REDUCTION OF JOINT PAIN IN PATIENTS WITH KNEE OSTEOARTHRITIS WHO HAVE RECEIVED MONTHLY TELEPHONE CALLS FROM LAY PERSONNEL AND WHOSE MEDICAL TREATMENT REGIMENS HAVE REMAINED STABLE

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Objective. **We previously reported that monthly telephone contact by lay personnel, to promote self-care for patients with osteoarthritis (OA), was associated with improved joint pain and physical function after 1 year of followup. The present study was a secondary analysis to determine whether improvement was contingent on intensified medical treatment.**

Methods. **We reanalyzed control/treatment group differences in all 40 subjects with radiographically confirmed knee OA who had had no changes in antirheumatic drug therapy or institution of physical therapy during the period of observation.**

Results. **Group differences in measured pain remained significant (effect size [ES] = 0.65 SD, $P < 0.01$). The same trend was observed for physical function (ES = 0.53 SD, P not significant).**

Conclusion. **The findings in this reanalysis suggest that periodic telephone support interventions are effective enough to be regarded as an adjunctive treatment for OA.**

Osteoarthritis (OA) is one of the most common chronic diseases affecting adults in the United States: 12% of the population between the ages of 25 and 74 have OA, and almost all people have radiographic evidence of OA by the age of 75 (1). Estimates in 1980 indicated that OA resulted in 3.7 million hospitalizations and 60 million days of lost work annually (2). Furthermore, with the "graying" of the population, the magnitude of the problem and its impact on health care delivery will escalate. Therefore, it is desirable to identify ways to ameliorate the impact of the disease on the health care system.

Treatments of OA currently in general use are aimed mainly at reducing pain and preserving function. The few longitudinal studies examining the effects of OA in terms of symptoms and function show that there is a high degree of variability (3,4), and assessments of clinical improvement in patients with OA have been limited largely to patients treated with nonsteroidal antiinflammatory drugs and pure analgesics (5,6), or with physical therapy (7).

A recent randomized controlled trial at our institution examined the effects of telephone and/or in-clinic interventions, delivered by nonmedical personnel, on the functional status of inner-city patients with OA (8). Monthly telephone contacts were associated with improved joint pain and physical function after 1 year of followup, in comparison with controls

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who received only routine medical care. These findings are especially important because patients from lower socioeconomic strata have an increased risk for morbidity and excessive utilization of health care (9). The fact that telephone intervention improved the functional status of these patients suggests new avenues for the management of OA.

Unfortunately, the mechanisms underlying the observed effects in that study were unclear. The intervention did not appear to influence logical intermediate outcomes (e.g., compliance, morale, social support, satisfaction with care) (10). Other factors, such as the site of OA, radiographic severity, extraarticular sources of pain, and changes in treatment, were controlled for in the experimental design, but may have interacted with and obscured the effects of the telephone intervention.

Among these latter factors, a concurrent increase in the patient's medical treatment would be an obvious potential mechanism that could mediate and explain the positive effects of the telephone intervention. If the effects of the telephone intervention occur only when there are modifications in the medical management, patients in the treatment group who had no change in their medical therapy should have shown comparatively little improvement in outcome. Therefore, the current study was designed to examine whether the telephone intervention improved functional status among patients in whom neither changes in OA medications nor additional physical therapy were prescribed. To reduce the degree of outcome variability related to other factors (e.g., muscle weakness, soft tissue rheumatism, trauma), we restricted this secondary analysis to patients with radiographically confirmed OA of the knee.

PATIENTS AND METHODS

Subjects. The original study included 394 OA patients who received their medical care from a university-affiliated municipal outpatient facility (8). Eligibility criteria for the original study included symptoms of and treatment for OA, with or without radiographic confirmation of the clinical diagnosis. In the current study, we restricted attention to those subjects who were assigned to control and telephone-only intervention groups. Furthermore, we included only those patients whose records (a) showed neither a change in OA medication nor referral for physical therapy during the 1-year period of study enrollment, and (b) included radiographic evidence of grade 2 (mild), grade 3 (moderate), or grade 4 (severe) OA of the knee (11). All chart reviews were conducted by an investigator (JR) who was blinded to the subjects' study group assignments.

Procedures. The methods used for study have been described in detail previously (8). Briefly, after baseline assessments, subjects were assigned at random to 1 of 4 study conditions: control, telephone intervention, in-clinic intervention, or both telephone and in-clinic interventions. Subjects in the intervention groups were contacted monthly by telephone and/or at scheduled clinic visits, by trained nonmedical personnel. At each contact, the following items were discussed: 1) joint pain, 2) medications (i.e., compliance, whether the supply was sufficient to last until the next appointment), 3) gastrointestinal and other symptoms, 4) date of the next scheduled outpatient visit, 5) an established mechanism by which patients could telephone a physician during evenings and weekends, and 6) barriers to keeping clinic appointments. The control group continued to receive their regular medical care without additional interventions.

The primary outcome variable in this study, functional status, was measured by the Arthritis Impact Measurement Scales (AIMS) (12). The AIMS scales have been compressed to 3 reliable dimensions: physical function, psychological status, and pain (13). All AIMS scores have been standardized to range from 0 to 10, where higher numbers indicate poorer health status. Because the telephone intervention in the original study had significant effects only on pain and physical function, the current study focused on these 2 outcomes.

Statistical analysis. Analysis of covariance (ANCOVA) was used to test telephone/control group differences on the AIMS dimensions, after controlling for baseline status. Within-group comparisons were evaluated by paired *t*-tests. Both between- and within-group differences were expressed also in terms of the magnitude of experimental effect (i.e., effect size [ES]). Using standard formulas for estimation of effect size (14), between-group differences on AIMS dimensions were expressed as the difference between corresponding control and telephone group means, divided by the control group standard deviation. Similarly, changes within groups were translated to effect size estimates by dividing the difference between baseline and followup means by the baseline standard deviation for each group. A positive value for ES, therefore, corresponds to improvement in outcome.

RESULTS

Of the 198 subjects who were in either the control group or the telephone-only intervention group in the original study and who completed that study, 185 had medical records available for review for the present analysis. Fifty-one of 94 telephone group subjects and 46 of 91 controls did not have a change in their OA medication or receive concomitant physical therapy during their participation in the study. The proportions of patients maintained on stable medical treatment regimens in the telephone and control groups were not significantly different (54.3% and 50.5%, respectively; $P = 0.61$).

Of these 97 subjects whose treatment remained

stable, 82 (85%) had radiographic evidence of OA. The frequency of OA by site was as follows: knee 40, spine 23, hip 6, hand 4, other or multiple sites 9. Because of the small number of subjects with OA at sites other than the knee, only subjects with knee OA were included in the current analysis.

Of the 40 original study subjects with symptomatic and radiographically confirmed knee OA, 17 were from the control group and 23 from the telephone-only group. As shown in Table 1, the OA in the majority of the patients in each group was assigned a radiographic grade of 3 (i.e., moderate severity). The demographic characteristics and baseline health status of the patients in the control and telephone groups were comparable (Table 1). Control and telephone intervention subjects were not significantly different from one another at baseline with respect to AIMS scores or radiographic severity of OA. AIMS scores of the subjects in the current study were similar to those of the original sample as a whole (8).

After controlling for baseline status, ANCOVAs evaluating group differences in post-intervention AIMS scores indicated a significant improvement ($F[1,34] = 7.65$, $P < 0.01$) in pain among patients who received the telephone intervention, in comparison with the control group (Table 2). The size of the effect on pain associated with the telephone intervention was moderate to large (ES = 0.65). There was also a moderate effect size for the physical function dimension (0.53), but the between-group difference was not significant ($F[1,34] = 1.90$, $P = 0.16$).

Reduction of joint pain within the telephone group was the only statistically significant within-group change observed ($t[21] = -3.27$, $P < 0.01$). The corresponding estimate of effect size revealed a large improvement in that group (ES = 0.95). In contrast, a small *increase* in the average level of joint pain was observed among the control subjects ($t[14] = 1.05$, P not significant, ES = −0.28). To a lesser, but not statistically significant, extent, the same pattern of differences was observed for physical function (treatment group ES = 0.30, control group ES = −0.10).

Table 1. Demographic characteristics, baseline health status as measured by the Arthritis Impact Measurement Scales (AIMS), and severity of osteoarthritis (OA) by study group, among subjects with OA of the knee

	Control group (n = 17)	Telephone intervention group (n = 23)
Age (years), mean ± SD	61.6 ± 12.7	63.5 ± 11.1
% female	88.0	86.8
Radiographic severity of OA, (%)*		
Grade 2 (mild)	41.2	39.1
Grade 3 (moderate)	52.9	52.2
Grade 4 (severe)	5.9	8.7
AIMS pain score, mean ± SD†	5.83 ± 2.48	6.13 ± 1.63
AIMS physical function score, mean ± SD†	2.66 ± 1.42	2.17 ± 1.05

* By Kellgren and Lawrence classification criteria (11).
† Standardized 10-point scale; higher value = higher impact (12).

Table 2. Estimates of between- and within-group effect size of telephone social support intervention on Arthritis Impact Measurement Scales (AIMS) pain and physical activity scores in patients with radiographically confirmed osteoarthritis of the knee

	Control group (n = 15)*	Telephone intervention group (n = 22)*	Between-group effect size†
AIMS dimension‡			
Pain	6.53 ± 2.99	4.59 ± 2.43	0.65
Physical function	2.80 ± 1.78	1.86 ± 1.35	0.53
Within-group effect size‡			
Pain	−0.28	0.95	
Physical function	−0.10	0.30	

* Data were not available for 2 control group subjects and 1 telephone intervention group subject at followup. AIMs values are the mean ± SD score at the end of the study, on a standardized 10-point scale; higher value = higher impact (12).
† $(\text{Mean}_{\text{control}} - \text{mean}_{\text{telephone}})/\text{SD}_{\text{control}}$.
‡ $(\text{Mean}_{\text{baseline}} - \text{mean}_{\text{followup}})/\text{SD}_{\text{baseline}}$.

DISCUSSION

This study was designed to further characterize the previously observed positive effects of monthly telephone interventions on the symptoms and functional status of patients with OA. Specifically, our aim was to evaluate the extent to which the originally observed group differences represented *direct* effects on pain and functional status, rather than indirect effects mediated by intensified treatment. To exclude the latter possibility, this secondary analysis was confined to subjects in whom there was no change in drug treatment of their OA, and physical therapy was not instituted, over the year of observation. There was no parallel analysis performed on subjects whose therapies were changed, because of the inability in the retrospective chart audit to distinguish changes in

treatment instituted for purposes of intensification from changes instituted for other reasons (e.g., side effects, cost).

This analysis of subjects with radiographically confirmed knee OA was intended also to permit us to conclude whether the telephone contacts improved OA-related pain and disability. Data that would have allowed us to use the American College of Rheumatology clinical criteria for diagnosis of OA (15) were not available for this patient population at the time of the original study (8). Again in the retrospective review of records, radiographic evidence was the only reliable indicator of bona fide OA. The knee was the only site with enough subjects to permit meaningful statistical analysis.

The results showed significant between- and within-group differences in the AIMS pain scores. Patients who received the telephone intervention demonstrated a large degree of improvement in pain (ES = 0.95, $P < 0.01$) as well as improvement, to a lesser extent, in physical function (ES = 0.30, $P = 0.16$). Insofar as similar interventions have shown an analogous discrepancy between pain and physical function outcomes (16), we suspect that the effects on physical function were real, but the number of subjects did not allow for sufficient statistical power.

It is notable that the effect size estimates for between-group comparisons of pain and physical function outcomes in the current study (0.65 and 0.53, respectively) are substantial. These contrasts suggest that the direct effects of telephone contact, as opposed to those mediated by intensified treatment of OA, may in fact be the primary mechanism of action of such intervention, by providing social support and information to patients with radiographically confirmed OA.

Moreover, the magnitudes of the effects we observed are comparable with, or exceed, those associated with standard therapies for OA. For example, within-group changes on AIMS pain and physical function scores were within 3% and 7%, respectively, of those observed in a 24-week open-label trial of diclofenac in patients with OA (5). While radiographic severity was not reported in our original study (8) or in the diclofenac trial (5), the rough similarity of AIMS scores in the 2 samples suggests that the similarly large effects were achieved in patients with comparable disease severity. Moreover, between-group differences in the present study were substantially larger than those found in a recent comparative trial of acetaminophen and ibuprofen in low and high doses for patients with knee OA (6). Most subjects in that trial were from the same clinic population as the current study.

In conclusion, the present analysis suggests that the effects of monthly telephone contact between OA patients and trained lay personnel to review the status of self-care are powerful enough for this intervention to be of significant benefit as an adjunctive treatment for knee OA—particularly for populations of inner-city patients who may otherwise be at risk for increased morbidity and utilization of health care resources.

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