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EULAR recommendations for the health professional's approach to pain management in inflammatory arthritis and osteoarthritis

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ABSTRACT

Pain is the predominant symptom for people with inflammatory arthritis (IA) and osteoarthritis (OA) mandating the development of evidence-based recommendations for the health professional's approach to pain management. A multidisciplinary task force including professionals and patient representatives conducted a systematic literature review of systematic reviews to evaluate evidence regarding effects on pain of multiple treatment modalities. Overarching principles and recommendations regarding assessment and pain treatment were specified on the basis of reviewed evidence and expert opinion. From 2914 review studies initially identified, 186 met inclusion criteria. The task force emphasized the importance for the health professional to adopt a patient-centered framework within a biopsychosocial perspective, to have sufficient knowledge of IA and OA pathogenesis, and to be able to differentiate localized and generalized pain. Treatment is guided by scientific evidence and the assessment of patient needs, preferences and priorities; pain characteristics; previous and ongoing pain treatments; inflammation and joint damage; and psychological and other pain-related factors. Pain treatment options typically include education complemented by physical activity and exercise, orthotics, psychological and social interventions, sleep hygiene education, weight management, pharmacological and joint-specific treatment options, or interdisciplinary pain management. Effects on pain were most uniformly positive for physical activity and exercise interventions, and for psychological interventions. Effects on pain for educational interventions, orthotics, weight management, and multidisciplinary treatment were shown for particular disease groups. Underpinned by available systematic reviews and meta-analyses, these recommendations enable health professionals to provide knowledgeable pain management support for people with IA and OA.

INTRODUCTION

Pain is the predominant symptom in the majority of people with inflammatory arthritis (IA) and osteoarthritis (OA), which both broadly contribute to the global burden of rheumatic and musculoskeletal conditions.[1-5] Knowledgeable pain management support can reduce pain, increase functioning and well-being, and reduce individual and societal costs.[6] Therefore, practitioners in all healthcare settings should have the knowledge and skills required to help people with IA and OA to better manage their pain. Rheumatology health professionals are ideally placed to provide comprehensive, evidence-based, and patient-centered care.[7]

Pain is a complex and multifaceted experience. Besides pathological processes such as inflammation and tissue damage, multiple individual factors influence pain, e.g., illness beliefs, mood, avoidance behavior, obesity, sleep disturbance, and the pattern of rest and activity throughout the day.[8-13] These factors are commonly mentioned in educational materials and are part of the pain management approach by health professionals in rheumatology.[9, 14, 15]

Meta-analyses and randomized controlled trials (RCTs) have, for instance, been performed with respect to pharmacological pain treatment in OA,[16, 17] aerobic exercise in rheumatoid arthritis and OA,[18, 19] activity pacing in chronic pain,[20] and broad education and self-management approaches in rheumatic diseases.[15, 21] Evidence regarding pain management support in IA and OA ranges from RCTs to expert reports, but as yet the effect of pain management options on pain have not been studied in a comprehensive way for multiple pain modalities. The aim of this review was to evaluate the existing scientific evidence associated with the benefits of the health professional's approach to pain management for people with IA and OA, and to use this evidence and expert opinion to provide recommendations that enable health professionals to provide knowledgeable pain management support.

METHODS

The standardized operating procedures for EULAR-endorsed recommendations were followed,[22] including a systematic literature review and definition of the strength of recommendations by a task force of experts. In the current article, the recommendations regarding management options mostly include advice with sufficient data-driven evidence, whereas the overarching principles and recommendations regarding assessment are based on expert opinion, because they could not be substantiated with evidence from systematic reviews.

Task force

The task force that included 18 members (16 from Europe and 2 from the USA) from 12 countries consisted of patient representatives, nurses, physiotherapists, psychologists, rheumatologists, a general practitioner, an occupational therapist, a clinical epidemiologist, and a research fellow. The executive committee of the task force consisted of a convener (RG), methodologist (RC) and research fellow (CLO). During the first of two task force

meetings, the research questions, scope of the project, and pain management options were defined.

Scope

Definition of the scope and framing of questions addressing management options in systematic reviews helped the task force to achieve focused recommendations. This process was guided by PICO, which specifies the patient Population, Interventions, Comparator, and Outcomes of interest.[23]

The target users of the recommendations are health professionals in the field of rheumatology including rheumatologists. The target population for these recommendations are patients with OA and patients with the following types of IA: rheumatoid arthritis (RA), spondyloarthritis (SpA), and psoriatic arthritis (PsA).

It was decided that recommendations should cover core general pain management that virtually any health professional should be able to give including the appraisal of treatment options which require referral to specialized pain treatment. These options requiring referral included in the recommendations should be readily available to most healthcare practitioners. Moreover, it was decided to exclude general pharmacological and joint-specific medical and surgical treatments such as arthroplasty and glucocorticoid injections from the systematic literature review, because these are better covered by the existing EULAR task force recommendations for the management of IA and OA.[16, 17, 24-29]

To restrict the systematic literature review to pain management strategies, the target outcome of our systematic review was pain. However, consistent with other expert groups,[30, 31] the task force unanimously endorsed that, besides pain, physical functioning (e.g., activity) and psychological functioning (e.g., emotional well-being and participation) are core domains of any management intervention in rheumatic care. This focus on pain as an outcome, but also the multiple management options that are reviewed and the broad group of patients to which this study is relevant, differentiates our study from studies with a more general focus on education in inflammatory arthritis,[21] or non-pharmacological management of osteoarthritis.[15]

Systematic literature review

The bibliographic databases Cochrane, Embase, PsycINFo, PubMed, Scopus, and Web of Science were searched with the name of one or more of the diseases of interest in the title and the word ‘pain’ and a word referring to a mode of intervention or care in the title, abstract, or key words (search date: October 19th, 2015). For efficiency in answering the broad question of the literature review and to benefit from the work that was done previously, the search was limited to systematic reviews, meta-analyses, (practice) guidelines, and recommendations. If no systematic reviews were available, we searched for RCTs. No time or language restrictions were applied in the initial search. Thus, included in the literature search were systematic reviews in one of the selected diseases (RA, SpA, PsA, OA) with

pain as an outcome measure. Excluded were studies involving general pharmacological and joint-specific medical and surgical treatment.

All abstracts were independently read and judged on their suitability for inclusion by two reviewers. Results were compared and, in case of discrepancy, discussed until consensus was reached. Excluded were duplicate articles, articles that were withdrawn, those not written in English, animal studies, conference abstracts, articles including (practice) guidelines or recommendations without a systematic review or meta-analysis included, previous versions of reviews and meta-analyses (e.g., Cochrane reviews), articles that did not have pain as a reported outcome measure or did not report outcomes for OA, RA, SpA or PsA, articles not reviewing the effect of one or multiple modes of intervention or care, and articles that only reviewed the effects of pharmacological treatments, surgical treatments, alternative medicine, herbs, or nutraceuticals. Reference lists of the selected articles were hand-searched for additional relevant systematic reviews and meta-analyses. The detailed search keys and exclusion criteria are shown in online supplementary file 1.

Evaluating the evidence

The evidence for OA was divided into evidence for OA in general, OA of the knee, hip, or knee and hip, OA of the hand/wrist, and OA of the foot/ankle. The systematic reviews and meta-analyses commonly included a mean effect size for pain. For every treatment option and per disease subgroup, the effect found by the included articles was recorded and effect categories were distinguished: 'positive effect' (i.e. articles [unanimously] state positive effects of the treatment option on pain), 'no effect' (i.e., articles state the treatment option has neither positive nor negative effects), 'unclear effect' (i.e. articles state both no effects and positive effects), or a combination thereof meaning that articles were divided in their conclusions on the effect of the treatment option (e.g. some state unclear effects and others only positive effects). 'Negative effect' could have been a category, but none of the included studies stated harmful overall effects of the examined treatment options.

Our systematic review protocol was developed as a review of reviews including systematic reviews and meta-analyses of RCTs. Therefore, the Oxford center for evidence-based 'category of evidence' for all recommendations was 1A (from meta-analysis or RCTs) or occasionally 1B (when only one RCT was available).[22] The Grades of Recommendation, Assessment, Development and Evaluation (GRADE) system was used to rate the overall quality of evidence of the reviews and meta-analyses.[32] Two assessors independently graded the quality of the available evidence as high, moderate, low, or very low. In case of discrepancy, the quality was discussed until consensus was reached.[33] 'Strength of recommendation' was determined for the recommendations. These scores vary from A ('Category of evidence' 1A: meta-analysis of randomized controlled trials) to D ('Category of evidence' 4 from expert committee reports or opinions and/or clinical experience of respected authorities or extrapolated recommendation from 'category of evidence' 2 or 3 from non-randomized experimental, correlation, or descriptive studies).[22]

Developing recommendations

During the second and last task force meeting, the results of the systematic literature were presented and discussed, and the wording of recommendations was started. Treatment recommendations were supported by findings in the systematic literature review. Overarching principles and assessment recommendations were mostly based on expert opinion in the task force. After this meeting, the wording was finished through e-mail, and each task force member indicated the 'level of agreement' on a numerical rating scale ranging from 0 (completely disagree) to 10 (completely agree).

RESULTS

Figure 1 shows a flow chart of the systematic literature review. The 2914 selected titles reduced to 214 after exclusion of duplicates and check of exclusion criteria. Full texts of 17 articles could not be obtained. Two assessors read 197 articles in full-text. Another 13 articles were excluded for being a narrative (non-systematic) review (3x), guideline without systematic review (1x), or duplicate (2x), not having pain as an outcome (4x), or treatment effects on pain as an aim (2x), or involving only results of pharmacological treatment (1x). Two additional meta-analyses were included after scanning the reference list of the selected articles. In total, 186 systematic reviews and meta-analyses were included and their content was assessed for the following information: population, types of intervention, effects, and level of quality. This information is provided in online supplementary files 2, 3, and 4 for all included studies.

Evaluation of effects on pain (systematic literature review)

No studies were found that systematically reviewed effects on pain for PsA. Moreover, it was found that of the included treatment options, sleep interventions and most assistive devices were not evaluated for their effect on pain in systematic reviews. Studies were heterogeneous with respect to intervention and comparator conditions. For example, comparisons of exercise included land-based vs. water-based, strengthening vs. aerobic, group vs. individual, supervised vs. home-based, multimodal vs. unimodal, progressive vs. non-progressive, and one or various exercises vs. standard care, sham, or medication. The reviewed studies, direction of effects, and level of quality are shown in table 1 and table 2 for the treatment modalities that were included in the recommendations and in table 3 for miscellaneous treatment modalities.

Education and self-management

The reviewed review studies on education and self-management programs generally concluded that available studies showed 'positive effects' (n=8) or showed both 'no effects' and 'positive effects' (n=14), but for SpA and OA of the hand/wrist single meta-analyses observed 'no effect' on pain (table 1).

Physical activity and exercise

Of all treatment options, the effects of physical exercise have been studied most extensively (table 2). For general exercise, aerobic exercise, and strength and resistance training, the

quality of studies was low to moderate and effects on pain were mostly ‘positive’ in IA and OA, with some reviews observing ‘no effects’. For Tai Chi, yoga, qigong, and whole body vibration, the quality of studies was low to very low, and it was unclear whether there were positive effects on pain. Table 2 can be used as a guide for choosing an appropriate intervention; for instance, strength and resistance training is more relevant and more extensively studied for OA of the knee than for other conditions. Reviews do not answer the question whether high-intensity exercise is as safe as low-intensity exercise, which is an ongoing issue of debate.[34, 35]

Orthotics

In mostly low quality studies, ‘positive effects’ of orthotics on pain have been consistently observed for orthopedic shoes in RA and OA of the knee, splints in OA of the hand, and sleeves and elastic bandages in OA of the knee and less consistently for other orthotics (table 1). Except for use of a cane,[16] no systematic reviews evaluated daily living aids such as a tin-opener or assistive devices using pain as an outcome. Although several orthotics can be recommended based on positive effects on pain, there is not enough evidence to give recommendations regarding design or materials.

Psychological and social interventions

In very low to moderate quality studies, effects of psychological interventions (e.g., cognitive-behavioral therapy (CBT), mindfulness-based interventions, stress management training) on pain as summarized in reviews were ‘positive’ with the exception of reviews showing ‘no effect’ on pain of CBT in SpA and biofeedback in OA (table 1).

Weight management

In very low to moderate quality studies, effects of weight management have been frequently reviewed for OA of the knee; ‘no effects’ and ‘positive effects’ were observed. For RA and SpA, ‘positive effects’ were observed in three reviews (table 1).

Sleep interventions

It has been proposed that sleep disturbance should be systematically assessed and managed in patients with IA and OA.[13, 36-38] Our systematic review did not extract systematic reviews that evaluated effects of sleep interventions on pain in OA or IA, but randomized trials examined the effects of cognitive-behavioral therapy (CBT) for insomnia in OA. CBT was observed to improve sleep and pain in one study.[39] In another study both CBT and a placebo condition resulted in improved sleep and comparable reductions of pain over 6 months, but the CBT group had significantly greater reductions in wake after sleep onset, which predicted subsequent decreases in clinical pain.[40] Outside the field of rheumatic diseases, meta-analyses support the effectiveness of behavioral, including self-help, interventions on sleep outcomes.[41, 42] Face-to-face treatments of at least four sessions seem to be more effective than self-help interventions.[43] In meta-analyses, small

but significant effects of sleep interventions on pain have been observed in people with varied chronic medical conditions.[44, 45]

Pharmacological treatment

Pharmacological treatment is a core ingredient of pain management in IA and OA. It includes analgesics (e.g. paracetamol, codeine and other opiate-like drugs); oral or topical non-steroidal anti-inflammatories (NSAIDs); intra-articular injections, e.g. with glucocorticoids; and occasionally also agents for neuropathic pain. The evidence for pharmacological pain treatment was not part of the current review but has been evaluated by other task forces.[16, 17, 24-29, 46-50] In brief, previous task forces recommended paracetamol as first line treatment, with topical agents such as topical NSAIDs and capsaicin also recommended for specific joints, for patients with OA,[17, 26, 29] and consideration of intra-articular injections for specific joints in OA and IA.[17, 24-26, 28, 29] Existing EULAR recommendations should be consulted regarding the safe use of NSAIDs.[17, 26, 29, 46]

Miscellaneous therapies

Table 3 shows an overview of less commonly available therapies in rheumatologic clinical practice that were therefore not included in the recommendations. This overview is a quick guide to the appropriate meta-analyses if a patient asks for the effects of one of these treatment and skilled professionals are available. These therapies have especially been studied in OA of the knee with positive effects on pain of acupuncture and ‘balneotherapy and massage’ and less clear effects of “electrical” therapies.

Psoriatic Arthritis

Pain is as high or higher in PsA than in RA,[51] and patients have an educational need to manage their pain.[52] Nevertheless, none of the extracted studies reviewed the health professional’s approach in PsA for effects on pain. Given the lack of specific knowledge, the health professional may use pain treatment options in RA to guide pain treatment in PsA.

Overarching principles (expert opinion)

The task force defined overarching principles based on expert opinion (table 4).

First, patient-centered care was considered important. Care that is respectful of and responsive to individual patient preferences, needs and values, and ensures that patient values guide clinical decisions,[53] may improve adherence and persistence with treatment.[21, 54-57] Validation of the patient’s pain experience is considered a prerequisite for trust, communication and engagement in treatment.

Second, a biopsychosocial model of pain was recommended. Relationships between all factors of this model are recognized to be interactive and reciprocal with mutually influencing pathways similar to a hanging mobile toy in which movement of one part causes movement of other parts. The importance of the distinct factors differs between individuals.

Third, in order to achieve pain control, it is crucial to treat disease activity and to prevent tissue damage. To meet that aim the health professional should have basic

knowledge of IA and OA. Common treatment goals in rheumatic diseases are to optimize control of inflammation, decrease disease activity, improve function and well-being, and to reduce pain and other disease-related symptoms.[15-17, 21, 24-29]

Fourth, the ability to differentiate between types of pain helps the health professional to direct the optimal pain management strategy. Pain localized in a specific region of the body might be due to peripheral nociceptive input such as inflammation or damage. Generalized pain is more often non-specific with regard to pathological findings and can be due to a dysfunction in the regulation of pain pathways. Pain is commonly regarded as generalized or widespread when pain is present in both sides of the body, above and below the waist and in axial body regions. In IA, generalized pain may remain despite good inflammatory control. Such pain requires comprehensive pain management strategies.[58, 59]

Not all health professionals may currently have the required knowledge and skills to apply these principles. For those health professionals who have identified that they require further education in this area, the overarching principles can be used to direct their learning. This may involve work-based supervision with another health professional or undertaking an educational course that addresses some or all of these principles.

Recommendations (systematic literature review and expert opinion)

Table 5 shows the recommendations. Proper assessment is a prerequisite for proper pain treatment. Recommendations 1 (assessment) and 2 (personalized treatment plan) were based on expert opinion in the task force. Treatment recommendations 3 to 10 were based on the systematic literature review summarizing effects on pain. Specific considerations regarding application of these treatment options (indicated with an asterisk in table 5) were based on expert opinion of the task force.

Assessment

The extent of assessment depends on many factors such as available time. A first step in ensuring that pain management is patient-centered, is to invite patients disclosing the impact of pain on their daily functioning, to assess their ideas and concerns regarding the cause of their pain and the perceived control over pain episodes, and to take account of their expectations and preferences for treatment. It is deemed important to establish the patient's functional and valued life goals, i.e. what it is that they cannot currently do as well as they would wish to. Research shows that individuals differ widely in terms of management needs.[21, 54, 60, 61]

Second, assess pain severity using a numerical or visual analogue pain rating scale,[62] and the onset, duration, location and spread (pain manikin), quality, interference, triggers, and progression of pain. Furthermore, appraise the type of pain (localized or generalized) and whether referral is needed to a pain specialist to evaluate the type of pain, current treatment, or current medication (safe use, interactions with other medication, side effects). Generalized pain can be recognized in a clinical interview and by the use of a pain

manikin such as the Michigan body map.[63] Use validated questionnaires to assess the potential presence of neuropathic pain.[62, 64-66]

Third, assess ongoing pharmacological and non-pharmacological treatments, previous treatments tried and the effects and side effects of these treatments, patient beliefs about ability to control and overcome pain and its consequences, and willingness of the patient to engage in additional treatment if deemed necessary.

Fourth, assess current inflammation and joint damage as sources of pain following the most recent recommendations.[67, 68] In case of poorly controlled inflammation, optimize disease control or refer to a rheumatologist for treatment according to recommendations.[25, 27, 48] In case of localized (nociceptive) pain relating to OA, consider (to refer to) joint specific treatments in line with recommendations.[16, 69]

Fifth, assess pain-related biological, psychological, and social factors that might need attention, specifically:

- *The nature and extent of disability*: physical activity, mobility, activities of daily living, social participation, general physical fitness (aerobic capacity, muscle strength, endurance), pain-related fear and avoidance of activities, balance of activities and rest (pacing).
- *Beliefs and emotions about pain and pain-related disability*: the psychological response to pain and psychological vulnerability factors: psychological distress, psychiatric comorbidity, and cognitions such as catastrophizing (rumination, magnification, and helplessness),[70] fear of movement-related pain,[71] catastrophizing, and pain self-efficacy.[72]
- *Social factors related to pain and its consequences:* the way family members or other significant other reacts to patient's pain or pain-related disability, work, family and friends, economic problems, housing.
- *Sleep problems:* The quantity and quality of sleep, including whether the patient feels refreshed upon waking, and sleep hygiene habits such as regular exercise during the day, stress management, noise, sleep timing, and avoidance of caffeine, nicotine, alcohol, and daytime napping.[73]
- Presence of obesity.[74]
- Other factors that might influence pain or pain management, such as dependence on tobacco, alcohol or drugs.[75]

Treatment

Tables 1 to 3 offer an overview of the number of the reviewed reviews and meta-analyses, the observed effects of specific treatments on pain, and the quality of evidence of the studies.

Through shared decision making, treatment is guided by the expressed needs of the patient, the health professional's assessment, and evidence-based treatment options. A stepped-care approach is recommended including education and self-management support in step 1 (recommendation 3), one or more treatment options by a specialist if indicated in step 2 (recommendations 4 to 9), or multidisciplinary treatment in step 3 (recommendation 10).

The choice for a specific intervention, is not only determined by effects on pain but also by effects on functioning, social participation, and well-being. Moreover, evidence for effects of specific pain treatments differ for specific diseases. The 'strength of recommendation' for recommendations 3 to 10 (table 5) holds for specific diseases in which uniform positive effects on pain (excluding studies with 'very low' quality of evidence) were observed.

- Education had a uniform positive effect on pain in OA (hip/knee, knee).
- Physical activity and exercise showed uniform positive effects on pain for general exercise in SpA and OA (general, hip/knee, knee, foot/ankle), aerobic exercise in OA (general, knee), and strength and resistance training in OA (general, hip/knee, hip, knee).
- Orthotics showed small but consistent positive effects on pain for orthopedic shoes in RA and OA of the knee, splints in OA of the hand, and knee orthoses (especially sleeves, elastic bandages) in OA of the knee.
- Psychological and social interventions showed a uniform positive effect on pain for cognitive behavioral therapy in RA and OA (general), psychosocial and coping interventions in OA (general), biofeedback in RA, and relaxation interventions in OA (general, hip/knee).
- There was no meta-analysis that evaluated effects of sleep interventions on pain in IA or OA, but small effects of sleep interventions on pain were observed in meta-analyses in people with varied chronic medical conditions.
- Weight management showed a uniform positive effect on pain in RA, SpA and OA of the hip/knee.
- Multidisciplinary treatment is cautiously recommended considering the absence of studies examining the added effect on pain of multidisciplinary treatment to monodisciplinary therapies and considering that meta-analyses on multimodal treatment did not observe effects on pain.

DISCUSSION

Results and conclusions derived from 186 systematic reviews and meta-analyses were reviewed to identify the evidence associated with the benefits of the health professional's approach to pain management for people with IA and OA. Effects on pain were most uniformly positive for physical activity and exercise interventions, and for psychological interventions. Effects on pain for educational interventions, orthotics, weight management, and multidisciplinary treatment were shown for particular disease groups. Recommendations for patient-centered pain management were guided by this scientific evidence and by clinical expert opinion.

The task force unanimously endorsed that in rheumatic care, besides pain severity, physical functioning and psychological functioning are major outcomes of any management intervention by health professionals, in agreement with other expert groups.[30, 31] Although pain was selected as the target outcome, our systematic literature review also included interventions that were not aimed at alleviating pain, but –for instance– at increasing muscle strength, physical activity, or emotional functioning. Nevertheless, our study showed that many evaluations of treatment options—especially physical activity and psychological

interventions—showed a reduction of pain in most patient groups. This included treatment options in which pain reduction was not the primary goal.

Box 1 presents questions for the future research agenda. Our systematic review showed that there is ample evidence for specific pain treatment options in specific groups. Nevertheless, there are several omissions in our knowledge with respect to effects of pain management on pain, especially in PsA, sleep interventions, assistive devices, and multidisciplinary treatment. Moreover, it is inherent to the multifaceted nature of pain, the heterogeneity of the group of patients with IA and OA, and specific needs of individual patients that pain management options of choice will differ among patients. From a clinical point of view, a multimodal approach will likely result in the best outcome, but from a scientific point of view, it would be more fruitful to learn whether a single treatment option is able to bring about change in pain and other outcomes. Thus, a main challenge in future research is to examine in which patient subgroups each specific treatment option causes a reduction of pain. Moreover, most studies pertain to systematic interventions in groups, but the most frequent clinical intervention is patient-customized education and advice given during a consultation, handing a brochure, or offering information through the internet. The effects of these minimal interventions should be investigated as well.

As pain is the predominant symptom and burden in IA and OA,[1-5] clinical training of rheumatology health professionals in pain management is essential. To ensure patient-centered pain management, health professionals need knowledge, confidence, communication skills, and skills to support patients to translate intentions into action plans, which should be part of educational programs.[76-78] It has been demonstrated that training of professionals helps to improve pain management of OA.[79] Health professionals can use the handout shown in figure 2 as a guide in their work, while the more detailed findings and recommendations can be used to fine-tune treatment. Further, knowledge and skills indicated in the overarching principles and recommendations, should be used when reviewing pain curricula in higher education and in postgraduate clinical education.[76] Within EULAR, the current recommendations can be included in the ‘EULAR online course for health professionals’ which comprises specific diseases such as RA and OA as well as broader modules: https://www.eular.org/edu_online_course_hpr.cfm. Finally, these recommendations will be disseminated through this publication, and through a lay summary of the recommendations that will be disseminated among national patient associations.

In conclusion, guided by expert opinion and partly underpinned by a considerable number of systematic reviews and meta-analyses, an expert group developed and launched the first set of recommendations that enable health professionals to provide knowledgeable and evidence-based pain management support for people with IA and OA.

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Contributors
CLO was the research fellow for the project undertaking the systematic literature review, RG was the project convener and drafted the work, RC was the methodologist supervising the systematic literature review, CLO and RC rated the quality of studies, CLO and JA

independently assessed the studies. All authors have contributed substantially by participating in the development of the recommendations and revising the manuscript critically for important intellectual content. All authors approved the final version for publication.

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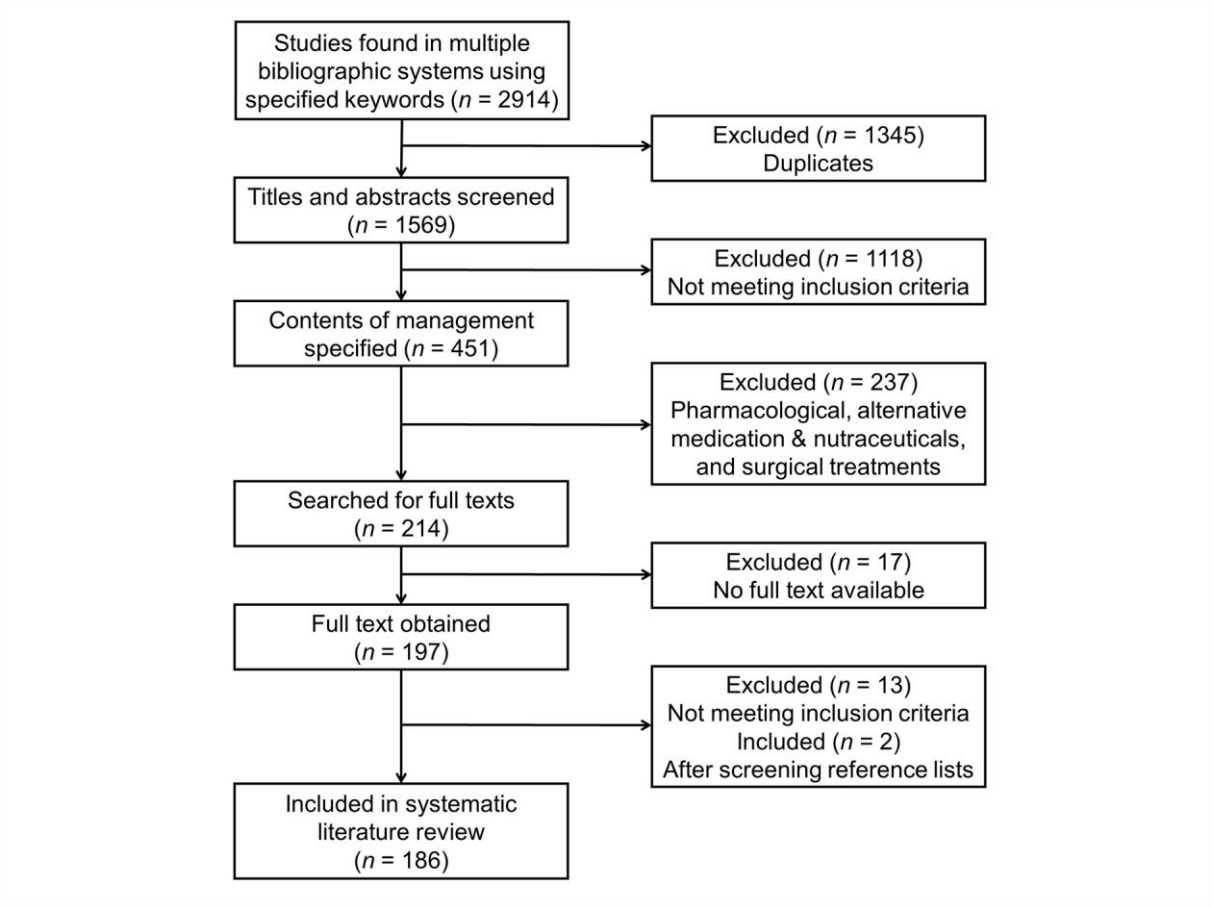

Figure 1. Flow chart of the systematic literature review of systematic reviews

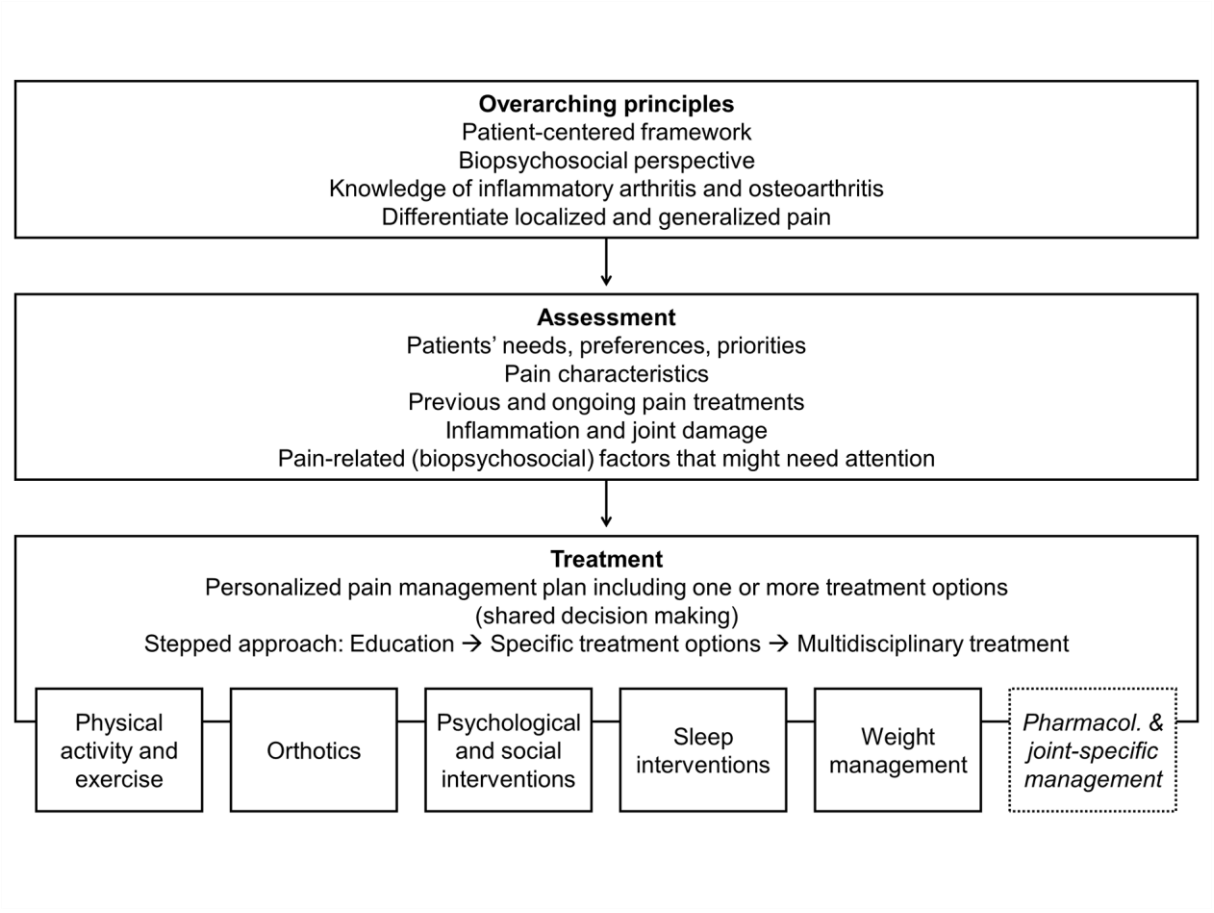

Figure 2. Handout with guide to pain management in inflammatory arthritis and osteoarthritis

Table 1. Overview of systematic reviews of randomized trials (evidence category 1A) regarding education, orthotics, psychological interventions, and weight management: treatment modality and disease, direction of effect, and the quality of the evidence according to GRADE (Grades of Recommendation, Assessment, Development and Evaluation) in patients with rheumatoid arthritis (RA), Spondyloarthritis (SpA), and osteoarthritis (OA). Diseases without a review were excluded from the table.

Treatment modality Disease *Specific treatment modality*	**Number of reviews**	**Direction of effect**	**GRADE quality of evidence**
Education and self-management			
RA	8	o / +	⊕⊕
SpA	1	o	⊕⊕
OA-general	6	o / +	⊕⊕⊕
OA-hand/wrist	1	o	⊕
OA-hip/knee	4	+	⊕⊕⊕
OA-knee	4	+	⊕⊕⊕
Orthotics			
RA			
Orthotic gloves	2	o / +	⊕⊕
Splints	5	o / +	⊕⊕
Insoles	8	o / +	⊕⊕
Orthopedic shoes	3	+	⊕⊕
Padded hosiery	1	+	⊕
OA-hand/wrist			
Orthotic gloves	1	o	⊕
Splints	8	+	⊕⊕
OA hip			
Insoles	1	+	⊕
OA-knee			
Braces	10	? / +	⊕⊕
Sleeves	1	+	⊕⊕
Elastic bandages	2	+	⊕⊕
Taping	3	? / +	⊕⊕
Orthoses in general	1	+	⊕⊕
Insoles	15	? / +	⊕⊕
Orthopedic shoes	1	+	⊕⊕
Cane	1	+	⊕⊕
Psychological interventions			
RA			
Cognitive behavioral therapy	7	+	⊕⊕⊕
Biofeedback	1	+	⊕⊕
SpA			
Cognitive behavioral therapy	1	o	⊕
OA-general			
Cognitive-behavioral therapy	1	+	⊕⊕⊕

Psychosocial and coping interventions	1	+	⊕⊕⊕
Relaxation techniques	1	+	⊕
OA-hip/knee			
Relaxation techniques	1	+	⊕
OA-knee			
Biofeedback	1	o	⊕
Weight management			
RA	2	+	⊕⊕
SpA	1	+	⊕
OA-hip/knee	2	+	⊕⊕⊕
OA-knee	10	o / +	⊕⊕⊕
Multimodal treatment			
RA			
Comprehensive occupational therapy	1	o	⊕⊕
OA-hand/wrist			
Multidisciplinary therapy	1	o	⊕⊕
OA knee			
Comprehensive physical therapy	1	o	⊕⊕⊕

Direction of effect: **+** positive, **o** no, **-** negative, **?** unclear (effect equivocal), or a combination thereof meaning that different reviews reached different conclusions about the effect of the treatment.

GRADE: High ⊕⊕⊕⊕, Moderate ⊕⊕⊕, Low ⊕⊕, Very low ⊕

References are shown in online supplementary file 2.

Table 2. Overview of systematic reviews of randomized trials (evidence category 1A) regarding 'physical activity and exercise': treatment modality and disease, direction of effect, and the quality of the evidence according to GRADE (Grades of Recommendation, Assessment, Development and Evaluation) in patients with rheumatoid arthritis (RA), Spondyloarthritis (SpA), and osteoarthritis (OA). Diseases without a review were excluded from the table.

Treatment modality Disease	**Number of reviews**	**Direction of effect**	**GRADE quality of evidence**
General exercise			
RA	5	o / +	⊕⊕
SpA	6	+	⊕⊕
OA-general	6	+	⊕⊕⊕
OA-hand/wrist	4	o / +	⊕⊕
OA-hip/knee	11	+	⊕⊕⊕
OA-hip	11	o / +	⊕⊕
OA-knee	18	+	⊕⊕⊕
OA-foot/ankle	2	+	⊕⊕
Aerobic exercise			
RA	3	o / +	⊕⊕
OA-general	3	+	⊕⊕⊕
OA-hip/knee	2	o / +	⊕⊕
OA-hip	1	o	⊕
OA-knee	9	+	⊕⊕⊕
Strength and resistance			
RA	2	o / +	⊕⊕
OA-general	3	+	⊕⊕⊕
OA-hand/wrist	2	o / +	⊕⊕
OA-hip/knee	4	+	⊕⊕⊕
OA-hip	3	+	⊕⊕
OA-knee	14	+	⊕⊕⊕
Tai Chi, yoga, qigong, whole body vibration			
RA	3	? / +	⊕
OA-general	6	o / +	⊕ to ⊕⊕
OA-hand/wrist	3	+	⊕
OA-hip/knee	1	o / +	⊕⊕
OA-knee	12	o / +	⊕ to ⊕⊕

Direction of effect:: + positive, o no, - negative, ? unclear (effect equivocal), or a combination thereof meaning that different reviews reached different conclusions about the effect of the treatment.

GRADE: High ⊕⊕⊕⊕, Moderate ⊕⊕⊕, Low ⊕⊕, Very low to low ⊕ to ⊕⊕, Very low ⊕. (The combined ⊕ to ⊕⊕ grade is due to difference in quality between studies of different modalities).

References are shown in online supplementary file 3.

Table 3. Review of reviews (evidence category 1A) regarding miscellaneous therapies: treatment modality and disease, direction of effect, and the quality of the evidence according to GRADE (Grades of Recommendation, Assessment, Development and Evaluation) in patients with rheumatoid arthritis (RA), Spondyloarthritis (SpA), and osteoarthritis (OA). Diseases without a review were excluded from the table.

Treatment modality Disease	**Number of reviews**	**Direction of effect**	**GRADE quality of evidence**
Acupuncture			
RA	5	o / +	⊕⊕
OA-general	4	o / +	⊕⊕
OA-hand/wrist	3	o / +	⊕
OA-hip/knee	2	+	⊕⊕
OA-hip	1	o	⊕⊕
OA-knee	16	+	⊕⊕⊕
Balneotherapy and massage			
RA	3	o / +	⊕⊕
SpA	2	o / +	⊕
OA-general	5	o / +	⊕ to ⊕⊕
OA-hand/wrist	3	+	⊕
OA-hip/knee	2	o / +	⊕
OA-knee	8	+	⊕⊕
Thermotherapy			
RA	4	o / +	⊕⊕
OA-general	1	o	⊕
OA-hand/wrist	3	o / +	⊕⊕
OA-knee	4	o / +	⊕⊕
RA	3	+	⊕⊕
OA-general	2	o / +	⊕⊕
OA-hip/knee	2	? / o	⊕⊕
OA-knee	12	o / +	⊕⊕ to ⊕⊕⊕
Electromagnetic therapy			
RA	2	o / +	⊕⊕
OA-general	1	+	⊕⊕⊕
OA-hip/knee	3	+	⊕⊕
OA-knee	18	? / +	⊕⊕ to ⊕⊕⊕
Laser therapy			
RA	3	+	⊕⊕
OA-general	2	o / +	⊕⊕
OA-hand/wrist	4	o	⊕⊕
OA-knee	7	o / +	⊕⊕⊕
Magnet therapy			
OA-general	1	o / +	⊕⊕

OA-hand/wrist	2	o / +	⊕⊕
OA-knee	2	o	⊕⊕
Manual therapy / joint mobilization			
OA-hand/wrist	4	+	⊕⊕⊕
OA-hip/knee	1	o / +	⊕⊕
OA-hip	1	+	⊕⊕
OA-knee	1	+	⊕⊕
Diverse			
OA-general (healing, qigong, chiropractic)	1	o / +	⊕
OA-hand/wrist (leeches, copper bracelets)	2	o / ?	⊕

Direction of effect:: **+** positive, **o** no, **-** negative, **?** unclear (effect equivocal), or a combination thereof meaning that different reviews reached different conclusions about the effect of the treatment or that the direction of effects differed between treatment modalities such as between Transcutaneous Electrical Nerve Stimulation (TENS) and Pulsed electromagnetic field therapy *(*PEMF), which are both included in 'electromagnetic therapy'.

GRADE: High ⊕⊕⊕⊕, Moderate ⊕⊕⊕, Low to moderate ⊕⊕ to ⊕⊕⊕, Low ⊕⊕, Very low to low ⊕ to ⊕⊕, Very low ⊕ (The combined grades are due to difference in quality between studies of different modalities such as balneotherapy versus massage studies)

References are shown in online supplementary file 4.

Table 4. Overarching principles

- The assessment and treatment process should be guided by a patient-centered framework.
- The health professional should understand that (any type of) pain encompasses multiple and mutually interacting biological, psychological and social factors that include but are not limited to pain severity, peripheral (inflammation and joint damage) and central neurophysiological processes, physical (dis)ability, resilience and vulnerabilities (emotions, cognitions, behavior, lifestyle), social factors (work, support, facilities, economic), sleep quality, obesity, and other health risks (e.g., smoking, alcoholism).
- The health professional should have basic knowledge of the pathology, treatment, and sequelae of inflammatory arthritis and osteoarthritis.
- The health professional should be able to differentiate between localized and generalized pain and knows that these types of pain may coexist.

Table 5. EULAR recommendations for the health professionals' approach to pain management in inflammatory arthritis and osteoarthritis

	Level of evidence	Strength of recom-mendation	Level of agreement task force: Mean (SD)
1. Assessment by the health professional should include the following aspects (the assessment is brief or extensive depending on factors such as available time, whether it is a first or regular consultation, and the needs of the patient): - patient's needs, preferences, and priorities regarding pain management and important activities, values and goals in daily life. - patient's pain characteristics including severity, type, spread, and quality. - previous and ongoing pain treatments and the perceived efficacy. - current inflammation and joint damage as sources of pain, and whether these are adequately treated. - pain-related factors that might need attention: a) the nature and extent of pain-related disability, b) beliefs and emotions about pain and pain-related disability, c) social influences related to pain and its consequences, d) sleep problems, and e) obesity.	4	D	9.3 (0.8)
2. The patient should receive a personalized management plan with the aim of reducing pain and pain-related distress and improving pain-related function and participation in daily life. This plan is guided by shared decision making, the expressed needs of the patient, the health professional's assessment, and evidence-based treatment options. A stepped-care approach may include, in step 1, education and self-management support (recommendation 3); in step 2, one or more treatment options by a specialist if indicated (recommendations 4 to 9); or, in step 3, multidisciplinary treatment (recommendation 10).	4	D	9.0 (0.8)
3. The patient should receive education. * All patients have easy access to 1) educational materials (such as brochures or links to online resources with encouragement to stay active, sleep hygiene guidelines, and so on), 2) psychoeducation by the health professional, and 3) online or face-to-face self-management interventions	1A	A	9.7 (0.6)
4. If indicated, the patient should receive physical activity and exercise.. * The health professional and patient appraise whether advice to stay active, supervised physical exercise, or multidisciplinary treatment is needed. * If the patient is not able to initiate physical activity and exercises without help, then consider the possibility for referral to a physiotherapist for individually tailored graded physical exercise or strength training. * If psychosocial factors such as fear of movement[71, 80] or catastrophizing cognitions[70] underlie a disabled, sedentary lifestyle, then consider a multidisciplinary intervention including cognitive-behavioral therapy.	1A	A	9.8 (0.8)
5. If indicated, the patient should receive orthotics. * If a patient has pain during activities of daily living, which impedes functioning, orthotics (such as splints, braces, gloves, sleeves, insoles, and shoes), daily living aids (such as a tin opener), an assistive device (such as a cane or rollator), or ergonomic adaptation (at home, workplace) can be	1A	A	8.6 (0.9)

offered. If the patients wants to use this assistive support, then consider referral to the occupational therapist, who can proceed with several actions: offer education about appropriate ways to use joints and ergonomic principles, appraise the need for the use of an orthotic or assistive device, give advice about how to acquire it, fit the customized aid to the patient, offer training in the use of it, refer to the appropriate specialist who will do this, e.g., orthopedic shoemaker.			
6. If indicated, the patient should receive psychological or social interventions. * If there are indications that social variables or psychological factors interfere with effective pain management and functional status, then consider (depending on the severity) providing basic social and psychological management support or referral to a psychologist, social worker, self-management support program, CBT, or multidisciplinary treatment. * If psychopathology (e.g., depression and anxiety) is present, discuss treatment options with the patient and the patient's primary care physician.	1A	A	9.5 (0.6)
7. If indicated, the patient should receive sleep interventions. * If sleep disturbance is reported, inquire about causes (e.g., pain, persistent worrying, poor sleep habits) and offer basic education about good sleep hygiene practices. * If sleep remains (severely) disturbed refer to a therapist or program aimed at restoring sleep, or to a specialized sleep clinic.	1B	B	8.4 (1.1)
8. If indicated, the patient should receive weight management. * If the patient is obese, explain to the patient that obesity can contribute to pain and disability. Discuss accessible weight management options with the patient or signpost appropriate specialized weight management support; e.g., dietician, psychologist, community lifestyle services, or bariatric clinic/surgery.	1A	A	9.1 (1.0)
9. If indicated, the patient should receive pharmacological and joint-specific pain treatment according to recent recommendations. * Ask about the patient's existing use of prescribed and over the counter pain relief including homeopathic remedies and consider if the frequency of use is safe (not over dosing) and appropriately regular. Ask or refer for further specialist or medical advice if there are concerns or if additional pharmacological treatment may be indicated.	See [16, 17, 24-29]		9.5 (0.8)
10. If indicated, the patient should receive multidisciplinary treatment. * If more than one treatment option is indicated, e.g. to treat psychological distress in combination with a sedentary lifestyle, and if monotherapy failed, consider a multidisciplinary intervention.	4	D	8.8 (1.1)

Notes.
'Level of evidence' and 'Strength of recommendation' for treatment modalities refer to specific diseases in which uniform positive effects on pain (excluding studies with 'very low' quality of evidence) were observed (tables 1 and 2). Overarching principles and recommendations regarding assessment are based on expert opinion.
Level of evidence: 1A, from meta-analysis of randomized controlled trials; 1B, from at least one randomized controlled trial; 2A, from at least one controlled study without randomization; 2B, from at least one other type of quasi-experimental study; 3, from descriptive studies, such as comparative studies, correlation studies or case–control studies; 4, from expert committee reports or opinions and/or clinical experience of respected authorities.
Strength of recommendations is a combination of the information from the systematic literature review and expert opinion: A Category I evidence; B Category II evidence or extrapolated recommendations from category I evidence; C Category III evidence or extrapolated recommendation from category I or II evidence; D Category IV evidence or extrapolated recommendation from category II or III evidence.[22]

Level of agreement by the task force on a scale from 0 to 10.
* Specific considerations regarding application of recommendations that are indicated with and asterisk are based on expert opinion of the task force.

Box 1. Research agenda

- To examine omissions in knowledge such as effects of treatment options on pain in psoriatic arthritis, the effects of sleep interventions on pain in IA and OA, and pain as an outcome measures in studies of assistive devices such as a cane or rollator in more diseases than OA of the knee alone.
- To examine in meta-analyses the effects of multidisciplinary treatment on pain.
- To improve the methodological quality of treatment outcome studies.
- To conduct an analysis examining effect sizes for more specific treatment modalities that are now merged into comprehensive treatment packages.
- To examine moderators of treatment effects (e.g. in which patient subgroups each specific treatment option causes a reduction of pain).
- To examine mediators of outcome, that is, how pain treatments work in IA and OA.
- To examine the effects on pain of minimal interventions such as advice during a consultation, use of brochures, and e-health psychoeducation.
- To examine whether combined pharmacological and non-pharmacological pain management is more effective than monotherapy.
- To contribute to personalized medicine by analyzing customized pain treatments; e.g., using replicated single case experimental designs with idiosyncratic outcome measures.
- To examine in which way health care could best be organized to be able to provide the best possible and knowledgeable pain management support for people with IA and OA.