Telephone-Based Self-management of Osteoarthritis

A Randomized Trial

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Background: Osteoarthritis is a leading cause of pain and disability, and self-management behaviors for osteoarthritis are underutilized.

Objective: To examine the effectiveness of a telephone-based self-management intervention for hip or knee osteoarthritis in a primary care setting.

Design: Randomized clinical trial with equal assignment to osteoarthritis self-management, health education (attention control), and usual care control groups. (ClinicalTrials.gov registration number: NCT00288912)

Setting: Primary care clinics in a Veterans Affairs Medical Center.

Patients: 515 patients with symptomatic hip or knee osteoarthritis.

Intervention: The osteoarthritis self-management intervention involved educational materials and 12 monthly telephone calls to support individualized goals and action plans. The health education intervention involved nonosteoarthritis educational materials and 12 monthly telephone calls related to general health screening topics.

Measurements: The primary outcome was score on the Arthritis Impact Measurement Scales-2 pain subscale (range, 0 to 10). Pain was also assessed with a 10-cm visual analog scale. Measurements were collected at baseline and 12 months.

Results: 461 participants (90%) completed the 12-month assessment. The mean Arthritis Impact Measurement Scales-2 pain score in the osteoarthritis self-management group was 0.4 point lower (95% CI, −0.8 to 0.1 point; $P = 0.105$) than in the usual care group and 0.6 point lower (CI, −1.0 to −0.2 point; $P = 0.007$) than in the health education group at 12 months. The mean visual analog scale pain score in the osteoarthritis self-management group was 1.1 points lower (CI, −1.6 to −0.6 point; $P < 0.001$) than in the usual care group and 1.0 point lower (CI, −1.5 to −0.5 point; $P < 0.001$) than in the health education group. Health care use did not differ across the groups.

Limitation: The study was conducted at 1 Veterans Affairs Medical Center, and the sample consisted primarily of men.

Conclusion: A telephone-based osteoarthritis self-management program produced moderate improvements in pain, particularly compared with a health education control group.

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Osteoarthritis is a leading cause of pain and disability and one of the most common conditions treated in primary care (1, 2). Optimal management of osteoarthritis involves both pharmacologic intervention and behavioral strategies, such as exercise and weight management (3). However, most patients with osteoarthritis do not adequately practice these behavioral strategies, and most primary care practices are not set up to support them (4, 5). Previous studies (6, 7) show that self-management programs can improve both healthy behaviors and outcomes among patients with osteoarthritis. However, many osteoarthritis self-management programs involve multiple in-person sessions, and attendance may not be feasible for many patients. Only about 10% of patients with arthritis report ever having taken an educational class to teach them how to manage this condition (5), which suggests that alternatives to in-person classes (the most common format offered) are needed to disseminate these programs more widely. Telephone-based self-management interventions could overcome the limitations of other delivery methods because they are widely accessible; relatively low-cost; and allow individualized, ongoing interaction with patients. Our objective was to examine the effectiveness of a 1-year, telephone-based, self-management support intervention for patients with hip and knee osteoarthritis who were recruited from a primary care setting.

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METHODS

The institutional review board of the Durham Veterans Affairs Medical Center (VAMC) reviewed and approved this study.

Study Design

We randomly assigned eligible, consenting patients equally to the osteoarthritis self-management, health education (attention control), or usual care control groups. Randomization was stratified by race (white vs. nonwhite), with block sizes of 12. Race stratification was used because of known racial differences in osteoarthritis-related pain and function (8, 9). Randomization was computer-generated and maintained separately from participant en-

rollment. A detailed description of our methods is published elsewhere (10).

Participants and Study Procedures

Participants were eligible if they were enrolled in primary care at the Durham VAMC; had a physician diagnosis of hip or knee osteoarthritis; and had persistent, current, self-reported joint symptoms (11). Exclusion criteria included other rheumatologic conditions, psychoses, dementia, other serious health conditions that would probably prevent participation in the study, being on a waiting list for arthroplasty, or participation in another osteoarthritis-related or lifestyle intervention study.

Using the electronic medical records of the Durham VAMC, we identified patients who had an International Classification of Diseases, 9th Edition, code for hip or knee osteoarthritis and no exclusionary codes. Medical records were then further examined to verify a physician's diagnosis of osteoarthritis on the basis of radiography. Patients who met these criteria were mailed introductory letters, and a study team member called to further assess their eligibility. Participants' telephone numbers were initially obtained from VA medical records. Once participants were enrolled in the study, they provided additional or alternate telephone numbers as appropriate. Eligible patients came to the Durham VAMC to give informed consent and receive baseline assessments. The study coordinator then informed participants of their group assignment by telephone. Recruitment began on 3 October 2006 and ended on 30 June 2008.

Participants were reimbursed $10 after the baseline and follow-up assessments ($20 total). All participants continued to receive usual care for osteoarthritis. Participants in the usual care group received the written osteoarthritis self-management materials after they completed follow-up assessments, but no other intervention.

Interventions

Osteoarthritis Self-management Support Intervention

Our self-management support intervention was grounded in social cognitive theory and focused on the key health behavior determinants of self-efficacy, knowledge, outcome expectations, health goals, and perceived facilitators and barriers (12). The intervention included 2 main components: providing education related to managing osteoarthritis symptoms, and helping participants develop goals and action plans related to osteoarthritis management. These have also been key components of other arthritis self-management programs (7, 13). Participants received written and audio versions of osteoarthritis self-management educational materials, including 10 topics that reflect core aspects of managing osteoarthritis (**Table 1**). Participants also received an exercise video designed for persons with osteoarthritis. The health educator called participants monthly for 12 months to discuss key points from the educational modules and provide participants with an opportunity to ask questions. During each telephone call, the health educator also discussed the participant's goals and action plans. Participants were asked to identify and write down 1 or more goals related to their osteoarthritis symptoms and management, as well as weekly action plans for achieving these goals. For example, a participant could choose a goal of increasing their walking; corresponding action plans could then specify distances they would attempt to walk on a specific number of days each week. The health educator guided participants in overcoming barriers they experienced in completing their weekly action plans. Participants were asked to rate how successful they were at completing the previous month's action plan on a scale of 0 (low) to 10 (high).

Context

Osteoarthritis management should engage patients in a healthy lifestyle, but practices often lack resources for patient education.

Contribution

This randomized trial assigned primary care patients with hip or knee osteoarthritis to receive telephone-based health education support, health education materials, or usual care. At 12 months, the intervention group had more improvement in some pain measures than did the control groups.

Caution

The study was conducted in the Veterans Affairs health care system, and most patients were men. For one measure, end point data were missing for 20% of patients.

Implication

This study supports the role of a telephone-based patient self-management program in reducing osteoarthritis-related pain.

—The Editors

Health Education Intervention (Attention Control)

Participants in this group received written and audio materials regarding the common health problems of hypertension, high cholesterol, diabetes, eye problems, dental problems, colorectal cancer, skin cancer, breast and cervical cancer or prostate cancer (sex-specific modules), and osteoporosis, as well as related screening recommendations (10). The health educator called participants monthly for 12 months to review key points from the educational modules, assess whether participants were being appropriately screened, and make suggestions for screening as needed. Participants in this group received the written osteoarthritis self-management materials after completing follow-up assessments.

Study Measures

We collected study measures at baseline and 12 months. The health educator was not involved in outcome assessments. The baseline measures and most (80.6%) of

Table 1. **Summary of Osteoarthritis Self-management Educational Modules**

Module	Main Topics
Introduction	Basic information on osteoarthritis Basic information on self-management concepts
Exercise	Health benefits of exercise Principles of safe exercise Instructions for major types of exercise Managing pain during exercise
Healthy eating and weight management	Importance of weight management in osteoarthritis General principles of healthy eating Behavioral strategies for weight management
Medications	Basic information about analgesic and anti-inflammatory drug classes Detailed data on specific drugs (doses and side effects) Recommendations for optimal medication use
Joint injections and surgery	Descriptions of specific joint injections and surgeries Recommendations for discussing these procedures with a health care provider
Communication with health care providers	Strategies for dealing with communication barriers Recommendations for information to share with a health care provider (such as symptom changes)
Joint care and protection	Basic principles of joint protection strategies Specific examples of incorporating joint protection into daily activities
Complementary and alternative medicines	Descriptions of common complementary and alternative therapies (including efficacy and risks) Guidelines for seeking quality products and health professionals
Stress management and relaxation	General principles and specific instructions for relaxation exercises Discussion of pain-related cognitions ("self-talk") Strategies for improving pain-related cognitions
Sleep	General strategies for improving sleep Strategies for reducing nighttime osteoarthritis-related pain

the follow-up measures were collected in person, but when participants could not return to the Durham VAMC during the specified period, follow-up measures were collected by telephone.

Primary Outcome

Our primary outcome was the pain subscale of the Arthritis Impact Measurement Scales-2 (AIMS2), which consists of 5 items that assess typical pain, pain severity, and pain during specific times of the day by using a 5-point Likert scale (from "all days" to "no days") (14, 15). The possible range of scores is 0 to 10, with higher scores indicating more severe pain.

Secondary Outcomes

Secondary outcomes were the AIMS2 physical function and affect subscales, the Arthritis Self-Efficacy Scale, and a 10-cm pain visual analog scale (VAS). The AIMS2 physical function subscale includes 28 items across 6 domains: mobility, walking and bending, hand and finger function, arm function, self-care, and household tasks. Because we focused on lower-extremity osteoarthritis, we examined the mobility and walking and bending scores separately. The AIMS2 affect subscale includes 10 items that encompass mood and tension. All items on the AIMS2 physical function and affect subscales are measured on a 5-point Likert scale (from "all days" to "no days"). Subscale scores can range from 0 to 10, with higher scores indicating worse function or affect. The Arthritis Self-Efficacy Scale measures how certain patients are that they can perform 8 specific activities or tasks, in terms of their arthritis (16). Items are scored on a Likert Scale from 1 (very uncertain) to 10 (very certain); total scores range from 1 to 10. Participants also indicated their average pain during the past 2 weeks on a standard 10-cm VAS with established validity and reliability (17), using anchors of "no pain" and "pain as bad as it can be." Because the 10-cm VAS must be administered in person, data are missing for 92 participants who completed follow-up assessments by telephone (33 in the osteoarthritis self-management group, 24 in the health education group, and 35 in the usual care group).

Intervention Costs

We calculated costs for the osteoarthritis self-management and health education interventions to inform their future implementation in clinical settings. Costs consisted of labor and nonlabor inputs. The labor inputs included the time for training the health educator (a counselor with a master's degree and previous experience in delivering health-related interventions) and making the intervention calls. The health educator received approximately 30 hours of intervention-specific training, which was applied to both intervention groups. The training consisted of learning the intervention materials, becoming familiar with the intervention delivery database, and delivering intervention calls to practice participants. Because the health educator's training is a one-time fixed cost and would approach 0 (per patient) over time, we also calculated labor costs without the training cost. The health educator's salary was based on the federal government's General Schedule, level 11-4, plus 30% for fringe benefits in the base case. To calculate an intervention cost range, we used the minimum and maximum salary range on the General Schedule for level 11. Indirect costs were calculated as a percentage of direct costs. The VA's Health Economics Resource Center recommends allocating indirect costs as a percentage of the direct costs of a service (18). We used administrative data from the VA Decision Support System to ascertain direct and indirect costs for telephone-based services provided at the Durham VAMC. We used these cost figures to calculate a direct cost–indirect cost ratio of 0.59, which is similar to the 0.61 ratio in a previous VA study (19). We applied the 0.59 ratio to the direct cost to impute the

amount of variable indirect cost to be allocated to the intervention.

For both interventions, nonlabor inputs included printing educational materials and creating CDs ($12.75 for the osteoarthritis self-management group and $5.50 for the health education group, because the booklet for the letter group had fewer pages). Development of educational materials was treated as a nonrecurring cost. Participants in the osteoarthritis self-management intervention also received an exercise video ($19.95).

Sample Characteristics

We collected the following variables by patient self-report: age, sex, race and ethnicity, marital status (married vs. not married), education (categorized as high school education or less vs. some education after high school), work status (working full- or part-time vs. not working), perceived inadequate income (defined as having to cut back on things to pay the bills or not being able to pay the bills), self-rated current health (excellent, very good, or good vs. fair or poor), current self-reported height and weight (from which body mass index was calculated), duration of osteoarthritis-related symptoms in hips or knees (in years), and joint with the most severe pain (hip vs. knee).

Statistical Analysis

Our primary hypotheses were that the osteoarthritis self-management program would result in a significantly greater improvement in pain (measured by the AIMS2 subscale) than either usual care or the health education intervention. Our secondary hypotheses examined differences between the osteoarthritis self-management and the usual care and health education groups for the 4 secondary outcomes we described. We also compared VA health care use between the osteoarthritis self-management group and the usual care and health education groups.

Our sample size estimate was based on detecting a difference between the osteoarthritis self-management group and the health education group. On the basis of our pilot study, we expected a baseline mean AIMS2 pain score of 3.96 (SD, 1.74) and estimated that a sample size of 147 patients per group was needed to detect a 0.57-point (14%) difference in change of AIMS2 pain subscale scores between the groups with 80% power. The estimated 12-month dropout rate of 15% resulted in a final study sample size of 173 participants per study group.

All analyses were performed by using SAS software (SAS Institute, Cary, North Carolina). The primary analyses involved all randomly assigned participants. For the primary and secondary analyses, we fit linear mixed models by using an intention-to-treat approach (20). The primary predictors in the models included indicator variables for the 12-month follow-up time and treatment group–by–follow-up time indicator interaction variables (the osteoarthritis self-management group was the reference group). This model assumes that the groups have equal baseline means, which is appropriate for a randomized, controlled trial and is equivalent in efficiency to an analysis of covariance model (21). A benefit of using a mixed-model framework for longitudinal analysis is that all available data are used. The estimation procedure used in this framework yields unbiased estimates of parameters when missing outcomes are assumed to be ignorable (related to either observed covariates or response variables but not to unobserved variables) (22). Because 92 participants were missing 12-month pain VAS values owing to the logistics of travelling to the Durham VAMC for a follow-up visit, we believe it is reasonable to assume ignorability in our analytic strategy. In addition, baseline demographic characteristics, pain VAS scores, and 12-month AIMS2 pain scores did not differ at follow-up between participants surveyed in person and those surveyed by telephone. The number of completed intervention calls was also similar between those surveyed in person or by telephone at follow-up in both the osteoarthritis self-management group (7.8 vs. 6.7 calls) and the health education group (8.9 vs. 9.3 calls).

For the repeated measures over time, we used a compound symmetry covariance. The final models also included our stratification variable for race. Our inference for all analyses was based on the treatment group–by–follow-up time indicator parameters, which are the estimated differences between the osteoarthritis self-management and comparison groups at 12-month follow-up. Residual plots from mixed models were examined to assess model assumptions and the effects of potential outliers.

Role of the Funding Source

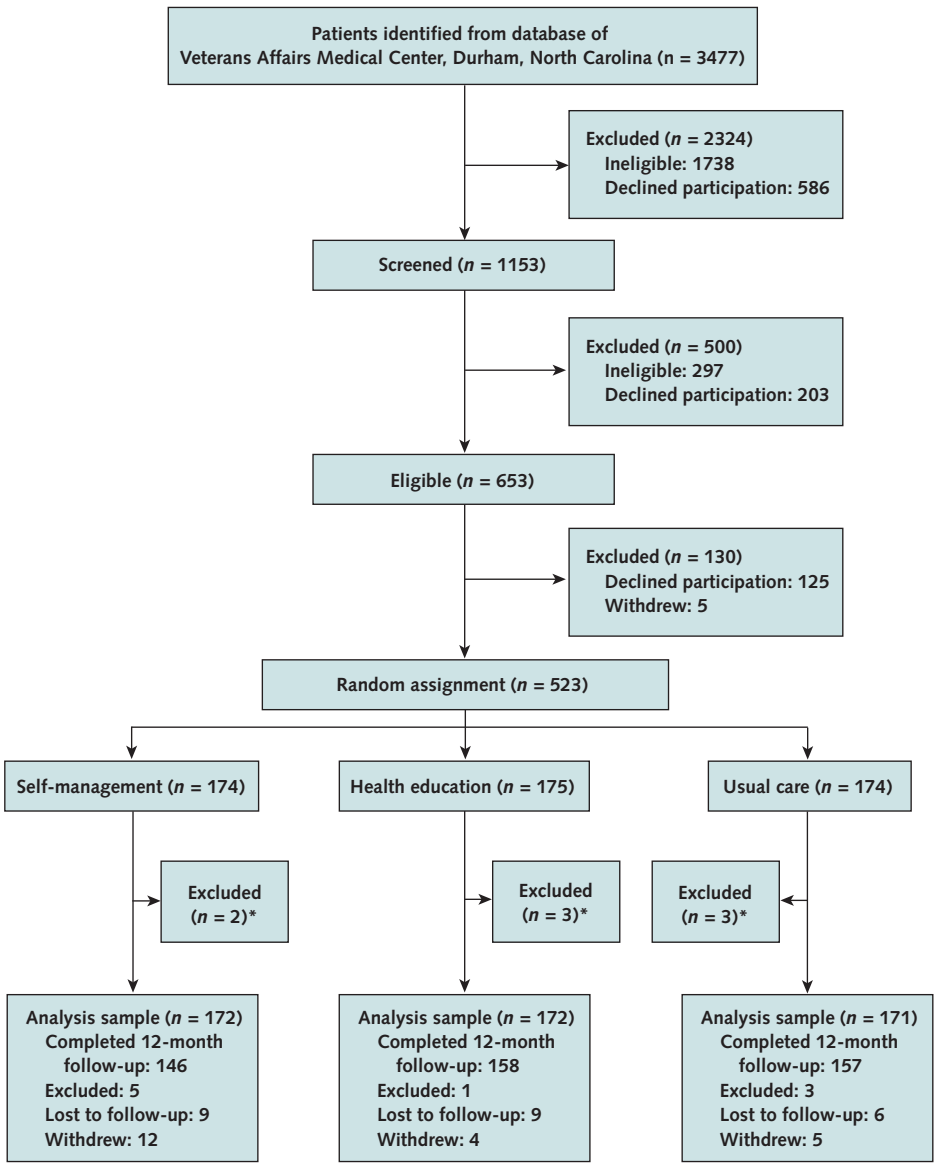
This study was funded by the VA Health Services Research and Development Service, which had no direct role in the study design, conduct, analyses, or reporting beyond approval of the scientific protocol in peer review for funding.

RESULTS

Participants

We identified 3477 persons from VA electronic medical records; of 1153 persons screened by telephone, 653 were eligible to participate, and 523 consented and were randomly assigned (**Figure 1**). Among those who were eligible, more nonwhite than white persons declined to participate (26% vs. 12%), but participants did not differ from nonparticipants in sex or age. Of the participants who were randomly assigned, 8 were excluded from analyses because a subsequent review of VA medical records revealed no documentation of radiographic evidence of knee or hip osteoarthritis, which meant that these participants did not meet the initial eligibility requirements (23). Of our analysis sample of 515 patients, 461 (90%) completed the study (**Figure 1**). Completion rates were similar for white and nonwhite participants (88% and 91%). No serious study-related adverse events occurred.

Figure 1. **Study flow diagram.**



* 8 persons were excluded from analyses because subsequent medical record review showed that they did not meet eligibility criteria.

Participants were primarily men, had a mean age of 60 years, and were evenly split between white and nonwhite persons (**Table 2**). Most nonwhite participants (93%) were African American. Osteoarthritis was more common in the knee than the hip, and about three quarters of patients indicated that the knee was their most painful joint.

Primary Outcome

At 12 months, the estimated mean AIMS2 pain score in the osteoarthritis self-management group was 0.4 point lower (95% CI, −0.8 to 0.1 point; $P = 0.105$) than in the usual care group, indicating improvement in pain, and 0.6 point lower (CI, −1.0 to −0.2 point; $P = 0.006$) than in the health education group (**Table 3** and **Figure 2**).

Secondary Outcomes

The AIMS2 function and affect subscale scores (including the mobility score) did not significantly differ between the osteoarthritis self-management group and either the usual care or health education group at 12 months (**Table 3**). However, the estimated mean AIMS2 walking and bending score in the osteoarthritis self-management group was 0.5 point lower (CI, −1.0 to −0.0 point; $P = 0.035$) than in the health education group at 12 months (**Table 3**), indicating improvement. The estimated mean arthritis self-efficacy score in the osteoarthritis self-management group was 0.4 point higher than in either the usual care (CI, −0.0 to 0.7 point; $P = 0.066$) or health

education (CI, 0.0 to 0.8 point; $P = 0.043$) groups (**Table 3** and **Figure 2**). The estimated mean VAS pain score in the osteoarthritis self-management group was 1.1 points lower (CI, −1.6 to −0.6 point; $P < 0.001$) than in the usual care group, indicating improvement in pain, and 1.0 point lower (CI, −1.5 to −0.5 point; $P < 0.001$) than in the health education group at 12 months (**Table 3** and **Figure 2**).

Goals, Action Plans, and Exercise Video Use

Of the 267 goals set by 157 participants in the osteoarthritis self-management group, 56% were related to exercise or physical activity and 30% were related to weight management. The median rating of success at completing action plans from the previous month was 6.6 on a scale of 0 to 10 (interquartile range [IQR], 5.6 to 7.6). About 35% of participants used the exercise video "occasionally," 15% used it "regularly," and 10% used it "frequently."

Intervention Costs

In the osteoarthritis self-management group, 1324 intervention calls were made to 172 participants (mean call length, 9.0 minutes; median calls, 9 [IQR, 6 to 10]). In the health education control group, 1539 calls were made to 172 participants (mean call length, 4.9 minutes; median calls, 10 [IQR, 9 to 10]).

The total per-participant cost (in 2010 dollars) was $118 (range, $111 to $134) for the osteoarthritis self-management intervention and $63 (range, $57 to 73) for the health education intervention. When the health educator training costs were excluded, the per-participant costs were $107 (range, $100 to $121) for osteoarthritis self-management and $51 (range, $47 to $60) for health education.

DISCUSSION

We examined the effectiveness of a 1-year, telephone-based self-management support program for patients with hip or knee osteoarthritis. To our knowledge, ours is one of the few studies to examine an entirely telephone-based self-management intervention for patients with osteoarthritis (24, 25). The osteoarthritis self-management group had significantly greater improvement on the AIMS2 pain subscale than the health education group. Although AIMS2 subscale pain scores were also lower than for the usual care group, this difference did not achieve statistical significance. The usual care group had a small decrease in pain over time, which may partly explain why we did not find a significant effect. Although we cannot explain why changes in pain over time differed for the 2 comparison groups, the between-group differences were of similar magnitude (−0.6 and −0.4 point between the osteoarthritis self-management group and the health education and usual care groups, respectively). The osteoarthritis

Table 2. **Sample Characteristics at Baseline**

Characteristic	Total Sample ($n = 515$)	Osteoarthritis Self-management Intervention ($n = 172$)	Health Education Intervention ($n = 172$)	Usual Care ($n = 171$)
Mean age (SD), *y*	60.1 (10.4)	60.3 (10.3)	60.3 (10.8)	59.7 (10.1)
Men, %	93	91	93	94
Married, %	69	72	65	71
High school education or less, %	33	33	34	33
Employed, %	39	38	40	39
Inadequate income, %	26	28	27	22
Race or ethnicity, %				
White	54	55	53	54
Nonwhite	46	45	47	46
Hispanic	2	1	3	2
Fair or poor health, %	32	30	37	30
Mean body mass index (SD), kg/m^2	31.8 (6.6)	32.0 (7.0)	31.6 (6.5)	31.8 (6.5)
Joint with osteoarthritis, %*				
Knee only	80	82	79	79
Hip only	15	12	16	17
Knee and hip	5	6	5	4
Joint with most pain, %†				
Knee	74	71	79	71
Hip	26	29	21	29
Mean time with osteoarthritis symptoms (SD), *y*	16.1 (12.2)	16.5 (12.7)	15.8 (12.0)	15.9 (11.9)
Mean AIMS2 pain subscale score (SD)	5.9 (2.2)	5.9 (2.3)	6.0 (2.3)	5.8 (2.1)
Mean AIMS2 function subscale score (SD)	2.5 (1.6)	2.6 (1.7)	2.7 (1.8)	2.3 (1.3)
Mean AIMS2 affect subscale score (SD)	3.5 (2.2)	3.7 (2.3)	3.6 (2.3)	3.2 (2.0)
Mean Arthritis Self-Efficacy scale score (SD)	5.8 (2.0)	5.7 (2.1)	5.8 (2.0)	5.9 (1.9)
Mean visual analog scale pain score (SD)	5.8 (2.3)	5.8 (2.3)	6.0 (2.2)	5.6 (2.4)
Mean clinic visits (SD), *n*‡	7.4 (5.4)	7.5 (5.7)	7.5 (5.4)	7.2 (5.3)

AIMS2 = Arthritis Impact Measurement Scales-2.
* As indicated by a radiograph in the patient's electronic medical record at the Durham Veterans Affairs Medical Center.
† Indicated by self-report.
‡ In the 12 mo before study enrollment.

Table 3. **Change in Functional Status, Self-efficacy, and Pain at 12 Months**

Variable	Osteoarthritis Self-management Intervention	Health Education Intervention	Usual Care	Difference, Self-management Versus Health Education (95% CI)*	*P* Value	Difference, Self-management Versus Usual Care (95% CI)*	*P* Value
Mean AIMS2 pain subscale score							
Baseline†	5.9	5.9	5.9				
12 mo	5.2	5.8	5.5	−0.6 (−1.0 to 0.2)	0.007	−0.4 (−0.8 to 0.1)	0.105
Mean AIMS2 function subscale score							
Baseline†	2.5	2.5	2.5				
12 mo	2.5	2.7	2.6	−0.2 (−0.5 to 0.0)	0.093	−0.1 (−0.3 to 0.2)	0.43
Mean AIMS2 walking and bending subscale score							
Baseline†	6.5	6.5	6.5				
12 mo	6.1	6.6	6.3	−0.5 (−1.0 to 0.0)	0.035	−0.2 (−0.7 to 0.3)	0.41
Mean AIMS2 mobility subscale score							
Baseline†	1.6	1.6	1.6				
12 mo	1.4	1.5	1.4	−0.2 (−0.5 to 0.1)	0.21	−0.0 (−0.3 to 0.3)	0.93
Mean AIMS2 affect subscale score							
Baseline†	3.5	3.5	3.5				
12 mo	3.4	3.3	3.3	0.1 (−0.3 to 0.4)	0.78	0.0 (−0.3 to 0.4)	0.79
Mean Arthritis Self-Efficacy scale score							
Baseline†	5.8	5.8	5.8				
12 mo	6.2	5.8	5.9	0.4 (0.0 to 0.8)	0.043	0.4 (−0.0 to 0.7)	0.066
Mean visual analog scale pain score							
Baseline†	5.8	5.8	5.8				
12 mo	4.8	5.8	5.8	−1.0 (−1.5 to −0.5)	<0.001	−1.1 (−1.6 to −0.6)	<0.001

AIMS2 = Arthritis Measurement Impact Scales-2.
* Estimated differences may not match 12-mo mean differences because of rounding.
† We assumed a common baseline value among treatment groups.

self-management group also had a roughly 1-cm greater improvement on the VAS than either the health education or usual care groups ($P < 0.001$). Although previous studies (26–28) have reported different results regarding clinically meaningful differences in VAS pain scores, the study that examined a pain VAS most similar to ours (global pain during the past week) indicated that a change of 0.8 cm is clinically relevant (26).

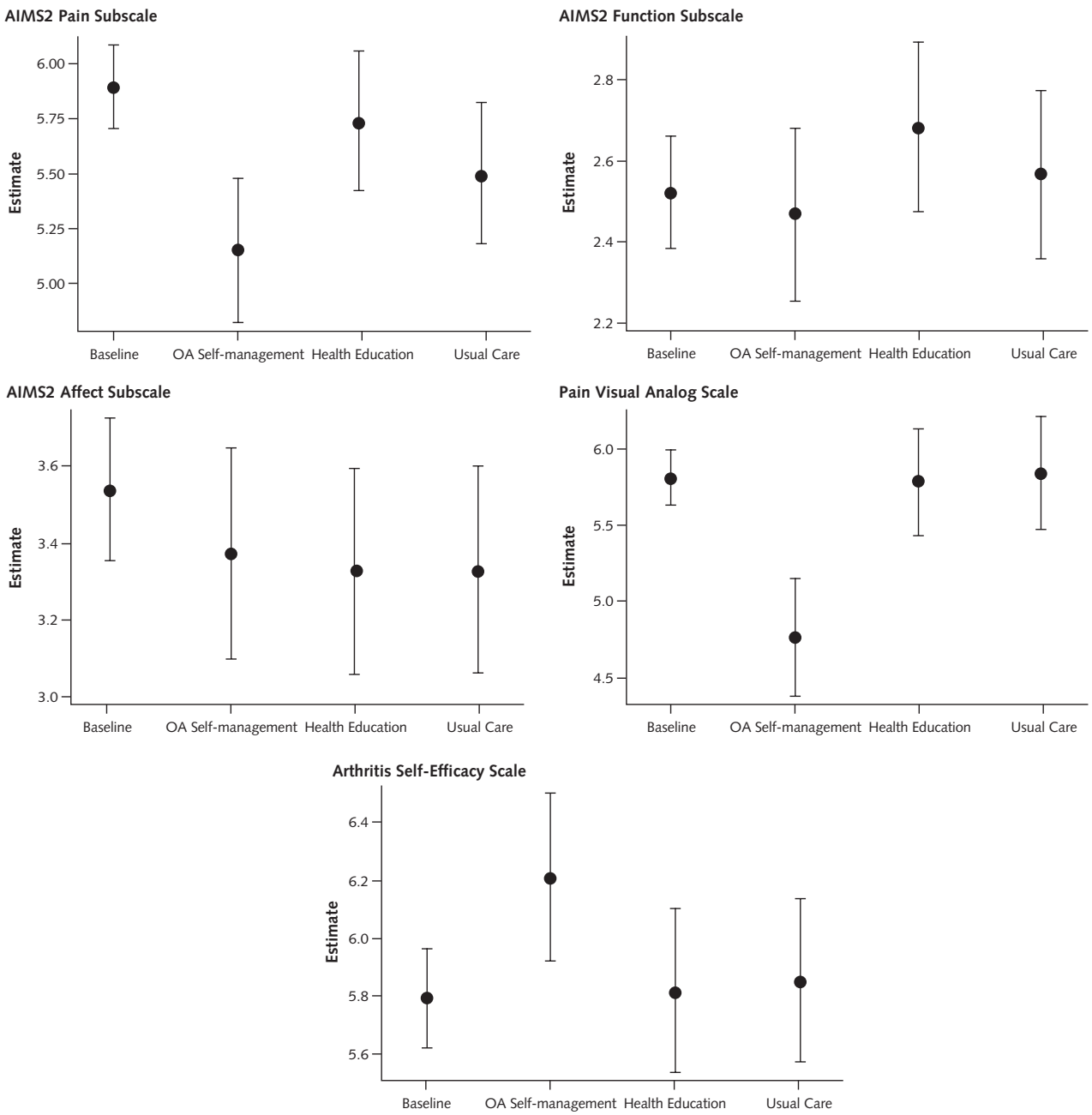
The osteoarthritis self-management group did not differ from the other groups in terms of changes in AIMS2 affect or global physical function. However, the osteoarthritis self-management group had greater improvement on the AIMS2 walking and bending subscale ($P < 0.035$) than the health education group. This is important, because walking and bending are 2 aspects of physical function that are substantially affected by knee and hip osteoarthritis. The osteoarthritis self-management group also had greater improvement in arthritis self-efficacy than the health education group ($P < 0.043$).

Our results are consistent with meta-analyses (6, 29–31) that show that arthritis self-management interventions are associated with modest improvements in pain and function. Most previous studies involved community-based samples recruited by self-referral, which suggests that the participants may have been very motivated to engage in behavior change. In contrast, our study actively recruited a more generalized sample of patients with osteoarthritis by using study-initiated letters and follow-up telephone calls, which may have resulted in a study sample with more mixed levels of readiness to change than self-referred samples. It is therefore important that we showed changes in some outcomes in a real-world clinical setting and patient sample. Different types of intervention strategies may be more effective for patients at various stages of readiness-to-change (32, 33), and a tailored, stage-based approach may be most effective when implementing osteoarthritis self-management broadly in clinical settings, but these questions remain to be explored. In addition, osteoarthritis self-management programs may also have a greater effect in clinical settings if they are more fully integrated into the health care environment. Linking osteoarthritis self-management more directly to clinical care could foster an ongoing patient–provider partnership and lead to more sustained healthy behaviors and improved outcomes (34).

This would require support for health educators within clinical settings.

Our study has limitations. First, it was conducted at 1 VAMC. Users of the VA health care system have poorer health overall and more severe arthritis symptoms and activity limitations than the general population (35–37), and most patients are men, all of which may limit generalizability. Second, the health educator for this study delivered both the osteoarthritis self-management and health education interventions, which could increase the risk for contamination between intervention groups. We attempted to minimize this risk by using detailed, standardized scripts for both interventions; the health educator did not discuss any osteoarthritis-related issues with participants in the health education group. Third, although we intended for the osteoarthritis self-management and health education interventions to be equal in intensity (for example, having the same number and volume of calls), the average length

Figure 2. **Estimated mean functional status, self-efficacy, and pain scores at 12 months.**



Treatment group estimates are at 12 months. AIMS2 = Arthritis Measurement Impact Scales-2; OA = osteoarthritis.

of the telephone calls was shorter in the health education group. Finally, our intervention did not involve direct communication with health care providers about patients' self-management efforts or symptom changes or efforts to improve provider facilitation of self-management.

In summary, we demonstrated that an entirely telephone-based osteoarthritis self-management support program was feasible to implement among patients actively recruited from a primary care setting, and it resulted in modest improvements in pain and some aspects of self-reported lower-extremity function. Telephone-based programs may be more readily integrated into clinical practice than face-to-face programs and seem to be particularly useful for reaching some vulnerable patient groups, including those who are older, have more disabilities or lower socioeconomic status, or live in a rural area. Given the high and increasing prevalence of osteoarthritis (38), the tremendous underutilization of behavioral approaches (such as exercise or weight management) for managing osteoarthritis (4, 39, 40), and the need to more widely implement osteoarthritis self-management interventions (41, 42), our results show that telephone-based administration of such programs should be a key component of an overall strategy for dissemination. Future work should examine strategies for strengthening the effects of osteoarthritis self-management programs, including more complete integration into the health care environment (34).

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