

Review

Non-drug care for RA—is the era of evidence-based practice approaching?

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Non-pharmacological treatment modalities are often recommended, prescribed and used in addition to drug treatment in patients with rheumatoid arthritis (RA). This article provides a review of the literature on their effectiveness.

Currently, a considerable number of systematic reviews summarising the available studies for non-drug care interventions in RA are available. The evidence of effectiveness varies among the different non-pharmacological modalities, with relatively strong support for exercise and self-management interventions, and modest support for joint protection programmes, specific orthoses and comprehensive care interventions. Overall, the evidence for effectiveness of massage and electro-physical modalities is absent or weak. In general, few studies in patients with early RA, studies comparing different attributes of non-pharmacological modalities or comprehensive care models and economic evaluations have been performed, so that the optimal timing, intensity, duration and mode of delivery often remain unclear. The results of this review indicate a need for further investigation into the most clinically and cost-effective strategies to deliver individual non-pharmacological treatment modalities as well as comprehensive arthritis service delivery models for RA patients in different stages of the disease.

KEY WORDS: Rheumatoid arthritis, Physical therapy, Exercise, Thermotherapy, Physical modalities, Occupational therapy, Orthoses, Assistive devices, Joint protection, Vocational rehabilitation.

Introduction

Despite the wide range of drugs currently available and their indisputable effectiveness, a substantial proportion of patients with rheumatoid arthritis (RA) will have a relatively low, but persistent, level of disease activity [1], to a greater or lesser extent interfering with their daily activities. This observation implies that the majority of patients will need long-term care, not only consisting of drug therapy, but also of education, guidance and support to cope with the consequences of the disease. More and more, patients with RA are encouraged to participate fully and take a leading role in the management of their disease. Recent guidelines for the management of RA, therefore, emphasize the use of non-drug care in addition to the use of pharmacological agents [2–4]. Nowadays, the large majority of RA patients have been told to use and tried at least one type of non-pharmacologic treatment [5].

Non-drug care includes a wide range of modalities, including exercise therapy, physical modalities, orthoses and assistive devices and self-management interventions. These modalities have traditionally been provided by various health professionals, who are often designated as the ‘multidisciplinary rheumatology team’ [3]. This team may include, apart from the rheumatologist, nurse specialists, physical therapists, occupational therapists, social workers, dieticians, podiatrists, psychologists and additional physicians such as general practitioners, orthopaedic surgeons or rehabilitation specialists. Ideally, all physicians and health professionals involved in the treatment are systematically coordinating their activities, for example by means of team conferences, in order to enhance the continuity and cohesiveness of care [6, 7]. In some regions, however, access to comprehensive arthritis care and the coordination of services are insufficient [8]. To enhance service

delivery and ensure timely access to health care services, alternative strategies for traditional multidisciplinary team care, such as the delivery of comprehensive care by multiskilled professionals, are being developed and provided in RA management [8, 9].

This review gives a summary of the available evidence regarding the effectiveness of individual non-drug care modalities and traditional and evolving comprehensive care models in RA. Whenever possible, this review is based on published systematic reviews on non-pharmacological interventions in RA. The main characteristics of those systematic reviews that were exclusively aimed at RA are summarized in Table 1 [10–25].

Individual treatment modalities

Exercise and movement

Exercise can be defined as planned, structured and repetitive physical activity, aimed at improving or maintaining physical fitness [26]. The objectives of exercise therapy in patients with RA are the restoration, preservation or improvement of joint range of motion, muscle strength, aerobic capacity and the performance of specific activities or skills [27].

A systematic review by Van den Ende *et al.* [10] included six randomized controlled trials (RCTs) on the effectiveness of dynamic exercise programmes. The authors of this review concluded that dynamic exercise was effective with respect to improvement of aerobic capacity and muscle strength, without detrimental effects on disease activity or pain. The same conclusion was drawn in a systematic review by Stenström and Minor [11], which included 15 RCTs on the effectiveness of aerobic and strengthening exercises in RA. Another systematic review focused on the effectiveness of aerobic fitness activities, including exercise modes like cycling, walking, running, ‘active’ hydrotherapy or aquatics (water aerobics, swimming, deep water running) and aerobic dance [28]. This review, including 18 studies of which 13 were RCTs, showed that aerobic capacity improved in the majority of studies, but to the greatest extent in cycling interventions. However, a number of trials included in this review comprised only patients with OA or mixed groups of RA and systemic lupus erythematosus. In all of the aforementioned

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TABLE 1. Characteristics of systematic reviews on non-pharmacologic interventions in patients with rheumatoid arthritis^a

	First author [reference number]	Number of trials included	Cochrane database	No. of patients	Treatment modalities	Mean/maximum methodologic score
Exercise therapy	Van den Ende [10]	Six RCTs	Yes	251	Dynamic exercise therapy (at least twice a week during at least 20 min exercise forms whereby the heart rate exceeded 60% of the maximal heart rate, duration of the programme at least 6 weeks)	6.5/10
Thermotherapy Ultrasound	Stenström [11]	15 RCTs	No	772	Aerobic and strengthening exercises	Not reported
	Robinson [12]	Seven RCTs	Yes	328	Any form of heat or cold (balneotherapy excluded)	2/5
	Casimiro [13]	Two RCTs	Yes	80	Ultrasound applications using any combination of parameters (intensity, mode or size of ultrasound head)	2/5
Electrotherapy	Brosseau [14]	Three RCTs	Yes	78	All types of transcutaneous electrical nerve stimulation	2.7/5
	Pelland [15]	One RCT	Yes	15	Electrostimulation of muscle	2/5
Low level laser therapy	Brosseau [16]	Five RCTs and One CCT	Yes	222	All types of low level laser therapy (Classes I, II and III) including all wavelengths	3/5
Balneotherapy	Verhagen [17]	Six RCTs	Yes	355	Bathing in water which may contain minerals (added or natural)	4.8/9
Occupational therapy	Steultjens [18]	15 RCTs 6 CCTs, 16 other designs	Yes	1210 ^b	Training of motor function, training of skills, instruction on joint protection, counseling, advice and instruction in use of assistive devices, provision of splints and comprehensive occupational therapy	5/21 RCTs or CCTs had a high methodologic quality
Splints and orthoses ^c	Egan [19]	10 (RCT or cross- over studies)	Yes	449	Rigid, semi-rigid or soft orthotics designed to provide support and/or pain relief to any joint (joints of the neck and back excluded)	Range 1–5/5
	Farrow [20]	Four RCTs	No	258	Orthoses and special shoes	2.5/5
	Clark [21]	Six RCTs ^d , five CCTs	No	423 ^d	Foot orthoses	Not reported
Self-management interventions	Riemsma [22, 23]	31 RCTs	Yes	Unclear	An intervention comprising formal structured instruction on RA and on ways to manage arthritis symptoms, including modern behavioural methods to promote changes in health behaviours	3.26/8
	Astin [24]	25 RCTs	No	1676	Treatment that included some psychological component beyond simply providing education	5.84/10 (range 3–9); 2.24/Jadad scale
Multidisciplinary team care	Vliet Vlieland [25]	15 CCTs (of which 9 RCTs)	No	1044	Defined inpatient, outpatient or day patient multidisciplinary team care programmes	Not reported

^aOnly reviews that were confined to RA patients were included in this table.

^bIn 15 RCTs and 6 CCTs.

^cSplints were also included in the review on occupational therapy by Steultjens *et al.* [43].

^dTwo RCTs concerned the same patient group ($n=102$) but were considered separately by the authors of this review.

reviews, it was found that the proof of effectiveness regarding arthritis-related disability was scanty.

In one RCT conducted after these reviews had been published, an intensive, long-term (2 years) dynamic exercise programme proved to be more effective with respect to aerobic capacity, muscle strength, functional disability, emotional status and bone mineral density than usual care, without detrimental effects on disease activity [29–32].

Moreover, in other recent RCTs, the effectiveness of high intensity resistance training regarding muscle growth [33] and the effectiveness of pool exercise therapy with moderate intensity on muscle endurance [34] were demonstrated. In addition, the long-term follow-up of an RCT on a 2-year strength training programme in early RA showed lasting improvements in muscle strength and functional ability, but not on bone mineral density [35, 36].

In total, three RCTs have studied the impact of exercise on radiological damage in RA patients [29–32, 36–38]. Overall, no detrimental effect on radiological progression of the small joints of hands and feet [29–32, 36–38] or large joints [29, 31] was seen. In this latter study, radiographic progression seemed more marked with intensive exercise in a subgroup of patients with pre-existing destructive lesions of weight-bearing joints [29, 31].

It should be noted that most of the studies have been performed in patients with established, stable RA, who did not have joint prostheses, so that the data are not generalizable to a considerable proportion of RA patients. In addition, nowadays, there is a shift from conventional, structured exercise regimens supervised by health professionals towards the promotion of physical activity according to individual preferences and convenience, executed in

non-health care settings. For that purpose, new modes of the delivery for physical activity programmes, such as the usage of the Internet, appear to be promising [39, 40].

Electro-physical modalities

Electro-physical modalities pertain to a range of modalities including electrical, thermal, light, sound and magnetic energy, used to generate therapeutic physiological effects to restore function.

Thermotherapy. Local cold (ice packs, ice chips, ice massage, cryowraps, cold air or vapocoolant sprays) and heat (superficial heat: hot packs, paraffin or wax baths, thermal baths and infrared; deep heat: electromagnetic wave forms and ultrasound) are commonly used in RA patients to relieve pain and stiffness [41]. Both local cold and heat have been found to influence the temperature of the skin, the superficial and deeper tissues and the joint cavity [41, 42].

In a systematic review of different thermotherapy applications in patients with RA, no significant effect of hot or cold applications or faradic baths on measures of disease activity (including joint swelling, pain, medication intake, range of motion, grip strength or hand function) compared to no treatment or active therapy was found [12]. However, there were positive results of paraffin alone for arthritic hands on objective measures of range of motion, pinch function, grip strength, pain and stiffness compared to control (no treatment) after four consecutive weeks of treatment. Overall, no detrimental effects of thermotherapy were reported. In a recent RCT, local cryotherapy was compared with whole-body cryotherapy (-60° and -110°) in

60 patients with RA [43]. Apart from a slightly greater improvement of pain in the whole-body cryotherapy at -110° group, there were no differences in effectiveness regarding various measures of disease activity between the groups.

A separate systematic review of therapeutic ultrasound alone in RA [13] comprised two RCTs in total [44, 45]. In a study by Hawkes *et al.* [44], three treatment groups, all including 10 patients, were compared: exercises and wax baths, exercises with ultrasound, and exercises with ultrasound and faradic hand baths. The ultrasound was applied in water to the palmar aspect of the hand, at 0.250 W/cm^2 , with a constant beam of 3 MHz. The treatment regimen was 3 min, five times a week, for 3 weeks. No significant differences with regard to pain, grip strength, proximal interphalangeal joint circumference, articular index, range of motion or level of activity were found between the three groups. Konrad *et al.* [45] examined ultrasound applied in water to the dorsal and palmar aspects of the hand, at 0.05 W/cm^2 continuously, compared to placebo in 50 RA patients. The treatment lasted 10 min and was applied on alternate days for 3 weeks, for a total of 10 sessions. In comparison with placebo, in the ultrasound group a greater increase of grip strength, durations of morning stiffness, number of swollen and painful joints and wrist dorsal flexion was found. No harmful side effects were reported. Given the fact that only two RCTs are available, and their relatively small sample sizes and methodological shortcomings, no conclusions on the effectiveness of ultrasound in RA can be drawn.

In general, the interpretation of the results of clinical trials on thermotherapy is hampered by their overall poor methodological quality and the use of concurrent therapies.

Electrotherapy. Electrotherapy is the therapeutic use of different forms of electric currents, mostly applied by surface electrodes. The main clinical indications are pain control and muscle stimulation. Pain control is intended with transcutaneous electrical nerve stimulation (TENS). TENS devices are small, portable instruments, producing sharp impulses (0.2 ms) within a frequency range of 1–150 Hz. TENS is commonly used in patients with loco-regional pain. In a systematic review on TENS for the treatment of RA of the hand, three RCTs, involving 78 people, were included [14]. In these trials, conventional TENS (high stimulation frequency of 40–150 Hz, low intensity at a current of 10–30 mA) and acupuncture-like TENS (low frequency of 1–10 Hz and high intensity, close to the patient's limit of tolerance) were compared to placebo and to each other. The results of these trials were conflicting. With respect to the effectiveness on pain while resting, in one study a significantly greater effect of acupuncture-like TENS and in another study no effect of conventional TENS in comparison with placebo was seen. No statistically significant difference was seen between treatment with acupuncture-like TENS or conventional TENS in relief of joint pain. Adverse events were not reported in the three studies.

Muscle stimulation by means of electrotherapy is used to improve muscle strength and function. A systematic review on the use of electrical stimulation in RA [15] included only one trial, in which electrical stimulation was applied to the hand in RA patients with muscle atrophy of the hand [46]. This trial showed that electrotherapy was effective with respect to muscle strength and endurance. Side effects were not reported.

Overall, well-executed studies on the effectiveness of electrotherapy in RA patients are too scarce to draw any conclusions.

Laser therapy. Low level laser therapy was introduced in the treatment of RA about 20 years ago. Low level laser therapy is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather related to photochemical reactions in the cell. A systematic review of low level laser therapy in RA [16], included five RCTs and one CCT

(all placebo-controlled). In these trials, low level laser therapy with wavelengths varying between 632.5 and 850 nm was used, for 3–10 weeks. The results of the studies using a separate control group suggest that low level laser therapy is effective in reducing pain, morning stiffness and tip to palm flexibility [16]. Other outcomes, such as functional assessment, range of motion and local swelling did not differ between groups. In a study where the opposite limb was used for control, no differences between treatment and control regarding pain or morning stiffness were observed. From the available trials, it could not be concluded how wavelength, dosage and duration of treatment and site of application affect the outcome of treatment. It should be noted that sample sizes were small, there was a considerable variety in the clinical application (dosage, wavelength and types of low level laser therapy) and the treated joints in all but one of the trials concerned the hands.

Spa therapy. Bathing in water (spa therapy, balneotherapy or 'passive' hydrotherapy) has been frequently used in classical medicine as a cure for diseases [47]. Water from mineral and thermal springs has been particularly valued. Spa therapy is best tolerated with temperatures of $34\text{--}35^{\circ}\text{C}$ and a duration of about 20 min. A systematic review on the effects of spa therapy in RA included six RCTs [17]. The interventions included mineral baths plus mud packs, radon-carbon dioxine baths, carbon dioxine baths, Dead Sea baths, sulphur baths and tap water of 36°C . Most of these trials reported positive results with respect to pain, morning stiffness and functional ability, with the effects lasting for 3–9 months. The authors concluded that a definite judgement about its efficacy is impossible, because of methodological flaws in the trials that were included. Moreover, they strike the need to consider the potential impact of the change of environment, the 'spa-scenery', the rest, the company of other people with arthritis and the relaxation on the improvement of arthritis symptoms.

Manual therapy

Massage. Massage is a form of manual therapy, which includes the use of manual techniques to facilitate and restore movement and function. Massage can be defined as the systematic manipulation of soft tissues of the body for pain reduction or other therapeutic purposes. 'Classic' ('Swedish') massage comprises effleurage (stroking and gliding), petrissage (kneading) and tapotement (percussion) [48]. Currently, no controlled trials on the effectiveness of massage in RA patients are available [49]. In one study with a cross-over design, including nine patients with RA, a positive effect of a combination of massage and aromatherapy on patients' perceptions of pain, sleep and well-being was described [50]. A systematic review on the safety of massage therapy concluded that serious adverse events are rare, and mostly associated with massage techniques other than the 'Swedish' massage [48].

Joint protection and energy conservation

Joint protection and energy conservation techniques include a wide variety of concepts, such as respect for pain, planning and pacing activities, regular rest, altering patterns of joint movement and the use of assistive devices. Studies on joint protection and energy conservation instruction have recently been listed in a systematic review on occupational therapy in RA [18]. It was concluded from eight studies, four of which were randomized and/or controlled, that there is limited evidence regarding the positive effect of joint protection instruction on knowledge and functional ability. A RCT that was published after this review, showed that an educational-behavioural joint protection programme was more effective with respect to joint protection adherence and functional ability than standard methods of training in RA patients [51, 52].

Aids and devices and adaptations of physical environment

Assistive devices and adaptations of the physical environment are frequently prescribed to ease pain, overcome joint limitations, compensate for muscle weakness and enhance safety with the ultimate aim to prevent or reduce dependence. Jar openers, raised toilets seats, bathroom appliances and special beds are among the assistive devices most frequently possessed [53, 54]. In a previously mentioned review on occupational therapy in RA [18], two studies on the prescription of assistive devices were included, one of which had a randomized, controlled design. From this review it was concluded that there is insufficient data to determine the effectiveness of the intervention 'advice/instruction in the use of assistive devices'.

Orthoses

Orthoses are 'any medical device added to a person's body to support, align, position, immobilize, prevent or correct deformity, assist weak muscles or improve function' [55]. In RA patients, orthoses are used predominantly to reduce local pain and inflammation by relieving strain or load on a joint or by decreasing motion. Moreover, they are used to improve patterns of motion and function by providing stability for unstable joints and to prevent deformity.

Wrist splints and finger/thumb splints. Wrist splints can be divided into resting or immobilization splints and functional or activity splints. Resting wrist splints are mainly prescribed to reduce pain and others signs of inflammation, and to a lesser extent to prevent contractures and preserve function [56]. Functional wrist splints are intermittently used during activities in which resistance, object weight or protracted positioning are likely to stress the wrist with the aim to support joints and restrict motion; they are primarily thought to relieve pain and improve the performance of activities of daily living [56, 57]. Finger or thumb splints are either custom-made from thermoplastic material or are pre-fabricated, and for example made of rings of metal.

The literature on hand and wrist orthoses has been reviewed more than once [18, 19, 58]. In a systematic review on occupational therapy in patients with RA, the results of 16 studies (including six RCTs) on different kind of wrist splints and finger/thumb splints were combined [18]. It was concluded that there are indicative findings that these splints are effective in reducing pain, have a negative effect on dexterity and a positive effect on grip strength. In a systematic review by Egan *et al.* [19], five studies on working wrist splints and two studies on resting hand and wrist splints were included. The authors of this review concluded that there is insufficient evidence to support the effectiveness of workings wrist splints in decreasing pain or increasing function, whereas some of these splints decrease grip strength and dexterity. Moreover, it was found that resting hand and wrist splints appear not to affect pain or the number of swollen joints, although patients with RA preferred wearing a resting splint to not wearing one.

With respect to finger splints for swan-neck deformities in RA, two studies, both not included in the aforementioned reviews, are available. In an uncontrolled study including 17 patients with RA and swan-neck deformity, sterling silver splints were found to improve hand function [59]. In a randomized, controlled cross-over study, splints from sterling silver were compared with custom made thermoplastic splints in 18 patients with RA and swan-neck deformities [60]. This study showed similar clinical effectiveness of the two types of splints regarding improvement of finger stability and decrease of the flexed position of the distal interphalangeal joint, but greater acceptability (comfort and cosmesis) of the pre-fabricated sterling silver splints.

Special shoes and inserts. Appliances for the rheumatic foot are prescribed to relieve excessive pressure, to reduce shock and shear, to accommodate, correct and support deformities and to control or limit painful motion of joints [61]. External shoe modifications may consist of rocker soles, extended steel shanks, stabilizers, wedges or extensions and inserts such as soft, semiflexible or rigid insoles and toe wedges. Apart from prescription footwear, off-the-shelf footwear for people with arthritis, to which orthopaedic amendments often can be made, is amply available [61]. In a systematic review on splints and orthoses in RA, three studies on foot orthoses and special shoes were included [19]. From these studies it was concluded that there is preliminary evidence to support the use of extra-depth shoes, with or without semi-rigid insoles, to relieve pain on walking and weight-bearing. Moreover, supported insoles appear to limit progression of hallux valgus angle but did not decrease pain or enhance foot function. In another systematic review that focused specifically on interventions for foot disease in RA, four RCTs concerning non-surgical interventions were included [20]. The authors concluded that functional, custom-designed and semirigid orthoses are likely to be beneficial with respect to pain and disability in patients with RA. Extra-depth shoes also appeared to have a favourable effect on pain, although their benefit was greater if combined with orthoses. Their findings were supported by one controlled clinical trial and eight observational studies they identified. From a recent systematic review on foot orthoses for the rheumatoid arthritic foot [21], including six RCTs (two concerning the same patient group), it was concluded that there is strong evidence that foot orthoses do reduce pain and improve functional ability; however, methodological issues of the included RCTs concerned small sample size and poor use of valid and reliable outcome measures. There is limited evidence pertaining to cost-effectiveness. The synthesis of the literature suggests that there is a need for further investigation into the most clinically and cost-effective foot orthoses to prescribe.

Cervical spine orthoses. Cervical spine orthoses are predominantly prescribed to limit motion of the cervical spine, especially flexion, with the aim to reduce pain, muscle tension and paresthesias. There are different types of cervical spine orthoses, varying with respect to their shape, material, extent and localization of points of support and comfort [62–64]. The evidence regarding the effectiveness of cervical spine orthoses is limited, with conflicting results regarding stabilization of cervical motion [65, 66]. An effect of cervical spine orthoses on progression of C1-C2 subluxation has not been demonstrated [67, 68].

Self-management interventions

Patients' involvement in the management of their care is referred to as self-management, which has been defined as 'the individual's ability to manage the symptoms, treatment, physical and psychological consequences and life style changes inherent in living with a chronic condition' [69]. The aim of self-management programmes for patients with RA is to give patients the strategies and tools necessary to make daily decisions to cope with the disease [22]. As self-management strategies include aspects such as joint protection and energy conservation, exercises or the use of assistive devices, there is some overlap among the literature discussed in this paragraph on self-management interventions and other paragraphs of this review.

A systematic review on patient education in RA patients by Riemsma *et al.* [22, 23], included 31 RCTs. In this review, a positive effect of patient education on disability (10%), joint counts (9%), patients' global assessment (12%), psychological status (5%) and depression (12%) was found at first follow-up. The benefits were, however, modest and short-lived. Based on 25 RCTs on psychological interventions, including relaxation,

biofeedback, stress management and cognitive-behavioural therapy, Astin *et al.* [24] found small but significant pooled post-intervention effect sizes for pain (0.22), functional disability (0.27), psychological status (0.15), coping (0.46) and self-efficacy (0.35). No clear or consistent patterns emerged when effect sizes for different types of treatment and control conditions were compared, or when higher quality trials were compared to lower quality ones. It was, however, suggested that psychological interventions were more effective in patients with shorter disease duration. In a review of self-management interventions in chronic illness, 15 RCTs in RA patients and four RCTs in both RA and osteoarthritis patients were identified [70]. It was found that changes of behaviour were demonstrated in a number of studies.

In all three reviews it was found that the contents of the interventions as well as the outcome measures varied widely among studies and that it remains unclear whether the results of self-management interventions can be improved by 'booster sessions', or the involvement of spouses or other family members. A recent RCT demonstrated the effectiveness of tailored cognitive-behavioural therapy in addition to standard care as compared to standard care alone in a selected group of RA patients with a psychosocial risk profile [71].

Comprehensive non-pharmacological care

Comprehensive physical therapy and occupational therapy

Physical therapy is a health care profession concerned with human function and movement and maximising potential. It uses physical approaches (manual therapy, exercise and movement, electro-physical modalities and health education and promotion) [www.csp.org.uk], with education and exercise being the most common components in RA patients. So far, the literature on the effectiveness of comprehensive physical therapy interventions is scanty. Four hours of a community-based physical therapy programme delivered over 6 weeks was found to significantly improve self-efficacy, disease management knowledge and morning stiffness in patients with RA [72, 73]. With respect to the mode of delivery, ambulatory care appeared to be less costly than home-based physiotherapy [74].

Comprehensive occupational therapy interventions may consist of a combination of instruction on joint protection and energy conservation, advice and instruction in using assistive devices and orthoses, training of motor function or skills and counselling. A systematic review on occupational therapy [18], comprising four studies on comprehensive interventions, concluded that there is limited evidence for their effectiveness on functional ability. A recent RCT showed that in patients with early RA, a pragmatic, comprehensive occupational therapy programme improved self-management but not health status [75].

The primary therapist model pertains to physical therapists or occupational therapists, who, after a structured training programme, provide cross-disciplinary care [76]. It was found that, in comparison with traditional physical or occupational therapy, the primary therapist model was associated with better clinical outcomes regarding functional ability, pain and arthritis knowledge [77] and proved to be potentially cost-effective [78].

Comprehensive nurse specialist care

In many countries, the clinical nurse specialist or nurse practitioner model was developed in rheumatologic care. Clinical nurse specialists and nurse practitioners have, apart from their specific nursing skills, extended their roles to incorporate various tasks of the rheumatologist or other professionals and to set up nurse-led clinics.

So far, the number of studies on the effectiveness of the clinical nurse specialist care is limited. In a controlled study in RA patients, care coordinated by a clinical nurse specialist in addition

to care provided by a rheumatologist was compared with care provided by a rheumatologist alone [79]. In that study, no major differences with regular care were seen regarding the need for information, the application of practical aids and adaptations, or daily functioning. In a randomized clinical trial [80–82], clinical nurse specialist care provided equivalent clinical outcomes regarding disease activity, functional ability and quality of life in comparison with inpatient and day patient team care, at significantly lower costs. The safety and effectiveness (disease activity, functional status and psychological functioning) and acceptability of nurse practitioner clinics in comparison with care provided by physicians have been established in the United Kingdom [83–85] in two RCTs. In a recent RCT, the added value of the expert clinical nurse specialist in comparison with outpatient clinic nurse with respect to patients' perceived ability to cope with their arthritis and to control their perceptions was demonstrated [86].

Multidisciplinary team care

Studies on the effectiveness and costs of traditional multidisciplinary team care in RA are scant. A review concerning the effectiveness of inpatient and outpatient multidisciplinary team care in patients with RA, published in 1987 [87], concluded that there is indicative evidence that team care results in better outcomes, but that most studies were methodologically flawed. Another systematic review [25] comprising 15 controlled clinical trials (nine RCTs), including one pilot study [88], was published 10 years later. From that review it was concluded that in patients with RA, inpatient multidisciplinary team care programmes were more effective than regular outpatient care and equally effective as day patient care with respect to disease activity and functional ability. The benefit of outpatient team care programmes in comparison with regular outpatient care appeared to be small.

Since the publication of that review, a number of uncontrolled studies [89–91], as well as three RCTs comparing inpatient with day patient multidisciplinary team care were conducted [80–82, 92]. In all of these trials, similar effectiveness regarding disease activity and functional ability of inpatient and day patient team care programmes was seen, with inpatient team care being more expensive than day patient care.

In the majority of the above mentioned studies the various treatment modalities as well as characteristics of the team care process were poorly described. Moreover, the studies were mainly concerned with patients in later stages of the disease and comparisons among variations of multidisciplinary team care programmes, such as the addition or subtraction of specific health professionals, team leaders or formal team conferences were hardly made. Therefore, the question 'What's inside the team care box?', which was raised many years ago [93], still remains largely unanswered [7]. In this respect, it should also be noted that the institution or change of drugs is usually an element of the multidisciplinary team care programme, so that it is likely that its effectiveness can, in part, be attributed to the pharmacologic intervention [94]. Now that the medical treatment of RA has largely improved, the expected health gains from non-pharmacological care as measured by conventional outcome measures on the level of disease activity and functional ability are limited [95]. The development and usage of outcome measures that are closely related to the current goals of non-drug care is therefore advocated [95–97].

With respect to the organization of multidisciplinary team care in RA, specific rehabilitation tools enhancing a structured approach, the patient's role and the communication among health professionals have been introduced [98, 99]. Examples of such rehabilitation tools are the Rehabilitation Activities Profile (RAP) [100], the Rehabilitation Problem-Solving Form (RPS) [99], the Canadian Occupational Performance Measure (COPM) [101] and the Indicators of Rehabilitation Status (IRES-3) patient

questionnaire [102, 103]. The impact of the introduction of the COPM [101] and the RAP [104] have recently been evaluated in rheumatology, with conflicting results with respect to the client's perception of participation in the rehabilitation process.

Another organizational development in multidisciplinary team care for patients with RA is the institution of forms of team care that are focused on specific age groups or specific problems. Examples of such forms of 'targeted team care' are clinics for elderly patients with arthritis [105], adolescents [106], vocational rehabilitation [107–109], neck problems [110] or foot problems [111].

Finally, developments in multidisciplinary team care concern arthritis care delivery by teams consisting of general practitioners and various allied health professionals in primary care. Glazier *et al.* [112] evaluated an educational intervention, entitled 'Getting a Grip on Arthritis', which was found to accomplish changes in the management of arthritis in a primary care setting, such as the provision of information on type of arthritis, medications and their side effects, disease management strategies and arthritis community resources.

Discussion

This review shows that over the past few years a considerable number of systematic reviews have become available summarizing the available evidence regarding non-pharmacological interventions for people with RA. The evidence of effectiveness varies among the different non-pharmacological modalities, with relatively strong support for exercise and self-management interventions, and modest support for joint protection programmes, specific orthoses and comprehensive care interventions. Overall, the evidence for effectiveness of massage and electro-physical modalities is absent or weak.

Given the relatively small numbers of studies available per intervention, their overall poor quality and the large variability regarding the outcome measures as well as the control groups used for comparison, it is hard to draw firm conclusions about the magnitude of the effects obtained by specific non-pharmacological interventions or non-pharmacological care in general. This inability to provide some general sense of strength of the findings is reflected in the majority of the systematic reviews included in this article, where quantitative, pooled statistical analyses based on three or more RCTs are rare. Exceptions to this observation are the reviews on self-management interventions by Riemsma *et al.* [22, 23] and Astin *et al.* [24]. In these reviews, 25 trials or more were included, which numbers exceed the average number of trials included in the reviews on other non-pharmacologic interventions by far.

As some systematic reviews included in this paper were based on only a small number of studies, or the results of studies on quite diverse interventions were being combined, the authors' conclusions of some reviews described in this article have to be interpreted with care.

With respect to the individual studies included in these reviews, poor descriptions of the intervention, small sample sizes and the usage of non-validated outcome measures were common methodological flaws. It has been reported previously that studies of non-pharmacological treatments were less well designed than studies of medications [113]. However, it must also be acknowledged that the conduct of studies in this field is hampered by the nature of the treatment modalities, so that trials can hardly meet criteria such as double blinding [114] and should be evaluated using specific tools [115]. In general, in the field of non-pharmacological care in RA, studies including patients with early RA [116], economic analyses [96], evaluations of potentially negative effects [117] and comparisons of various complex arthritis care delivery models are scanty [96, 97] and are therefore a major challenge for future research. Apart from the usage of an appropriate study design, the choice of outcome measures which

are relevant for non-pharmacological modalities is of utmost importance. An example is the development of specific measurement instruments to measure the patients skills to effectively participate in his or her own disease management, such as the Canadian 'Effective Consumer Outcome Scale' [118].

Since 2002, a group of researchers, patients, rheumatology opinion leaders, health care administrators and other stakeholders from Europe and North America (The Care-group) have been working to develop and disseminate an actionable research agenda to improve care for people with arthritis [7, 9, 95, 97, 119–123], including issues around models of care, study design, outcome measures and knowledge translation.

This review shows that, with the exception of dynamic exercise and self-management interventions, the number of clinical trials on specific non-pharmacological treatment modalities in RA patients is limited. The available studies are to a large extent hampered by methodological issues, such as small sample sizes, poor description of the intervention, concurrent treatment, a large variety of outcome measures and unblinded assessments. Given these shortcomings, and the observation that few studies were done in early RA and economic analyses are rare, the optimal timing, intensity, duration and mode of delivery of many treatment modalities or comprehensive care models remain unclear.

Challenges for future research by allied health professionals include the conduct of methodologically sound studies, including economic analyses, with the recognition that some criteria, such as double blinding, cannot be met in some cases. For that purpose, the development of a core set of outcome measures relevant for non-pharmacological care in RA is needed. Moreover, more studies in patients with early RA need to be conducted. Similar to research on the optimization of drug therapy in RA [124], there is a need for studies comparing non-pharmacological treatment strategies or comprehensive care models rather than individual treatment modalities.

Despite the above mentioned limitations, the availability of evidence in the field of non-pharmacologic treatment of RA patients is more and more acknowledged, and, together with expert opinion, processed into practice recommendations or guidelines [2–4, 115, 125, 126]. These guidelines are considered to serve as an aid for health professionals and patients who have to make decisions about the most appropriate management strategy. For that purpose, they need to be widely disseminated and discussed among all stakeholders.

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