et al., 2012; Gardner et al., 2017; Gheldof et al., 2005; Holden et al., 2009; Linton et al., 2002; Pain, 2010; Recommendations by the International Association for the Study of Pain), HCPs feel that their skills and confidence are insufficient to change their behaviour, which is sometimes also not applicable in their clinical practice (Driver et al., 2017; Richmond et al., 2018; Synnott et al., 2015; Zangoni & Thomson, 2017). Furthermore, patient ability and
preferences also affect HCPs’ guideline adherence (Gardner et al., 2017; Lugtenberg et al., 2011; Roussel et al., 2016).

Postgraduate training programs could lower these barriers by improving their knowledge, skills and confidence to facilitate behavioural change. Studies showed that educational interventions resulted in more guideline adherend’ recommendations and intentions than solely providing clinical guidelines, although there were no significant differences in behaviour change (French et al., 2013; Schectman et al., 2003). In addition to improved guideline adherence, training programs are effective to improve HCPs’ knowledge and skills regarding the management of pain with effect sizes ranging from small to large (Gaupp et al., 2020; Ghandehari et al., 2013; Jacobs et al., 2016; Stevenson et al., 2006; Synnott et al., 2016; Zhang et al., 2008). However, this effect can decline over time (Achaliwie et al., 2023). Most educational training programs were applied for monodisciplinary groups of HPCs, while there is a need for interdisciplinary training to improve interdisciplinary collaboration within healthcare (Hammick et al., 2007; Petit et al., 2019; Recommendations by the International Association for the Study of Pain). In return, interdisciplinary collaboration in clinical practice is associated with higher psychosocial attitudes and might therefore benefit the mid- and long-term effectiveness of training programs (Misra et al., 2009; Petit et al., 2019; Thompson et al., 2018). However, little is known about the effectiveness of interdisciplinary postgraduate pain educational training programs, especially when focusing on chronic pain. Given the established need for interdisciplinary educational training programs to improve interdisciplinary collaboration within healthcare (Hammick et al., 2007; Petit et al., 2019; Recommendations by the International Association for the Study of Pain), the lack of studies examining the effectiveness of interdisciplinary postgraduate chronic pain training educational programs represents a significant knowledge gap. Such interdisciplinary postgraduate chronic pain training programs are also challenging, as they have to be applicable for all HCPs. Here, we aimed to address the significant knowledge gap by developing an interdisciplinary training program about chronic pain for HCPs.

For the reasons outlined above, within this study, we describe the development of an interdisciplinary training program about chronic pain for HCPs. First, an interdisciplinary expert panel was organised to identify barriers and needs expressed by HCPs for such an interdisciplinary chronic pain training program. Second, the identified barriers and needs of HCPs for a chronic pain training program were used for the development of an interdisciplinary training program regarding the management of patients with chronic pain. Third, the paper also describes the planned evaluation method to assess the short- and mid-term changes in knowledge, attitudes and guideline adherence among HCPs. This study is part of a type 2 implementation project to evaluate the effectiveness of an interdisciplinary training program about chronic pain on HCPs’ knowledge, attitudes, and guideline adherence.

**Methods**

The study was approved by an independent Medical Ethical Committee (EC-2021-327) linked to the University Hospital of Brussels, Brussels, Belgium and was in accordance with the Guideline for Reporting Evidence-based practice Educational interventions and Teaching (GREET) (Phillips et al., 2016), Template...
for Intervention Description and Replication (TIDieR) checklist (Hoffmann et al., 2014) and Standards for Reporting Implementation Studies (StaRi) Statement (Pinnock et al., 2017).

Belgian context

Belgium is a European country with 11.7 million inhabitants and is divided into three regions: Flanders – official language Dutch -, Brussels official language Dutch and French - and Wallonia – official language French. Belgium has a federal government (Federal Public Service) that manages substantial parts of public health. Each region has its own governance with powers in fields that are connected with its region. In 2019, 7.9% (€37.2 billion) of the Belgian Gross Domestic Product, is spent on health (Devos Carl, 2019). In 2022, Belgium had approximately 17.914 general practitioners (GPs), 41.535 physiotherapists, 13.255 nurses 210.079 dentists, 22.508 pharmacists, 14.478 occupational therapists and 14.641 clinical psychologists (Federale Overheidsdienst Volksgezondheid, 2022). However, these are registered healthcare professionals and do not represent practising healthcare professionals. Most of the care is coordinated by GPs, and access to a physiotherapist or occupational therapist requires a referral. Care will require expenses by the patient because it is partly reimbursed by health insurance – which is mandatory for all inhabitants. Approximately 23% of the population has chronic pain (Breivik et al., 2006), and chronic pain patients account for 33 to 49% of the GPs’ patient contact (Steyaert et al., 2023). Within this group, pain was the primary motive to seek consultation in 54% of the cases, and 81% had pain for more than a year (Steyaert et al., 2023).

The project consortium consists of three partners: an international research group, Pain in Motion, administratively embedded at VUB in collaboration with Université de Liège, Ghent University, Antwerp University and Université Catholique de Louvain; and two GPs associations - SSMG and Domus Medica - who represent Dutch and French-speaking GPs in Belgium. The Belgian Federal Public Service of Health, Food Chain Safety and Environment funded this project. Together with affiliated healthcare policy organisations, the Federal Public Service was represented in a guidance committee. This committee supervised the progress of the project and provided feedback based on reports and presentations by the project consortium.

Learning objectives

The main goal of the training program about chronic pain was to promote and facilitate the implementation of the biopsychosocial model and PSE into clinical practice. The training program was therefore developed to improve the biopsychosocial orientation and related skills for implementing the biopsychosocial model and PSE in the treatment of patients with chronic pain. Within the consortium, the following learning objectives of the training program were established:

1. Improved understanding of acute and chronic pain within a biopsychosocial framework
a. Reconceptualise pain: understand the difference between pain and nociception and acute and chronic pain. This enables participants to understand that statements like “your pain is not real” are inappropriate and that the words they use with patients are essential as they can influence the “credible evidence of danger”. Thus, they understand why some messages need to be avoided while others are recommended, e.g. (KCE report on low back pain and radicular pain)(Jonckheer & Mairiaux, 2017).

b. Understand that the purely biomedical model is out-of-date and that the biopsychosocial model of pain should be adopted. Indeed, it is well-established that psychosocial factors influence pain experience, and functional impact of pain; and they are also risk factors for the transition to and persistence of chronicity(Berquin, 2010; Nicholas et al., 2011).

2. **Assess patients with (chronic) pain**

   a. Use questionnaires and interviews to identify patients’ biopsychosocial factors which might influence pain experience according to the PSCEBSM model(Amarins J. Wijma et al., 2016) (pain–somatic factors – cognitive factors – emotional factors – behavioural factors – social factors – motivation).

   b. Assess the patients’ resources, obstacles to improvement, and their “readiness to change”.

3. **Integrate contemporary pain science into clinical reasoning in patients with chronic pain**

4. **Provide tailored and patient-centred strategies to subacute and chronic pain patients**

   a. Educational strategies:

      i. Understand that PSE is a continuous process;

      ii. Improve communication skills to favour therapeutic alliance (which is crucial as it can increase patients’ involvement in their own treatment);

      iii. Master pain neurophysiology and the biology behind different pain mechanisms to be able to explain pain to patients by means of metaphors and tools

   b. Use a patient-centred approach to define specific goals that are meaningful to the patient.

   c. Manage obstacles to improve the patient’s motivation to change.

   d. Develop the skills to teach patients pain coping skills aligned with the ideas delivered during PSE.

   e. Design a multimodal treatment program, either mono- or interdisciplinary, according to the patients’ representations, beliefs, expectations and needs, e.g. stress self-management program, graded activity program, graded exposure, education/reassurance, etc.

5. **Understand the role of HCPs in a multidisciplinary perspective**
a. Gain more understanding of other healthcare disciplines' role in successfully managing chronic pain.

b. Improve communication with other HCPs about the management of chronic pain.

**Interdisciplinary expert panel**

Knowing the priority groups’ setting and the barriers and needs to change is essential to achieve successful implementation (Damschroder et al., 2009; Grol, 1997; Grol Richard, 2013; Pallesen et al., 2020; Roschelle et al., 2006). We selected priority groups with HCPs working in primary care since these are the first HCPs in contact with patients with chronic pain. We selected GPs, (home)nurses, psychologists, physiotherapists, occupational therapists, dentists and pharmacists. Although we focused on priority groups, the training program was accessible for all HCPs.

A interdisciplinary expert panel was organised included 21 experts: a Dutch and a French-speaking expert for each priority group, two pain centre specialists, two heads of pain centres, a member of a patient association and a member of a Belgian organisation that focuses on guideline implementation.

The multidisciplinary panel completed an online questionnaire in which they indicated to what extent they agreed or disagreed about the current compliance of the Belgian HCPs with the objectives of the training program. In addition, the expert panel was asked to formulate barriers and needs relating to training content and the implementation of chronic pain management in clinical practice within Belgian healthcare, in line with contemporary pain science. They were asked to provide the barriers and needs at the level of HCPs, patients, organisations and the healthcare system. The results were accompanied by a literature search and discussed during the first meeting to provide a deeper understanding of the barriers, needs and specific context variables relevant to the implementation project. The COM-B model – with capability, opportunity, motivation and behaviour domains - was used as a theoretical domain framework to organise the barriers and needs based on capability, motivation and opportunity and characterise interventions and policies to change behaviour (Michie et al., 2011). Three online meetings with the expert panel were organised, one about the barriers and needs, one to evaluate the patient materials and one to evaluate the training program prior to implementation. The expert panel received an update about the results of the training program after the completion of the implementation process.

**Chronic pain training program**

We designed an interactive blended learning training program with two e-learning modules of approximately one hour each and two face-to-face workshops in groups of approximately seven hours. This amount of training hours is commonly applied and reported to be effective in changing knowledge, attitudes and determinants of implementation behaviour (Kongsted, Hartvigsen, et al., 2019; Schröder et al., 2020). This training program was adapted to the barriers and needs formulated by the literature search and expert panel and a French and Dutch version was developed so it could be implemented in Antwerp, Brussels, and Namur.
The e-learning modules provided the theoretical basis to the participants and maximised the time for interactions and skills training during the workshops. The two workshops were designed to focus on skill training and practical implementation of the biopsychosocial model and pain education in clinical practice. Approximately a month was planned between both workshops so participants can practice in their clinical practice and their experience can be discussed during their second workshop. We used a variety of educational methods, such as interactive lessons, video materials, local opinion leaders (Flodgren et al., 2019), demonstrations, illustrations, assignments, skills training, clinical reasoning training, goal settings, role playing, case studies and interdisciplinary discussions, and peer- and teacher feedback to improving the learning process (Demmelmaier et al., 2012; Flodgren et al., 2019; Gardner et al., 2010; Krause et al., 2017). These methods were used to reduce barriers and to implement the biopsychosocial model and PSE in practice, corresponding to HCPs’ current best-evidence approach in line with modern pain sciences (Demmelmaier et al., 2012; Thompson et al., 2018). Both workshops included mandatory phases in combination with optional phases that could be adapted to the expectations and needs of the participants.

After participating in the training program, participants were asked if they were interested in sharing their name, work address(es) and contact details. With this information, an interactive map was developed and shared with all participants to improve their multidisciplinary collaboration. The local trainers aimed to facilitate a sustainable change by acting as a chronic pain resource person for the HCPs in their area after the implementation project.

**Patient materials**

Patient materials were developed to support the implementation of PSE in clinical practice and the quality of PSE for patients with chronic pain. The patient materials included posters, a patient booklet – which was an update from an existing PSE booklet (Nijs & van Wilgen, 2010) - and videos explaining pain were created by collaborating with the Retrain Pain Foundation by making videos from their PSE slides (Foundation). A panel of five Dutch-speaking and five French-speaking patients with chronic pain were organised to co-design these materials. These patients were recruited from two chronic pain patient organisations and within the university hospital of Brussels (UZ Brussel). The patient panel discussed patients’ needs, information and messages that were important to patients and provided feedback on the developed materials. The patient materials discusses the impact of pain, why we feel pain, the difference between acute and chronic pain, the role of the nervous system and the brain, an overprotective alarm system and contributing factors, and how to manage chronic pain (e.g. improve understanding about pain, beliefs and expectations, active lifestyle, stress management, social life, sleep, positive and negative effects of medication, self-management and the support from HCPs. The patient materials were evaluated based on the following criteria: ‘clarity’, ‘content’, ‘usefulness’, ‘layout’, ‘understandability’, ‘added value or not’, ‘consistency’ and ‘suggestions for improvements’ by the expert panel and patient panel. All materials were updated based on their feedback to improve quality.

**Trainer recruitment and train-the-trainer workshop**
Each training was provided by a pair of teachers. One expert teacher from the consortium who is graduated as an HCP and was familiar with chronic pain, the biopsychosocial model, PSE and has experience with teaching. This expert teacher was teamed up with an HCP working in the area of training implementation to tailor the training program to the local context, i.e. taking into account the sociocultural diversity of the patient population in the area and the local, formal and informal networks of HCPs. The local trainer's criteria were as follows: speaking fluently Dutch or French, working three days a week with patients with chronic pain in the areas of implementation (Antwerp, Brussels or Namur), expertise in chronic pain, a biopsychosocial perspective, ability to participate in the train-the-trainer workshop and ability to provide at least two workshops.

The train-the-trainer workshops were implemented to secure the quality of the trainers and to ensure that the trainers’ knowledge and attitudes were in line with the training content. It included online one-on-one training sessions and discussions about chronic pain organised by the expert trainer with whom the local trainer forms a training duo. This personal train-the-trainer workshop provided the opportunity to adapt it to the needs of the expert and local trainer. In addition, group meeting(s) with other local trainers were organised for more general discussions to ensure that the core of the training program was the same for all training duos. At the end of the train-the-trainer workshop, all trainers completed the KNAP questionnaire to assess their knowledge and attitudes toward pain in line with modern pain science. Trainers received a fee of €350 for participating in the train-the-trainer workshop and a fee of €600 for each day of provided workshops for HCPs.

**Recruitment healthcare professionals**

We aimed to train 300 HCPs at minimum within a total of 15 groups with approximately 20 to 25 HCPs — five training groups in each implementation area; Antwerp (Flanders), Brussels and Namur (Wallonia). All HCPs in Belgium were eligible to register for the training program. HCPs were recruited between June 2021 and May 2022 through multiple methods and networks. The consortium collaborated with organisations associated with HCPs in primary care, the Federal Public Service, and organisations connected to the project to recruit HCPs. All organisations shared information and flyers on their website, magazines, social media and/or within their network. At the start, we prioritised recruitment in the area where we implemented the training to increase the likelihood that HCPs could collaborate after participating in the training program. The area to share information was expanded when a training group was not full a month before the training date.

Participants received accreditation for participating in the training program to stimulate participation. The cost of the training programs was covered within the project's funding. Therefore, the training was free for participants, making the training also accessible for HCPs with fewer financial possibilities. In addition, the training program was implemented at various days of the week - Monday to Saturday - and various periods of the day - morning and afternoon or afternoon and evening - so that it enables most HCP to participate within their work scheme.

**Data collection and evaluation**
All HCPs who registered for the training program were asked to participate in the study. The effectiveness of the implementation project was assessed by the change in knowledge and attitudes regarding pain and guideline adherence between the start of the training program (pre-training), directly after the training program (post-training), and six-month follow-up. An extensive description of the evaluation can be found in Online Resource 1. The participants received a link to fill in the quantitative evaluations and HCPs’ demographics digitally through the platform of Qualtrics. In addition, the satisfaction of the participants was measured after each workshop and at six-month follow-up. Attendance was taken at each workshop. Unfortunately, the e-learning platforms could not store the names of the participants who completed the e-learning modules. Therefore, attendance was only taken into account in the analysis based on the workshops, and participants were asked verbally if they completed the e-learning modules. HCPs were recruited from August 2021 to May 2022. Workshops were organised from October 2021 to June 2022. All participants were asked to fill in informed consent.

Within this project, the results will be analysed and reported in separate papers. These separate papers will report the effectiveness of the implementation project on knowledge, attitudes and guideline adherence regarding chronic pain - combined with the participant’s satisfaction with the training program and its impact on behavior and organisation – and the mediating and moderating factors. A detailed statistical analysis will be provided within that publication.

**Results**

**Importance and current compliance of learning objectives**

Within the interdisciplinary expert panel, 17 of the 21 members completed the questionnaire about the importance of the learning objectives and to what extend the current learning objectives are already achieved ‘compliance’ in HCPs’ clinical practice. The expert panel considered 9 objectives as ‘very important’ to ‘extremely important’, see Fig. 1. One of the main objectives – ‘integrate contemporary pain neuroscience into clinical reasoning in patients with chronic pain – and a subobjective ‘Use questionnaires and interviews to identify patients’ biopsychosocial factors which might influence pain experience according to the PSCEBSM model(Amarins J. Wijma et al., 2016) - were rated between ‘moderately important’ and ‘very important’. Originally, the questionnaire asked for the importance of integrating contemporary pain neuroscience into clinical reasoning. During the meeting, the expert panel recommended that ‘integrating pain neuroscience into clinical reasoning’ was seen as important when pain science does not solely focus on neurophysiology. Therefore, the learning objective was changed to ‘pain science’. The importance regarding the use of questionnaires were seen as less important compared to other objectives. The current compliance of HPCs’ to the learning objectives in their clinical practice ranged from ‘neutral’ to ‘agree’, showing that there was large room for improvement on all objectives and that the training program took the low compliance in account within the training program by discussing the importance of the objectives, arranging more time to achieve this objective and making it accessible for HCPs who have less experience with related objectives.
Barriers and needs

All 21 members of the interdisciplinary expert panel completed the questionnaire or participated in the meeting relating HCPs' barriers and needs related to training content and the implementation of chronic pain management in clinical practice within Belgian healthcare, in line with contemporary pain science. The questionnaire and meeting with the interdisciplinary expert panel and literature search resulted in a large variety of barriers and needs which are presented in the COM-B domains, see Table 1.

In summary, the barriers and needs reflected the importance of the formulated learning objectives. Based on the domain of psychological capabilities, the training program needed to improve HCPs' knowledge and especially skills related to a biopsychosocial approach and interdisciplinary collaboration for the management of patients with chronic pain. It was advised to develop a general chronic pain course which was not too complex, however, there was a stronger need to focus on improving skills than improving knowledge.

The social and physical opportunities domain showed that many environment factors, such as the biomedical perspectives of healthcare and society, and the lack of biopsychosocial education regarding pain, could limit the acceptance of the biopsychosocial model by the participants. In addition, it showed implications for implementation in clinical practice, such as lack of time, resources and support for HCPs and patients. Furthermore, based on the domain of motivation, many HCPs have a lack of interest in the management of patients with chronic pain and interdisciplinary collaboration. In addition, they have less confidence in assessing psychosocial factors, believe that patients have less interest in a biopsychosocial approach and pain education, HCPs' goals for pain management are not focused on self-management and quality of life, and that HCPs and patients have negative emotions relating to pain management.

Table 1. HCPs' barriers and needs to implement a chronic pain training program.
<table>
<thead>
<tr>
<th>COM-B</th>
<th>Barriers of HCPs</th>
<th>Needs of HPCs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Capability</strong></td>
<td><strong>Psychological</strong></td>
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<tr>
<td></td>
<td><strong>Knowledge</strong></td>
<td></td>
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<tr>
<td></td>
<td>• Lack of knowledge about pain and its characteristics (Berquin et al., 2011; Brockopp et al., 1998; Carr, 2007)(^\text{E})</td>
<td>• Increase knowledge of pain mechanisms(^{18})</td>
</tr>
<tr>
<td></td>
<td>• Lack of knowledge about an adequate assessment of pain (Carr, 2007)</td>
<td>• Increase awareness of all factors to consider when treating a person with chronic pain(^{E})</td>
</tr>
<tr>
<td></td>
<td>• Lack of knowledge about the biopsychosocial model(^{E})</td>
<td>• Provide knowledge not only on managing chronic pain but also on preventing patients from developing chronic pain(^{E})</td>
</tr>
<tr>
<td></td>
<td>• Lack of knowledge about the role, opportunities and barriers of other disciplines(^{E})</td>
<td>• Increase knowledge and values of a patient-centred approach(^{E})</td>
</tr>
<tr>
<td></td>
<td>• Not familiar with research and literature (Brockopp et al., 1998)</td>
<td>• Increase awareness of social influences (e.g. Friends and family)(^{E})</td>
</tr>
<tr>
<td></td>
<td>• Unfamiliar with adverse effects of narcotics (Brockopp et al., 1998)</td>
<td>• Increase knowledge of the added value of interprofessional learning and working(^{E})</td>
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<tr>
<td></td>
<td></td>
<td>• Emphasise the importance of a follow-up in treatment programs(^{E})</td>
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<td></td>
<td></td>
<td>• Increase awareness that behaviour change techniques pairing is more effective(^{19})</td>
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<td></td>
<td></td>
<td>• Make caregivers aware of the burden of chronic pain(^{E})</td>
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<td></td>
<td></td>
<td>• Provide awareness of insufficient undergraduate education regarding (chronic) pain(^{E})</td>
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<tr>
<td></td>
<td><strong>Skills: cognitive and interpersonal</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Difficulty applying psychosocial perspective (Berquin et al., 2011; Fritz et al., 2019)(^{E})</td>
<td>• Make the training practical(^{E})</td>
</tr>
<tr>
<td></td>
<td>• Difficulty with assessing pain in people with communication difficulties (Carr, 2007)</td>
<td>• Integrate effective resources for multimodal pain management(^{E})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Practice skills to encourage patients’</td>
</tr>
</tbody>
</table>
Problems with interdisciplinary communication (Brockopp et al., 1998; Carr, 2007)

Lack of communication and listening skills with patients

Inability to treat without an established diagnosis (Carr, 2007)

Incompetence to give PSE to patients (Carr, 2007)

Difficulty in dealing with patients with psychological problems (Cowell et al., 2018)

Self-management

Practice adapting treatments based on the individual

Practice using metaphors

Train communication strategies/skills (Cowell et al., 2018)

Enhance skills to include and assess social and family factors

Memory, Attention and Decision processes

HCPs don't apply a patient-centred approach (Berquin et al., 2011; Brockopp et al., 1998)

HCPs have a biomedical perspective (Fritz et al., 2019)

Patients have a biomedical perspective, and managing it is difficult (Cowell et al., 2018)

No assessment of patient behaviours and beliefs (Berquin et al., 2011)

HCPs apply an inadequate assessment of pain and pain relief (Brockopp et al., 1998; Carr, 2007)

Poor patient reporting in pain management (Carr, 2007)

HCPs work monodisciplinary, no or too few multidisciplinary consultations are made (Berquin et al., 2011)

Follow-up of between HCPs are highly variable (Berquin et al., 2011)

Patients have different expectations (Berquin et al., 2011)

Focus training on basic knowledge

Use case studies of common problem areas that are applicable to largely the whole group (or can be adapted to the specific caregiver)

Promote interventions co-facilitated by HCPs with different skills

Promote interdisciplinary collaboration (Park et al., 2013)

Take into account therapeutic alternatives

Practice developing inter-/multidisciplinary treatment plans

Provide the message to take the patient seriously

Encourage acceptance of chronic pain and the biopsychosocial approach

Provide sufficient time to discuss the participant's current situation during training
- Patients are not open to PSE (Cowell et al., 2018; Matthews et al., 2015)
- Patients have conflicting information
- HCPs have unhelpful attitudes regarding pain (Carr, 2007)
- Unknown whether patients ask for pain relief or pain medication (Brockopp et al., 1998)

### Behavioural regulation
- Too little interest in overly theoretical information
- Patients with fear of pain and consequences communicate less well (Carr, 2007)
- Implement the application and handling of "yellow flags" in the ambulatory setting
- Spend attention and time for interest in meeting other HCPs within the training (build a "social" identity)

### Physical

#### Skills: physical

### Opportunity

#### Social

- Lack of social support for patients
- Lack of society’s recognition of the problems of chronic pain
- Cultural/religious differences (Brockopp et al., 1998)
- Reluctance of patients to report pain (Carr, 2007)
- Patients ashamed of symptoms (Park et al., 2013)
- Experiences and stories of family and friends (Carr, 2007)
- Encourage the use of peer groups for patients with chronic pain
- Create a status for pain management
- Use "Local Opinion Leaders" to increase impact (Flodgren et al., 2019)
- Let participants discuss chronic pain with colleagues to increase social support (Park et al., 2013)

### Physical

#### Environmental context and

- Lack of adequate training
- Create a network of
resources for the issue of 'chronic pain' in the curriculum of training and courses (Berquin et al., 2011; Cowell et al., 2018). E

- Previous received training was biomedically oriented (Matthews et al., 2015).
- Lack of finance/financial compensation (for a comprehensive approach to treating patients with chronic pain) on the Micro, Meso, and Macro level (Berquin et al., 2011; Brockopp et al., 1998; Carr, 2007; Cowell et al., 2018). E
- Dominance of anaesthesiologists, giving preference to technical treatments (Berquin et al., 2011).
- Not trained for sociofamilial initiatives (Berquin et al., 2011). E
- Lack of pain specialists and training of teams (Berquin et al., 2011). E
- Excessive workload (Berquin et al., 2011). E
- Inadequate or non-existent education materials (Brockopp et al., 1998). E
- No accessibility for patients to receive certain treatments (nonavailability/long travel time) (Park et al., 2013).
- Uneven geographical distribution of multidisciplinary pain centres. E,16
- Lack of time (Micro, Meso, Macro) (Brockopp et al., 1998; Carr, 2007; Cowell et al., 2018). E
- Lack of leadership within chronic pain treatment
- Therapists working in the field of chronic pain; Create peer review groups. E
- Develop patient pain educational materials like booklets and videos that are available for patients and HCPs as support for PSE E
- Creating postgraduate PSE courses E
- Encouraging and creating more available training courses about pain E
- More hours of education are needed about pain in training courses E
- Make use of apps on smartphones to coach patients and evaluate treatment progress E
- Use apps and videos to train caregivers and encourage self-management of caregivers to improve knowledge and skills E
organisations (Brockopp et al., 1998; Carr, 2007)

- Available information on chronic pain does not support its implementation, nor does it identify its limits.
- Lack of time to start and complete chronic pain training.
- Insufficient incentives to support HCPs in such treatments and training initiatives.
- (Excessive) Cost to patients making therapy inaccessible or stopping earlier.
- Lack of training in dealing with sensitive topics (Cowell et al., 2018)

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Reflective</th>
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<tr>
<td>Social/Professional Role &amp; Identity</td>
<td>- Lack of interest in interprofessional collaboration and to be in a dynamic of integrated care.</td>
</tr>
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<td></td>
<td>- Negative attitudes about the role of other disciplines and patients with chronic pain.</td>
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<tr>
<td></td>
<td>- Lack of interest in (chronic) pain.</td>
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<td>- Lack of motivation in patients to participate in long-term treatment pathways.</td>
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<td></td>
<td>- Lack of awareness of their actions (Fritz et al., 2019; Matthews et al., 2015).</td>
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<td></td>
<td>- Different expectations from other HCPs or organisation (Fritz et al., 2019).</td>
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<tr>
<td>Beliefs about capabilities</td>
<td>- Less motivated HCPs will be challenging to recruit.</td>
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<td></td>
<td>- Empower HCPs that their management can include psychological and social factors (Cowell et al., 2018).</td>
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<td></td>
<td>- Encourage acceptance that chronic pain can be chronic.</td>
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<td></td>
<td>- Build confidence for effective therapeutic care.</td>
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<tr>
<td>Optimism</td>
<td>Beliefs about consequences</td>
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<td>- Many HCPs have little trust in the healthcare system</td>
<td>- Lack of visibility of benefits when collaborating between HCPs in treating patients</td>
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<td></td>
<td>- Possible loss of trust in HCPs who have to perform theoretical education</td>
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<td></td>
<td>- Anaesthesiologists do not want to go along with guidelines because of increased workload, fear of licensing problems and reduced revenue (Brockopp et al., 1998)</td>
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<td>- Knowledge about the addictive effect of pain medication did not worry HCPs (Brockopp et al., 1998)</td>
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<td></td>
<td>- Lack of confidence in assessing psychosocial factors and in nonpharmaceutical treatments (Cowell et al., 2018; Fritz et al., 2019; Park et al., 2013)</td>
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</table>
The overview of barriers and needs relating to the learning processes, learning objectives and implementation within Belgian healthcare, formulated by the expert panel and literature search. The factors are divided into behaviour change domains using the Theoretical Domain Framework.

\[ E = \text{Formulated by the expert panel; HCP = Healthcare professional; PSE = Pain science education.} \]

### Training program

#### E-learning modules
The first e-learning module - of approximately one hour - aimed at learning objectives 1 and 2 (1. Improved understanding of acute and chronic pain within a biopsychosocial framework; 2. Assess patients with (chronic) pain). It included an “introduction” part explaining the rationale and objectives of the teaching programme and necessary basic theoretical parts, e.g. the impact of chronic pain on patients and society, definitions of pain, physiology of acute pain and chronic pain, the biopsychosocial model, biopsychosocial factors related to chronication and persistence of pain (e.g. stress, anxiety, catastrophising, depression, misbeliefs, insomnia, inactivity, etc.), and types of pain (nociceptive, neuropathic and nociplastic pain).

The second e-learning module aimed at achieving objectives 3, 4 and 5 (3. Integrate contemporary pain science into clinical reasoning in patients with chronic pain; 4. Provide tailored and patient-centred strategies to subacute and chronic pain patients; 5. Understand the role of health care practitioners in a multidisciplinary perspective).

This module started with a summary of the first e-learning module, after which it introduced patient-centred approach, attitudes, beliefs, motivation and coping of patients, PSE strategies, metaphors, the importance of the words used with patients, goal-setting, obstacles for change, motivational interviewing, self-management and lifestyle, needs and expectations of patients, commonly applied modalities/treatments (e.g. imaging, medication, hands-on techniques, and exercise) and the mono- and multidisciplinary approach in the management of chronic pain.

The e-learning modules used interactive educational methods to activate the participants’ prior knowledge and experience together with an efficient integration with what is new. The content was delivered through video animations, expert interviews and short texts. Reflection questions complemented them during and after slides and within a test at the end of each session (such as quizzes, multiple-choice tests and open questions on which the participants received automated feedback).

**Face-to-face workshops**

The key aspects of the training program were a biopsychosocial pain assessment, PSE and specific patient-centred communication techniques. The interdisciplinary training program can be found in Online Resource 2.

The first workshop aimed to provide knowledge and skills needed to implement (pain) assessment of patients successfully, to give the first introduction to PSE in their practice and to integrate the biopsychosocial model and contemporary pain science into clinical reasoning in patients with chronic pain (learning objectives 1–3). The workshop included lecturing, exercises, group discussions, and skills training relating to pain assessments, communication, PSE and their barriers and needs to implement it in their clinical practice. After the first workshop, participants received exercises to implement and practice biopsychosocial pain assessment, PSE and specific patient-centred communication techniques in their clinical practice. Participants received a poster providing key messages for patients regarding chronic pain, a patient booklet to support PSE in their clinical setting and the link to the patient videos. All French
and Dutch patient materials can be found on the website of Pain in Motion http://www.paininmotion.be/patients/information-about-persistent-pain.

The second workshop aimed to provide the ability to tailor and apply patient-centred strategies to subacute and chronic pain and to understand the role of HCPs from a multidisciplinary perspective. The workshop lecturing, exercises, group discussions, and skills training relating to providing PSE, motivational interviewing, patient-centred approach, mono-/multidisciplinary approach and communication between HCPs.

Both workshops contained nine mandatory phases with objectives per phase and two optional phases to adapt the training to the needs of the participants in the group. We evaluated if these phases were applied and achieved through discussions with participants and questions and observations by the trainers. If the learning objectives were achieved was assessed within the satisfaction questionnaire after each workshop.

**Adaptations during the implementation process**

The workshops were slightly adapted during the process of implementation. However, the core elements of the workshops remained the same. After the first three workshop groups, a group discussion about the factors influencing pain at the start of the first workshop was removed because participants thought it had less added value in addition to the e-learning modules. Furthermore, participants wanted more time for PSE exercises, so a motivational interviewing exercise was moved to the second workshop. In the second workshop, a motivational interviewing exercise was simplified due to difficulties experienced by participants. Furthermore, during the implementation process, minor adjustments were made in slides to support teachers' lecturing.

For the first four workshop groups, we aimed to recruit approximately 20 HCPs for each group. However, many participants cancelled last minute due to situations relating to COVID-19. Therefore, in agreement with the trainers, group sizes were increased to approximately 25 for the remaining 11 workshop groups to train a minimum of 300 HCPs but assure the quality of the training program.

**Discussion**

The developed interdisciplinary training program regarding the management of patient with chronic pain included a two-day and two e-learning modules — aimed to promote and facilitate the implementation of the biopsychosocial model and PSE into clinical practice. A large variety of barriers and needs were formulated - by the interdisciplinary expert panel and literature search - relating to training content and the implementation of chronic pain management in clinical practice, in line with contemporary pain science. This provided valuable insight into the challenges for the implementation project and for healthcare professionals, which was used to adapt the training program to the Belgian context. This study is part of a type 2 implementation project to assess the effectiveness of such chronic pain training programs on
the knowledge, attitudes and guideline adherence in HCPs regarding chronic pain management, aiming for higher value care for patients with chronic pain.

Recently, Slater et al. (2022) designed a framework in Australia, which is a blueprint for shaping interdisciplinary training about chronic pain with patients, HCPs and pain educators (Slater et al., 2022). This framework identified gaps and training targets based on priorities in pain care. Although this study was performed in the Australian context, the identified gaps and training targets are closely aligned with our learning objectives and content of the training program. It is therefore most likely that our learning objectives and related barriers and needs are generalizable for many contexts in healthcare worldwide. However, it remains unknown what the optimal dose, intensity and frequency of trainings are needed to address these barriers and needs and to achieve the learning objectives. Our training program lasted two days, which is a commonly applied duration and has been effective in previous studies achieve the objectives by improving knowledge, attitudes and behavior of HCPs (Achaliwie et al., 2023; Gaupp et al., 2020; Machira et al., 2013; Schröder et al., 2020). Other studies used training programs ranging from a workshop of multiple hours (Machira et al., 2013; Stevenson et al., 2006), multiple workshops of a few hours (Ghandehari et al., 2013) to multiple days (Kongsted, Ris, et al., 2019; Sheldon, 2005). These studies - with both fewer and more hours of workshops - found significant improved knowledge and skills regarding pain knowledge or to educate patients about pain, indicating that our learning objectives are feasible. However, the training programs were monodisciplinary and a detailed training program was not published, making it difficult to compare. Konsted et al. (2019) published a brief training program that aimed to support physiotherapists and chiropractors’ implementation of the biopsychosocial model and PSE in clinical practice for low back pain management (Kongsted, Ris, et al., 2019). This training program also included two-day workshops, had similar learning objectives and a similar mix of theoretical and skills training, showed to be feasible and effective in changing clinical behaviour (Kongsted, Hartvigsen, et al., 2019; Ris et al., 2021). In addition to the training programs reported above, our training program included two e-learning modules to support the workshops, which potentially improved the learning experience and satisfaction of participants (Noesgaard & Ørngreen, 2015). To our knowledge, no other interdisciplinary training program plans are available about the topic of pain.

A strength of this study was the co-design with a large interdisciplinary expert panel who formulated barriers and needs of HCPs and the use of a theoretical domain framework to identify factors relating to behavioural change (Atkins et al., 2017). These barriers and needs, together with a blended learning design and interactive teaching methods, improved the quality of the training for HCPs in Belgium (Pallesen et al., 2020; Roschelle et al., 2006). Furthermore, the two-day training program available for all HCPs and targeted for seven disciplines makes it feasible to implement and scale-up for a large population of HCPs and many healthcare systems. Furthermore, the training program was updated during the implementation process to improve the training based on the experiences of the trainers and participants. Another strength is the availability of patient materials - which was developed with a patient panel - as support for HCPs to implement PSE within clinical practice. At last, the training program was implemented in three different areas of Belgium, in two different languages, and is available in Dutch, French and English. However, this study also faces several compromises. A more intensive co-design
throughout the process with experts and patients can improve the quality of the training program. Furthermore, the formulated barriers and needs were based on literature search and the expert panel, no systematic literature review was conducted which result in the possibility that some barriers and needs are being missed.

This study can potentially start as a foundation for future training programs - instead of redeveloping training programs – which saves significant time and resources. However, training programs need to be further developed and cross-culturally adapted within the areas of implementation. To improve this process, more training programs should be available to facilitate learning from other training programs, e.g. to provide insight into how many hours of practical training is desired or which elements of the training facilitate the strongest learning ability. By reducing the differences between postgraduate training programs, we might also reduce the differences in knowledge and attitudes between HCPs and potentially improve their interdisciplinary collaboration (Fewster-Thuente & Velsor-Friedrich, 2008). Many factors play an important role in the learning experience of HCPs and their behaviour change, and many factors seem poorly understood. Hence, the publication of training programs by projects and researchers should be encouraged, and the the effectiveness of such training programs and their implementation process in clinical practice should be assessed. Furthermore, studies are needed to compare the effect of interdisciplinary versus monodisciplinary training programs. Although interdisciplinary groups can facilitate interdisciplinary collaboration, they could also reduce the learning effect, as the training potentially focuses on knowledge or skills, which are not always important for all disciplines (Wilson & Mires, 2000).

Conclusion

To address the significant knowledge gap of studies examining the effectiveness of interdisciplinary postgraduate chronic pain training programs, as well as the established need for interdisciplinary training to improve interdisciplinary collaboration within healthcare (Hammick et al., 2007; Petit et al., 2019; Recommendations by the International Association for the Study of Pain), an interdisciplinary training program was developed to train HCPs to improve knowledge, attitudes and guideline adherence regarding chronic pain management and to promote and facilitate the implementation of the biopsychosocial model and PSE into clinical practice for the treatment of patients with chronic pain. To do so, an interdisciplinary expert panel was created to identify the barriers and needs of HCPs for such a chronic pain training program. The identified barriers and needs of HCPs for a chronic pain management training program were used for the development of the interdisciplinary pain management training program. In addition, the training program can be used as a foundation for developing future training programs to enhance the quality of future training programs.

Abbreviations

GP
General Practitioners
HCP  
Healthcare professional  
KNAP  
Knowledge and Attitudes of Pain  
PSE  
Pain science education  
PSCEBSM-model  
pain – somatic factors - cognitive factors - emotional factors - behavioural factors - social factors – motivation

**Declarations**

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Medical Ethical Committee (EC-2021-327) linked to the University Hospital of Brussels, Brussels, Belgium.

**Availability of data and materials**

The complete and more detailed training program and materials are available in French and Dutch upon reasonable request.

**Disclosures and declarations**

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https://doi.org/10.1097/01.NAQ.0000305946.31193.61.


https://doi.org/10.1371/journal.pone.0065471.


**Figures**
4e. Design a multimodal treatment program, either mono- or interdisciplinary according to the patients’ representations, beliefs, expectations and needs

1b. Understand that the pure biomedical model is out-of-date and that the biopsychosocial model of pain should be adopted

4a,d. Integrate pain education, in which pain mechanisms are explained with metaphors and tools to favour therapeutic alliance

4b. Use a patient-centred approach to define specific goals that are meaningful to the patient

5a. Understand the role of other health care disciplines in the successful management of chronic pain

2b. Assess the patients’ resources and obstacles to improvement, as well as their “readiness to change”

1a. Understand the difference between pain and nociception, between acute pain and chronic pain

4c. Manage obstacles to improve the patients’ motivation to change

5b. Communicate adequately with other health care professionals about the management of chronic pain

2a. Uses questionnaires and interviews to assess identify patients’ biopsychosocial factors which might influence pain experience according to the PSCEBSM model

3. Integrate contemporary pain neuroscience into clinical reasoning in patients with chronic pain

Higher scores reflect higher matter and better compliance of HCPs related to the objective.

**PSCEBSM = pain – somatic factors - cognitive factors – emotional factors – behavioural factors – social factors – motivation**

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.
• OnlineResource1.docx
• OnlineResource2.docx