Intervention Programs for Arthritis and Other Rheumatic Diseases

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Disability reduction or prevention programs for people with arthritis and other rheumatic conditions reduce long-term pain and disability but reach only a fraction of their target audience. Few public health professionals are aware of these programs or their benefits. The objective of this study is to review and describe packaged (ready-to-use) arthritis self-management education and exercise/physical activity programs that have had at least preliminary evaluation. Nine intervention programs (five self-management education programs, and four exercise/physical activity programs met study criteria). Several of the packaged arthritis interventions reviewed help people with arthritis and other rheumatic conditions maximize their abilities and reduce pain, functional limitations, and other arthritis-related problems. Other packaged interventions show promise in reducing pain, disability, and depression and in increasing self-care behaviors, but they need to be evaluated more extensively.

Keywords: *arthritis; interventions; exercise therapy; program evaluation; self-management*

In the United States, arthritis and other rheumatic conditions, a family of more than 100 diseases, are among the most prevalent, disabling, and costly conditions. In 1997, they were estimated to affect more than 15.0% (43 million) of the population[1,2] and are projected to affect 18.2% (59.4 million) of the 2020 population.[2] In 1990, the major life activities (work, school, home) of 7 million people were limited by these conditions, and projected figures indicate that 11.6 million will be limited in 2020.[2]

Arthritis and other rheumatic diseases have a significant impact on many demographic groups. Arthritis is the most prevalent and disabling condition among women.[3] Arthritis is among the top four chronic conditions affecting different racial and ethnic groups (e.g., Caucasian, African American, Asian/Pacific Islanders, and Hispanics) and is ranked first or second in each group as a cause of activity limitation.[4]

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The effects of morbidity on those with arthritis are also substantial; direct and indirect costs associated with arthritis were estimated to total $65 billion in 1992.[5] Decreasing the prevalence of arthritis would lead to a much greater decrease in functional limitations and costs of long-term care in the 21st century than would similar decreases in the prevalence of coronary artery disease, stroke, cancer, diabetes, or dementia.[6] It will be difficult to achieve the primary goals of *Healthy People 2010*[7]—to increase quality and years of healthy life and to eliminate health disparities—without concerted public health efforts to address arthritis.

Arthritis and other rheumatic conditions have only recently been addressed as public health problems. Public health efforts for chronic diseases have historically focused on leading causes of death. Arthritis is primarily a quality-of-life issue because it is usually nonfatal and incorrectly viewed as being an inevitable part of aging, affecting only older people, and having no effective treatment. However, a variety of interventions are available that can improve the health and quality of life of people with arthritis. Arthritis education and exercise/physical activity programs slow down or reduce long-term impairments and disabilities, reduce pain, and help people adjust to their condition.

There is extensive and consistent evidence that health education programs on arthritis management produce positive changes in knowledge, behavior, psychosocial factors, and health status. A comprehensive review of arthritis patient education studies found that 77% to 87% of studies reviewed reported positive changes in multiple factors.[8] A meta-analysis of psychoeducational interventions in arthritis indicated that the intervention groups experienced a 16% improvement in pain over control groups, along with an average 22% greater improvement in depression ratings and an 8% greater improvement in disability.[9] Goeppinger and Lorig,[10] in their review of community-based arthritis patient education, concluded that the "trio of clinical outcomes termed the 'gold standard' of arthritis outcomes research—pain, function/disability and depression—were consistently measured and either found to be improved (pain and depression) or unchanged (function/disability)" (p. 109).

Exercise and physical activity are also priorities in arthritis management. Arthritis often leads to increased inactivity that results in reduced joint mobility, strength, fitness, exercise participation, and risk for development of coronary heart disease,[11,12] yet in the past, people with arthritis were specifically discouraged from participating in exercise activities. Since 1975, however, study results have consistently indicated that moderate-intensity aerobic exercise is both safe and physically and psychologically beneficial for people with arthritis.[13,14] The U.S. Surgeon General's report on *Physical Activity and Health*[15] concluded that regular moderate aerobic or resistance-training exercise programs relieve symptoms and improve function in people with rheumatoid arthritis (RA) or osteoarthritis (OA).

Because of the apparent efficacy of these interventions, clinical and public health practitioners are recommending participation in exercise or physical activity and self-management education programs for people with arthritis. Fortunately, a number of education and exercise programs are offered in a packaged or ready-to-use format and are available for widespread use by health professionals at the state and local levels. Yet far less than 1% of people with arthritis participated in Arthritis Foundation–sponsored self-management education or exercise programs in 2001 (M. Boutaugh, Arthritis Foundation, personal communication, 2002), which suggests that these programs are not reaching many people with arthritis who would benefit from them.

The aging of the population and the increasing prevalence of arthritis make it more important than ever to raise awareness of the growing impact of arthritis and other rheu-

matic conditions and available interventions to decrease symptoms and increase function. The purpose of this article is to review and compare nine packaged (ready-to-use) arthritis intervention programs that are widely available to health professionals who want to address the large and growing problem of arthritis. Interventions currently in the research and development stage or not yet evaluated or packaged (materials ready for easy distribution and implementation) are not included in this review.

METHODS

Intervention programs appropriate for review were defined as those that focused on arthritis or other rheumatic diseases, were packaged (ready to use), were supported by institutions and organizations, and had undergone some evaluation to document their effectiveness. Programs and related literature were found by (a) recommendations from the Arthritis Foundation; (b) a search of computerized databases of medical and scientific publications, including Medline, Community Health Interventions Data (CHID), and Psychlit; and (c) an examination of review articles on arthritis interventions. Reports were reviewed for both program descriptions and evaluation results.

RESULTS

The literature review identified nine intervention programs that met study criteria. These programs are divided into two categories: those that focus primarily on self-management education to provide people with arthritis with the knowledge, skills, and confidence to manage their arthritis and those that focus on exercise or physical activity. Self-management education can be delivered in either a group or individual format. Program characteristics (target population, methods, personnel, program costs) are described in Table 1, and key program content and process areas are listed in Table 2. Program evaluations (participants, design, and available participant outcome data) are described in Table 3.

Self-Management Education (Group Format)

Arthritis Self-Help Course

The Arthritis Self-Help Course (ASHC), also known as the Arthritis Self-Management Program, is the prototypic arthritis education program. Originally developed by Kate Lorig, DrPH, at Stanford University, the program was adopted by the Arthritis Foundation in 1981. The ASHC is a 6-week series of classes for 2 to 2.5 hours per session, taught in a group setting by a pair of trained leaders (laypeople with arthritis and health professionals) who received 2 days of leader training (see Table 1). The curriculum and course materials were developed and standardized on the basis of a needs assessment documenting the concerns of people with arthritis, such as pain, disability, fear, and depression.[16] Accordingly, the course content focuses on what people need to know and do to address these arthritis-related problems, as well as generic skills such as how to make informed decisions and use problem-solving skills to adapt to fluctuations in their disease activity and level of impairment (see Table 2).

Since its initial development, the ASHC has undergone several revisions in response to research findings. Although multiple randomized, controlled trials documented that the original versions of the course were effective in improving knowledge and self-care behaviors and in reducing outcomes such as pain, depression, and physician visits, they also demonstrated only a small correlation between health behavior changes and health outcomes. Further research led to the identification and quantification of a construct, self-efficacy, which correlated strongly with health outcomes. Lorig and Gonzalez[17] defined *self-efficacy* as "one's confidence or belief that he or she can achieve a specific behavior or cognitive state" (p. 358). Subsequent studies showed that adding strategies to enhance self-efficacy to the course appeared to result in improved health outcomes such as decreased pain and depression.[17]

In a 4-year follow-up study, course participants reported 9% more disability but 20% less pain compared with controls—similar to the amount of pain reduction reported in short-term clinical drug trials of nonsteroidal anti-inflammatory drugs—and also showed a reduction in physician visits (see Table 3).[18] Significant reductions in pain and physician visits persisted at 4-year follow-up and suggested cost savings of $648 for participants with RA and $189 for participants with OA during the 4 years of the study, making it a robust cost-saving intervention from both the societal and health care system perspectives.[19,20] To achieve these results, the ASHC strongly emphasizes adult learning principles and group process techniques designed to improve self-efficacy, establish behavior change, and foster positive health outcomes. The ASHC is conducted over 6 weeks to allow participants adequate opportunity to practice new behaviors and skills. A recent study compared the effects of a three-session course with the standard six-session course and concluded that the shorter course was not as effective in changing health behaviors, health status, or health care utilization but did reduce health distress and increase self-efficacy beliefs.[21]

Systemic Lupus Erythematosus Self-Help Course

Although the ASHC was developed for people with any type of arthritis, a need to develop similar programs to address specific concerns of people with systemic lupus erythematosus (SLE) and fibromyalgia was identified. The SLE Self-Help Course (SLESH) was originally developed in 1983 and revised in 1994. The program is offered over 7 weeks for a total of 17 hours; it is taught by two to three instructors, including a health professional and a person with SLE, who have received 2.5 days of training. The content and format are similar to that of the ASHC, but SLESH has a greater emphasis on fatigue management; coping with losses, depression, and other psychosocial concerns; and self-monitoring techniques (see Table 2). The educational method of the SLESH was originally based on Braden et al.'s self-help model, which theorizes that learned enabling skills such as problem solving and belief in self can reduce the negative impact of a chronic condition.[22] Therefore, many of the course activities were designed to increase enabling skills, reduce depression, and help reduce limitations.

The revised version of the SLESH course includes the same self-efficacy-enhancing strategies as the Arthritis Self-Help Course. In one small 4-month pretest-posttest evaluation, participants experienced a slight reduction in depression and pain and an increase in self-care activity in the form of exercise participation and relaxation (see Table 3).[23]

(Text continues on page 55)

Table 1. Characteristics of Nine Selected Intervention Programs for Arthritis and Other Rheumatic Conditions

Interventions	Characteristics				
	Target Population	Method/Duration	Personnel/Training	Fees Per Person[a]	Program Costs
Group self-management education programs					
Arthritis Self-Help Course[b] (ASHC)	People with chronic arthritis and their significant others (SO)	Weekly 2-hour group sessions for 6 weeks (total 12 hours)	Two-person team (laypersons or health professionals); 2.5-day training	$10-$50	Accessible classroom; textbook; optional flipcharts or overheads; training costs and personnel time
SLE Self-Help Course[b] (SLESH)	People with systemic lupus erythematosus and their SO	Weekly 2-hour group sessions for 7 weeks (total 17 hours)	Two- to three-person team (at least one person with SLE and a health professional); 2.5-day training	$10-$50	Same as ASHC
Fibromyalgia Self-Help Course[b] (FSHC)	People with fibromyalgia and SO	Same as SLE course	Two- to three-person team (at least one person with fibromyalgia and a health professional); 2.5 day training	$10-$50	Same as ASHC
Individual education programs					
Bone Up on Arthritis[b] (BONE UP)	People with arthritis in rural areas or with low literacy	Self-paced six lessons on audiocassettes and workbook	Mail-delivered instruction; support personnel	$0-$20	Cost of audiocassettes, print materials; postage costs

Self-Management Arthritis Treatment[c] (SMART)	People with multiple forms of arthritis	Individualized, computer-tailored program, books, relaxation audiotape, and exercise videotape	Mail-delivered instruction and quarterly questionnaires	$80-$90	Cost of questionnaires, books, audiocassette, videocassette, postage costs
Exercise interventions					
People With Arthritis Can Exercise[b] (PACE)	People with arthritis	One to three times per week; 1-hour sessions; 8 weeks—ongoing	Health and fitness professionals; 12-hour training	$0-$50	Accessible meeting room; participant booklet; training costs; personnel time
Joint Efforts[b]	Sedentary people with arthritis	One to five times weekly for 1-hour group for 6 to 8 weeks or ongoing	Senior center and nursing home activity directors; 4-hour training	$20-$40	Accessible meeting room; class participant manual; facility guide; training costs and personnel time
Arthritis Foundation Aquatics Program[b] (Aquatics)	People with arthritis	One to three times weekly 1-hour group sessions for 6 to 10 weeks or ongoing	Health and fitness professionals and lifeguards; 8- to 10-hour training for instructors	$5-$50	Accessible heated pool; training costs and personnel time
EDUCIZE[d]	People with arthritis	Two times per week for 6 weeks	Trained health or fitness professionals as instructors	$35-$70	Accessible classroom, training costs and personnel time

a. The range of registration fees charged by various chapters for Arthritis Foundation–supported programs. These fees may cover part or all of the program.
b. Contact the Arthritis Foundation for more information at 1-800-283-7800.
c. Contact Healthtrac, 525 Middlefield Road, Suite 250 Menlo Park, CA 94025; phone: (650) 324-1749.
d. Contact Institute for Inquiry in Education, Inc., 35 E. Wacker Dr. #1220, Chicago, IL 60601; Maureen Gecht at (312) 996-0130.

Table 2. Key Content Areas and Processes of Selected Intervention Programs for Arthritis and Other Rheumatic Conditions

Interventions	Key Content Areas	Key Processes
Group self-management education		
ASHC	Cause, meaning, and how to deal with disease and its consequences; generalizable skills (e.g., problem solving, decision making, communicating with providers, cognitive restructuring/self-talk techniques etc.); training/support in adopting and maintaining health-related behaviors: exercise, relaxation, energy-saving techniques	Experiential educational methods (problem-solving discussions, brainstorming, demonstration/practice, and feedback); self-efficacy-enhancing strategies (goal setting/contracting, role modeling, peer support and persuasion, reinterpreting symptoms); behavioral modification techniques (shaping of behavior, repeated practice and feedback, self-monitoring/diaries, environmental cueing); social support strategies (involvement of significant others, buddy system, allotment of time for group sharing and feedback)
SLESH	Same as ASHC plus more emphasis on fatigue management, coping with losses, depression, self-esteem issues; medications and treatments for complications; planning ahead for flare-ups; wellness issues	Same as ASHC
FSHC	Same as ASHC; also has strong emphasis on pain, fatigue, and sleep management; posture and body mechanics; coping strategies	Same as ASHC
Individual education programs		
BONE UP	Basic disease information about osteoarthritis (OA), rheumatoid arthritis (RA), and osteoporosis; problem-solving strategies; communicating with your doctor; managing problems with pain, depression, sleep; benefits/barriers to exercise; relaxation techniques; and so on	Self-efficacy-enhancing strategies (vignettes of people with arthritis on the audiocassettes; goal setting/contracting); behavioral strategies (encouraging repeated practice of self-care behaviors); problem solving

SMART	Disease and treatment information specifically tailored to questionnaire responses	Graphic reports and individualized self-management recommendations based on questionnaire responses
Exercise interventions		
PACE	Seventy-two range-of-motion and muscle-strengthening exercises; endurance component; relaxation training; health education; games and special activities to promote socialization, balance, coordination, and endurance	Exercise and relaxation demonstration and practice; educational discussions; problem-solving discussions
Joint Efforts	Range-of-motion exercises; some muscle-strengthening exercises; games to promote socialization, endurance, balance, and coordination; relaxation component	Supervised exercise and relaxation
Aquatics	Seventy-two range-of-motion and muscle-strengthening exercises; moderate-intensity aerobic activities; games	Supervised exercise
EDUCIZE	One-hour exercise session with 15- to 20-minute warm-up exercise, 20 to 30 minutes of dance-based aerobic activity, and 15 to 20 minutes of muscle-strengthening exercises on mats, followed by 1-hour problem-solving educational discussions	Supervised exercise training; problem-solving education discussions

NOTE: ASHC = Arthritis Self-Help Course; SLESH = Systemic Lupus Erythematosus Self-Help Course; FSHC = Fibromyalgia Self-Help Course; BONE UP = Bone Up on Arthritis; SMART = Self-Management Arthritis Treatment; PACE = People With Arthritis Can Exercise; Aquatics = Arthritis Foundation Aquatics Program.

Table 3. Selected Evaluations of Nine Selected Interventions for Arthritis and Other Rheumatic Conditions

	Evaluation Features		Results[a]					
Intervention	Participants	Design	Symptoms/ Disability	Depression-Psychological	Self-Care Characteristic	Knowledge	Costs	Self-Efficacy
Group self-management education								
ASHC[19]	233 persons with osteoarthritis (OA), rheumatoid arthritis (RA), and other related arthritic conditions	Longitudinal, initially randomized controlled trial with 4-year follow-up	↓ pain reduced 20% (↑ disability 9%)	—	—	—	↓ MD visits reduced 40%	—
SLESH[23]	89 persons with lupus	Pretest-posttest comparison, 4-month follow-up	↓ pain 26%	↓ depression 12%	↑ self-care activity: exercise 62%, relaxation 66%	—	—	—
FSHC[24]	137 persons with fibromyalgia	Pretest-posttest comparison	—	↓ depression	—	↑ quality of life	—	↑ self-efficacy

Individual education programs								
BONE UP[26]	154 persons with OA/RA and other conditions	Pretest-posttest comparison, 4-month follow-up	↓ pain 7%, ↓ disability 6%	↓ depression 17%, ↓ learned helplessness 4%	↑ self-care behavior 14%	↑ knowledge	—	—
SMART[27]	445 persons with OA/RA	Randomized control trial (6-month follow-up)	↓ pain 16%, ↑ functional ability 5%	—	—	—	↓ MD visits reduced 16%	↑ self-efficacy/ confidence 15%
SMART[29]	1,102 persons with arthritis	Randomized controlled trial (3-year follow-up)	↓ pain (at 1 year), ↑ role function (at 1 year)	↓ depression (at 1 year)	—	—	↓ MD visits (Year 2)	↑ self-efficacy (at 1, 2 years)
Exercise interventions								
PACE[31]	43 persons with OA/RA	Pretest-posttest comparison, 4-month follow-up	↓ pain 24%	—	↑ self-care behavior	—	—	↑ perceived self-efficacy 17%
Joint Efforts[35]	84 persons with OA/RA	Pretest-posttest comparison, 4-month follow-up	↓ pain 22%, ↓ stiffness 13%	—	↑ self-care behavior 66%, ↑ use of therapy for arthritis 38%	—	—	—

(continued)

Table 3. continued

	Evaluation Features		Results[a]					
Intervention	Participants	Design	Symptoms/ Disability	Depression-Psychological	Self-Care Characteristic	Knowledge	Costs	Self-Efficacy
Exercise interventions								
Aquatics[37]	60 persons with OA/RA	Pretest-posttest comparison, 4-month follow-up	↓ pain 18%, ↓ functional ability 25%	—	—	—	—	—
Aquatics[39]	249 adults with OA	Randomized controlled trial baseline—program end (20 weeks)	↓ disability 9%, ↑ perceived quality of life—physical 11%	↑ desirability of health status 3%	—	—	↓ medical expenses	—
EDUCIZE[40]	43 persons with RA	Pretest-posttest comparison (follow-up)	↓ discomfort 17%, ↑ lower extremity function 16%	↓ depression 25%	—	↑ quality of life 16%	—	—

NOTE: ASHC = Arthritis Self-Help Course; SLESH = Systemic Lupus Erythematosus Self-Help Course; FSHC = Fibromyalgia Self-Help Course; BONE UP = Bone Up on Arthritis; SMART = Self-Management Arthritis Treatment; PACE = People With Arthritis Can Exercise; Aquatics = Arthritis Foundation Aquatics Program.

a. Statistically significant at $p < .05$.

The Fibromyalgia Self-Help Course

The Fibromyalgia Self-Help Course (FSHC) was developed and initially disseminated by the Arthritis Foundation in 1995. In addition to the content of the ASHC and SLE course, the FHSC also has a strong emphasis on pain, fatigue, and sleep management; posture and body mechanics; and general coping strategies (see Table 2). It is offered over 7 weeks in 2.5-hour sessions and is led by trained health professionals and people with fibromyalgia who have undergone a 2.5-day training workshop (see Table 1).

A small pretest-posttest comparison study reported significant improvements in depression, self-efficacy, and perceived quality of life (see Table 3).[24]

Self-Management Education (Individual Format)

Bone Up on Arthritis

The Bone Up on Arthritis (BUOA) program is a home study self-care education program originally developed for rural populations with low literacy skills. It consists of six 2-hour lessons on audiocassettes, supplemented by illustrated print materials written at a fifth-grade reading level and periodic telephone contacts from trained community coordinators who offer personalized support. The program, the contents of which are similar to the Arthritis Self-Help Course, was adopted by the Arthritis Foundation in 1989 (see Table 1). The key contents of this program include basic disease information, problem-solving strategies, communication, and disease management skills.

In a randomized controlled trial with a 4-month follow-up, two formats of BUOA (home study and small group) were compared to a no-intervention control group. Both intervention formats achieved similar results: At 4 months, experimental group participants reported significant increases in knowledge and self-care behaviors and significantly decreased feelings of helplessness, and these changes were sustained at 8- and 12-month follow-up.[25] The Arthritis Foundation obtained similar results in a multisite nationwide pilot test of the home study format (see Table 3).[26] BOUA has been revised into a higher literacy version. This revised program, now called Arthritis Basics for Change, is currently being evaluated.

Self-Management Arthritis Treatment (SMART)

The Self-Management Arthritis Treatment (SMART) program was developed by Healthtrac, Inc. and is also known as the Arthritis Home Health program. It is a mail-delivered self-management program for people with arthritis and is based on the same educational models as the Arthritis Self-Help Course. The materials consist of an individualized computer-tailored self-management plan, self-care books, relaxation audiotapes, and an exercise videotape. Contact is maintained by mailing computer-generated letters and reports to participants at 4-month intervals. Program goals are to improve personal self-efficacy, problem-solving skills, self-care activities, and medication compliance and to reduce medication side effects and use of health care services (see Table 2).[27] Computerized programs allow recommendations to be more individualized and better tailored to meet the needs of each person than can be done in group programs, but the benefits of small-group interactions are not available in a mail-delivered program.

Arthritis Home Help was initially tested by three groups in California recruited from various health organizations. After 6 months, a randomized control trial found that participants had better physical function, less pain, greater self-efficacy, and fewer visits to MDs/specialists in comparison to the control group (see Table 3). These researchers noted that at 1-year follow-up, the improvements were still maintained.[28] In a large randomized controlled trial of SMART, improvements in depression, role function, pain, and self-efficacy were significantly greater in the experimental group in comparison to controls at 1-year follow-up. At 2-year follow-up, the experimental group reported significantly higher self-efficacy, lower disease severity, and fewer physician visits than controls. Significant differences were not found at 3-year follow-up.[29] A comparison of ASHC and SMART found results comparable at 1- and 2-year follow-up, although ASHC showed more benefits at 3-year follow-up.[30]

Exercise or Physical Activity Interventions

People With Arthritis Can Exercise Program

Developed by the Arthritis Foundation in 1987 and revised in 1999, People With Arthritis Can Exercise (PACE) is a community-based group recreational exercise program offered one to three times per week. There are two class levels (basic and advanced) to accommodate the wide diversity in the capabilities of people with arthritis. The advanced level builds on the basic activities and contains more aerobic conditioning activities. The instructors are usually health or fitness professionals with a minimum of 12 hours of specialized training (see Table 1). To accommodate different levels of limitations, instructors can select from 72 different exercises, as well as exercises performed while participants are seated, standing, or lying on the floor, depending on group needs. Activities also include endurance-building activities, games, relaxation techniques, and health education topics.

As shown in Table 3, a small pilot study of the PACE program demonstrated significant improvements at 4 months in self-care behaviors, level of pain, and perceived self-efficacy.[31] Another study funded by the Park Nicollet Medical Foundation revealed a significant decrease in depression and an increase in self-efficacy[32] from pretest to posttest. A randomized controlled trial of 74 women with rheumatoid arthritis demonstrated significant differences in social activity and health status at the 6-month follow-up.[33] A recent small pilot evaluation of 119 PACE program participants from seven states found improvements in arm, hand, and finger function. A dose effect was also found; participants who attended the program twice a week or more experienced improvements in mood as well.[34]

Joint Efforts

Joint Efforts is a very low-impact exercise program appropriate for sedentary older adults. It was originally developed in 1986 by the Arthritis Foundation and was revised in 1994. The program is offered for 6 to 8 weeks, and all exercises are done while sitting in a chair. Each class session begins with a 15-minute warm-up, followed by a 30-minute movement segment consisting of range-of-motion and a few muscle-strengthening exercises. In addition, a variety of partner activities are also encouraged to increase socialization and to improve balance, coordination, and endurance. Program leaders attend a 4-

hour training workshop, supplemented with instructional materials, guidelines, and procedural manuals (see Table 1).

Participants in a small pilot study of the Joint Efforts program were compared to a nonrandomized control group (see Table 3). After 4 months, participants in the pilot study showed significant decreases in pain and stiffness and increases in the frequency of self-care behaviors and therapies.[35] These results are consistent with those achieved through other randomized control trials of group exercise by people with arthritis.[36]

Arthritis Foundation Aquatics Program

This aquatic program was codeveloped with the YMCA of USA in 1983 and is reviewed and revised (as necessary) every 3 years. Like the PACE program, it also has a basic and advanced (*Plus*) level. The classes are held in a warm pool, last approximately 1 hour, and meet one to three times per week for 6 to 10 weeks. Classes are taught by health and fitness leaders who have attended an 8- to 10-hour workshop (see Table 1). Although the classes are held in the water, swimming ability is not necessary to participate in the program. For those who do not have access to a group program, a videotape with guided instruction is available. The exercises include range-of-motion and muscle-strengthening exercises and, if appropriate for the group, a moderate-intensity aerobic component to build endurance.

In a quasi-experimental pilot study that used a nonrandomized comparison group, the program participants showed significant improvements at 4 months in pain and ability to perform activities of daily living (see Table 3).[37] A small randomized controlled trial of the Arthritis Foundation Aquatics Program found significant changes in range of motion and muscle strength.[38] Patrick et al.[39] demonstrated improved functional status and perceived quality of life, as well as reductions in physician visits among aquatic program participants. Those attending the program twice per week (29% of the 125-member experimental group) had significantly higher quality-of-life and functional status scores.

EDUCIZE

EDUCIZE, a program for people with arthritis that combines low-impact aerobic exercise with problem-solving discussion, was developed at Northwestern University's Multipurpose Arthritis Center in 1983. Initially tested on people with rheumatoid arthritis, EDUCIZE programs are now open to all people with arthritis and typically include those with rheumatoid arthritis, osteoarthritis, lupus, fibromyalgia, and low-back pain. The program is conducted by fitness instructors and allied health professionals and is offered over 6 weeks in twelve 2-hour sessions. The program includes aerobic exercise and mat work that emphasizes flexibility, strengthening, and relaxation training (see Table 1). The exercise segment is followed by group discussions to explore and critique ways participants might use physical benefits derived from program exercise activities to overcome arthritis-related problems in their everyday lives, such as limitations in travel, shopping, work, bathing, and other activities of everyday life.

The initial evaluation of a 16-week, 32-session EDUCIZE program used a pretest-posttest design with 43 persons with rheumatoid arthritis; results showed significant improvements in disease status, physical and psychological function, and four quality-of-life indices related to the problem-solving component of the program (see Table 3).[40] A later controlled study of a 12-week, 24-session EDUCIZE program with 117 persons

with various types of arthritis produced results similar to the initial evaluation and established that allied health professionals could be trained to conduct the program.[41]

In recent years, effective video and print materials have been developed to train interested professionals in conducting basic EDUCIZE programs. Such programs now typically involve twelve 2-hour sessions over a 6-week period and are offered in a variety of community settings (e.g., retirement homes, nutrition centers, activity centers, and hospitals). There has been no published evaluation of the 6-week format of EDUCIZE (M. Gecht, personal communication, 2001).

DISCUSSION

Arthritis and other rheumatic conditions are an important and growing public health problem for our aging society, whether measured in terms of prevalence, disability, or costs. The literature search revealed five self-management education and four exercise/physical activity interventions that met the review criteria (materials and training packaged or ready to use, organizational support for dissemination, and some evaluation data). Preliminary data on the effects of self-management education, delivered individually or in a group, and land- and water-based exercise/physical activity interventions are positive. However, the amount of research done to evaluate these programs varies.

In general, there is more evidence to support the self-management education programs than the exercise/physical activity programs, but that, too, is variable. There is a robust body of randomized controlled research to support the ASHC.[42] It is clear that the ASHC is effective with the audiences it reaches. The two other self-management interventions delivered in a group setting, the Systemic Lupus Erythematosus Self-Help Course[23] and the Fibromyalgia Self-Help Course,[24] each have one small pilot study to evaluate their efficacy. As for the self-management education programs delivered individually, there is a growing body of research on the effectiveness of the Self-Management Arthritis Treatment program,[29,30] whereas evaluation data on the revised Bone Up on Arthritis program, now called Arthritis Basics for Change, are not yet available.

Evaluation data on the exercise/physical activity interventions are even less robust; much of them are based on small nonrandomized pilot studies. Although many of the self-management education programs were developed in academic institutions and supported by National Institutes of Health (NIH)–type research grants, several of the physical activity interventions were developed by the Arthritis Foundation, with modest development and evaluation resources. Consequently, much of the efficacy and effectiveness research has appeared as unpublished Arthritis Foundation reports, master's theses, or conference abstracts.[43] A limited number of randomized controlled studies have begun to appear in peer-reviewed journals as PACE and the Arthritis Foundation Aquatics Program have caught the attention of university-based evaluation researchers.[33,38,39]

Although many of the programs reviewed have promising preliminary data on efficacy and effectiveness, the ASHC and the Arthritis Foundation Aquatics Program also have data on their cost-effectiveness. In two analyses, the ASHC was deemed cost-effective from both the health care system and societal perspectives.[19,20] In an economic evaluation of the Arthritis Foundation Aquatics Program, medical costs did decrease, but these were offset by program implementation and participant costs.[39]

Limitations and Research Needs

As is evident from this review, the scientific evidence supporting these programs is modest at best. With the exception of the Arthritis Self-Help Course, most programs have a limited number of studies evaluating their efficacy and effectiveness, and many of those are small unpublished pilot tests. A solid base of efficacy and effectiveness research is needed for both group and individual delivery modes.

A second limitation of this arthritis intervention research is the lack of diversity among the populations studied. Goeppinger and Lorig[10] summarized the study samples as primarily Caucasian, middle-aged to elderly women with osteoarthritis and 12 years of education or more. Boutaugh[43] provided a similar description of study samples for the physical activity programs, although she cited both osteoarthritis and rheumatoid arthritis diagnoses in the study samples. A priority for future research is to determine the effectiveness of these interventions among minority and underserved populations. Early studies of a Spanish-language version of the ASHC have shown positive changes in pain, disability, and self-efficacy with study samples of lower education levels.[44]

Additional cost-effectiveness studies are also needed. Once intervention efficacy and effectiveness are established, cost-effectiveness studies could demonstrate the economic value of these interventions. If these interventions are found to reduce physician visits and/or medication costs, they could be cost saving for health care organizations and Medicare-Medicaid programs. If significant cost savings can be demonstrated, health care organizations and health insurance reimbursement programs may be persuaded to include coverage of these interventions in their benefit programs.

Finally, program dissemination research for efficacious and cost-effective programs is also a high priority. Effective interventions, such as the Arthritis Self-Help Course, will still have a minimal impact if they do not reach the individuals they are designed to influence. The Arthritis Foundation estimated in 1998 that less than 1% of the target audience had participated in one of these self-management education or physical activity programs. This may be due to misperceptions about the manageability of arthritis, previous advice not to exercise, lack of knowledge about the existence and benefits of these programs by both health care professionals and people with arthritis, and a multitude of other potential barriers to participation. In addition to determining which are effective interventions to deliver, it is imperative to determine how best to deliver these programs and what other modes of program delivery, such as Internet-based programs, may be useful. One such program, the Arthritis Foundation's *Connect and Control: Your Online Arthritis Action Guide*, is currently being evaluated.[42]

Implications for Practitioners

The ready-to-use self-management education and physical activity/exercise programs can be useful to both clinical and public health practitioners. For clinicians, these intervention programs should be an integral part of the management of arthritis and other rheumatic conditions; the Arthritis Self-Help Course and range-of-motion, strengthening, and aerobic exercises are all included in the American College of Rheumatology's (ACR's) guidelines for the medical management of osteoarthritis,[45] and patient education and rehabilitation therapies are included in the ACR's guidelines for the medical management of rheumatoid arthritis.[46] Specific referral to one of these intervention programs and follow-up reinforcement of that referral can be a key strategy for enhancing patient self-management in the clinical setting.[47]

Preliminary evidence suggests that there is a dose-response effect in the physical activity programs. For both PACE and the Arthritis Foundation Aquatics Program, participants obtained significantly more positive results if they participated in the program two or more times per week.[34,39] Consequently, clinical recommendations should highlight the benefits of participating two or more times per week.

For public health practitioners, implementation of these interventions can form a cornerstone of the public health response to arthritis. Several developments are actively facilitating this response. For the first time ever, *Healthy People 2010* contains a chapter with specific arthritis objectives (Chapter 2: "Arthritis, Osteoporosis, and Chronic Back Conditions"), including health education objectives, and people with arthritis are identified as a select population for physical activity and nutrition objectives. In addition, the Centers for Disease Control and Prevention (CDC), along with the Arthritis Foundation (AF) and the Association of State and Territorial Health Officials (ASTHO), released the *National Arthritis Action Plan: A Public Health Strategy* (*NAAP*)[48] in late 1998. This document suggests strategies for the delivery of effective intervention programs at the national, state, and local levels and identifies key prevention research needed to address gaps in current knowledge about the development and delivery of effective intervention programs. Congress has recognized arthritis as a public health priority and appropriated funds beginning in 1999 for the CDC to develop an arthritis program to assist in the implementation of the *NAAP* at the national, state, and local levels.

The ASHC appears to be both efficacious and cost-effective and is a logical choice for implementation in public health settings. Although the evidence is not as robust for PACE and the Arthritis Foundation Aquatics Program, both have shown positive results in randomized controlled trials and would offer both land- and water-based physical activity interventions for implementation in a public health setting. If further evaluations of the SMART program show consistent results, it could become a good alternative for outreach to dispersed populations or individuals unlikely to ever attend a group education program.

CONCLUSION

As demonstrated in this review, five self-management education programs and four exercise/physical activity programs are readily available for both clinicians and public health practitioners to use to reduce the burden of arthritis. These interventions are supported by other groups, so practitioners need not act alone. The Arthritis Foundation, a national voluntary organization with points of service in all states (www.arthritis.org), supports many of these interventions and is a natural partner for state or local health departments, health care organizations, and others interested in improving the quality of life of people with arthritis.[49] Indeed, such partnerships may make better use of limited resources and allow these interventions to reach more culturally diverse populations. In addition, other packaged interventions that do not meet our review criteria are available (e.g., the Arthritis Foundation's Walk With Ease program). These, too, need to be evaluated.

Of the nine interventions reviewed, the Arthritis Self-Help Course enjoys a well-established body of research supporting its efficacy and cost-effectiveness, although this research has focused primarily on Caucasian middle-aged to elderly women with high school education or more. Further research is needed on effective delivery strategies, outreach to underserved and minority populations, and other modes of program delivery. The PACE and Arthritis Foundation Aquatics Program interventions have less extensive

research support but appear to be promising interventions as well. Further research is needed on effectiveness, cost-effectiveness, and dissemination. Other self-management education and education/physical activity interventions demonstrate some positive results in small pilot tests or unpublished reports but require more extensive research to evaluate efficacy, effectiveness, and cost-effectiveness before widespread dissemination.

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