

Effects of Intercessory Prayer on Patients With Rheumatoid Arthritis

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ABSTRACT

Background. Many individuals pray during times of illness, but the clinical effects of prayer are not well-understood.

Methods. We prospectively studied a cohort of 40 patients (mean age, 62 years; 100% white; 82% women) at a private rheumatology practice. All had class II or III rheumatoid arthritis and took stable doses of antirheumatic medications. All received a 3-day intervention, including 6 hours of education and 6 hours of direct-contact intercessory prayer. Nineteen randomly selected sample patients had 6 months of daily, supplemental intercessory prayer by individuals located elsewhere. Ten arthritis-specific outcome variables were measured at baseline and at 3-month intervals for 1 year.

Results. Patients receiving in-person intercessory prayer showed significant overall improvement during 1-year follow-up. No additional effects from supplemental, distant intercessory prayer were found.

Conclusions. In-person intercessory prayer may be a useful adjunct to standard medical care for certain patients with rheumatoid arthritis. Supplemental, distant intercessory prayer offers no additional benefits.

MANY INDIVIDUALS PRAY on a regular basis, particularly during times of illness, and often wish to include prayer as part of their medical treatment.^{1,5} Despite growing evidence of the beneficial effects of overall religious involvement on health,^{6,7} specific therapeutic effects of prayer on human health and disease are not well-understood.

Some studies of prayer are self-report surveys of individuals' customary practices of praying for their own health in conjunction with other aspects of religious involvement, most notably worship attendance.^{1,3,4} Other studies have examined clinical effects of intercessory prayer (ie, individuals praying for the healing of other persons) as an experimental intervention for treating medical illnesses⁸⁻¹³; the results are mixed.¹⁴ Two types of intercessory prayer have been studied: in-person, direct-contact prayer (ie, "laying on of hands") and distant, or remote, prayer, in which there is no physical or telephone contact between those offering prayers and those receiving such prayers. Most of the studies have examined effects of distant prayer.⁹⁻¹³ One study by

Beutler et al⁸ evaluated the effects of both in-person prayer and distant prayer on patients with hypertension and found that while there was no difference in blood pressure control between groups, in-person, "laying on of hands" prayer was associated with enhanced patient well-being.

We decided to assess the effects of both forms of experimental, intercessory prayer (in-person and distant prayer), in conjunction with standard medical treatment, on the clinical course of patients with a major medical illness—rheumatoid arthritis (RA).

Based on the findings of the study by Beutler et al,⁸ we anticipated that application of in-person, "laying on of hands" prayer might have a substantial short-term effect on well-being, but we also postulated that its effects might not be sustained over a long-term period without supplemental "booster doses" of prayer. Therefore, we decided to evaluate two research questions: (1) Does in-person intercessory prayer by an experienced healing team improve short-term and long-term clinical outcomes among patients with RA? and (2) Does supplemental distant prayer offer additional, "booster" effects on the long-term outcome of patients with RA beyond those obtained with in-person intercessory prayer alone?

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TABLE 1. Demographic and Clinical Characteristics

<i>Variable</i>	<i>Value*</i> (<i>N</i> = 40)
Mean age (yr) (SD)	61.6 (11.5)
White (no.)	40 (100%)
Female (no.)	33 (82%)
Married (no.)	19 (48%)
Mean income (SD) (x \$1000)	27.3 (29.2)
Education beyond high school (no.)	23 (58%)
Religious beliefs and practices	
Christian (no.)	40 (100%)
Believe religion to be personally "very important" (no.)	30 (79%)
Obtain "a great deal of strength and comfort from religion" (no.)	26 (65%)
Pray daily or more often (no.)	31 (79%)
Attend worship weekly or more often (no.)	20 (53%)
Mean duration (SD) of RA (yr)	16.7 (14.2)
Stopped work because of RA (no.)	14 (36%)
Receiving disability from RA (no.)	13 (32%)
Currently working (no.)	7 (18%)
Comorbid illnesses (≥ 2) (no.)	20 (50%)
Mean number (SD) of medicines currently taking	6.0 (3.4)
Prednisone use (no.)	
Beginning of study	27 (68%)
End of study	28 (70%)
Methotrexate use (no.)	
Beginning of study	19 (48%)
End of study	22 (55%)
Other disease-modifying antirheumatic drug use (no.)	
Beginning of study	13 (33%)
End of study	16 (40%)
NSAID use (no.)	
Beginning of study	24 (60%)
End of study	17 (43%)
Narcotic use (no.)	
Beginning of study	12 (30%)
End of study	10 (25%)

*Due to occasional missing values, total number does not always equal 40.
RA = Rheumatoid arthritis; NSAID = nonsteroidal anti-inflammatory drug.

METHODS

Our study was done at the Arthritis/Pain Treatment Center (Clearwater, Fla), a private rheumatology practice, with a patient population consisting largely of elderly, white, female retirees. The protocol was approved by the Institutional Review Board of the National Institute for Healthcare Research (Rockville, Md).

Inclusion and Exclusion Criteria

To be eligible for the study, patients met all of the following criteria: (1) being older than 18 years of age; (2) fulfilling the 1987 American College of Rheumatology (ACR) criteria for the diagnosis of RA¹⁵; (3) having seropositivity for IgM rheumatoid factor, or, if negative, having documented evidence of erosive disease on radiologic examinations; (4) having symptomatic arthritis of at least moderate severity (ACR functional class II or III), with at least nine or more tender joints and six or more swollen joints requiring daily analgesic, anti-inflammatory, and/or disease-modifying anti-

rheumatic medications (DMARDs; namely, methotrexate, azathioprine, penicillamine, gold, sulfasalazine, minocycline), morning stiffness of at least 15 minutes, and an erythrocyte sedimentation rate (ESR) of at least 25 mm/hr; (5) having not started a new anti-inflammatory drug or DMARD within 3 months of beginning the study, except that each patient was allowed, if clinically indicated, to have a maximum of 1 intra-articular injection during the initial 3-month period; and (6) agreeing to participate in a study of Christian prayer as a therapeutic intervention for RA.

Potential participants were excluded for the following reasons: (1) being younger than 18 years of age; (2) being nonfluent in English; (3) having chronic, clinically evident cognitive impairment; (4) having seronegativity for IgM rheumatoid factor, unless there was evidence for erosive changes on radiographs; (5) use of more than 10 mg/day prednisone; (6) current use of cyclophosphamide, cyclosporine, or investigational drugs for treatment of RA; (7) introduction of new analgesic, anti-inflamma-

TABLE 2. Overall Results: Paired Comparison of Baseline and 12-Month Follow-up Data for Entire Sample (N = 40)

Variable	Baseline*	12 Month*	P Value†
Tender joints (no.)	16.8 (7.0)	5.7 (6.2)	<.0001
Swollen joints (no.)	9.8 (5.4)	3.1 (4.6)	<.0001
Grip strength (mm Hg)	244.3 (117.1)	278.8 (136.6)	.039
ESR (mm/hr)	40.9 (31.6)	42.1 (24.5)	.787
CRP (mg/dL)	1.5 (2.0)	1.4 (1.9)	.744
Pain rating (0 to 10 cm)	4.5 (2.7)	3.1 (2.7)	.004
Global rating (0 to 10 cm)	7.4 (2.4)	7.9 (2.5)	.134
Fatigue rating (0 to 10 cm)	4.5 (3.4)	3.1 (3.0)	.007
Arthritis Impact Measurement Scale (AIMS)	121.2 (24.9)	107.7 (29.4)	.0002
Modified Health Assessment Questionnaire (MHAQ)	36.2 (7.8)	32.9 (8.2)	.012

*Values expressed as mean (SD).

†Measured by paired *t* tests for tender joints, swollen joints, grip strength, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) and by Wilcoxon matched-pairs, signed-ranks tests for patients' pain, global functioning, and fatigue ratings and AIMS and MHAQ scores.

tory, and/or DMARDs within 3 months of beginning the study, except each patient was allowed, if clinically indicated, to have a maximum of 1 intra-articular injection during this initial period; (8) ACR functional class I or IV RA; and (9) clinical evidence of other major rheumatic disorders (eg, gout, chondrocalcinosis, systemic lupus erythematosus, polymyalgia rheumatica) except fibromyalgia and osteoarthritis, which were not grounds for exclusion due to their high prevalence in this population.

Recruitment and Assessment

Volunteers for the study were solicited from the Arthritis/Pain Treatment Center, other rheumatology practices, and the general public using print advertising, letters, telephone, and clinician contacts. The specific nature of the prayer intervention was fully described to each potential participant before obtaining informed consent.

All participants received from a single rheumatology clinician-researcher (S.M.M.) an initial, complete examination, including the following elements:

- Standard demographic information (Table 1);
- Clinical history, including date of onset and current severity of RA, review of previous diagnostic tests, radiologic examinations and treatment for RA, medical and surgical history, comorbidity, and medication use;
- Spiritual and religious factors, including separate instruments for the assessment of spiritual well-being,¹⁶ intrinsic religiosity,¹⁷ and degree of religious commitment (eg, frequency of prayer, scripture reading, and worship attendance).¹⁸ Results from each of these three instruments were dichotomized: values above the median of responses for that instrument were classified as "high" and values below the median were classified as "low";

- Symptom checklist, including symptoms of pain, morning stiffness, weakness, incapacity, sleep and appetite disturbance, fever, depression, and anxiety;
- Patients' level of expectancy for improvement in physical, emotional, spiritual, and overall clinical status, as assessed by Likert-type scales given before and immediately after the receipt of the in-person intercessory prayer intervention;
- Physical examination, including measurement of joint swelling and tenderness, pain on joint movement, limitation of joint movement, degree of deformity (eg, degree of ulnar deviation), and identification of any subcutaneous nodules, thenar wasting, contractures, tenosynovitis, or extra-articular manifestations of RA¹⁹;
- Functional assessment, including measurement of grip strength, using a rolled-up sphygmomanometer; the Modified Health Assessment Questionnaire (MHAQ),²⁰ measuring patients' perceptions of the degree of arthritis-related disability; and the revised Arthritis Impact Measurement Scale (AIMS),²¹ measuring functional impairment from arthritis;
- Assessment of pain, global functioning, and fatigue by the patient and assessment of overall disease activity, functional impairment, and improvement during follow-up by the clinician, using 10 cm visual analog and 4-point ordinal scales²²;
- Laboratory studies, including ESR (Westergren method) and C-reactive protein (CRP).

Intercessory Prayer Intervention

Intercessory prayer was offered by lay, volunteer prayer ministers from Christian Healing Ministries (Jacksonville, Fla). Two types of prayer were administered, in-person prayer and distant prayer.

In-Person Prayer: Direct-contact intercessory prayer (in-person prayer) was offered to all participants according to a 3-day protocol comprised of group educational sessions and individual healing prayer sessions. A total of 6 hours of educational sessions was presented over the 3-day period. Sample topics included

TABLE 3. Changes From Baseline to 6-Month Follow-up: Group 1 (Treatment) Versus Group 2 (Waiting-List Control)

Variable	Group 1* (n = 26)		Group 2* (n = 14)		P Value†
	Baseline	6 Mo	Baseline	6 Mo	
Tender joints (no.)	16.3 (5.9)	9.2 (8.4)	18.7 (9.0)	19.2 (11.6)	.016
Swollen joints (no.)	8.7 (4.7)	4.4 (4.0)	11.8 (6.0)	10.4 (7.3)	.128
Grip strength (mm Hg)	242.0 (123.4)	272.8 (130.6)	231.3 (102.3)	230.8 (101.7)	.457
ESR (mm/hr)	43.0 (33.8)	38.8 (24.7)	30.8 (17.1)	42.8 (27.3)	.136
CRP (mg/dL)	1.8 (2.3)	1.8 (2.5)	1.0 (1.1)	1.0 (0.9)	.992
Pain rating (0-10 cm)	4.5 (2.6)	3.6 (2.9)	5.0 (3.0)	3.8 (2.4)	.701
Global rating (0-10 cm)	7.3 (2.7)	7.4 (2.4)	7.2 (1.5)	6.0 (2.9)	.058
Fatigue rating (0-10 cm)	4.7 (3.4)	3.0 (2.9)	4.5 (3.5)	4.3 (2.5)	.266
AIMS	123.1 (26.1)	114.3 (32.1)	117.6 (21.9)	115.6 (19.4)	.342
MHAQ	37.9 (8.1)	34.3 (9.4)	32.6 (6.0)	34.1 (6.9)	.040

*Values expressed as mean (SD).

†Measured by unpaired *t* tests for tender joints, swollen joints, grip strength, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP), and by Mann-Whitney *U* tests for patients' pain, global functioning, and fatigue ratings and Arthritis Impact Management Scale (AIMS) and Modified Health Assessment Questionnaire (MHAQ) scores.

the nature of physical, emotional, and spiritual healing; the role of God and one's relationship to God in the healing process; the impact of anger and forgiveness; and the identification of any impediments to healing among participants (eg, pain, trauma, family-of-origin conflicts, dysfunctional spiritual beliefs and practices).²³ Also, a total of 6 hours of personalized, hands-on "soaking prayer" was offered, in which several prayer ministers prayed aloud and laid their hands for prolonged periods over the affected joint(s) or other affected body parts of each individual.²³

The 3-day meeting protocol was offered twice: once in October 1996 and again in April 1997. Our intention was to enroll 60 patients and to randomly assign them to two groups. Group 1 participants (projected n = 30) would receive the 3-day intercessory prayer ministry intervention in October 1996, followed by structured follow-up visits for 12 months. Group 2 participants (projected n = 30) would receive the same baseline and follow-up evaluations for the first 6 months as group 1 but would serve as a "waiting list control" (ie, receiving no intercessory prayer ministry) until April 1997, at which time they would receive the same 3-day prayer intervention as group 1 participants did in October 1996. After receiving the prayer intervention in April 1997, group 2 participants would have an 6 additional months of structured follow-up visits.

Due to insufficient recruitment (only 44 patients volunteered to participate) and unforeseen difficulties in coordinating schedules among patients and prayer ministry staff, the initial study design was altered and randomization was not done. Instead, based on the patient's date of enrollment, convenience, and

availability, the first 29 volunteers participated in the first meeting in October 1996. The 26 participants in group 1 completed a 1-year follow-up program consisting of regularly scheduled follow-up visits at 3, 6, 9, and 12 months after the intervention.

The next 15 participants received baseline evaluation identical to that of group 1 patients and were designated as a "waiting list" control group, receiving no intercessory prayer intervention in the initial phase of the study. These individuals received regular follow-up visits 3 and 6 months after initial evaluation. In April 1997, after this 6-month preintervention waiting period was completed, these 15 patients received a 3-day intercessory prayer ministry intervention similar to that received by group 1 in October 1996; they subsequently completed two additional follow-up visits 3 and 6 months after intervention. Fourteen of the 15 individuals (group 2) completed the entire protocol.

Distant Prayer. Remote intercessory prayer (distant prayer) was provided to 23 of the 44 participants, who were randomly selected using a random number table, to receive at least 10 minutes of daily prayer by each of two prayer ministers in distant locations for 6 months after the patients had received their 3-day, in-person prayer intervention (from October 1996 to April 1997 for group 1 participants and from April 1997 to October 1997 for group 2 participants). The prayer ministers received a picture and some brief demographic and clinical information describing the patient for whom they would be offering prayers. In addition to their individual daily prayers, the two prayer ministers also prayed together, in person or on the telephone, for the health of the patient as-

signed to them at least once per week throughout the 6-month intervention period. The prayer ministers maintained logs of their prayer activity.

The clinician (S.M.M.), who was the exclusive evaluator of patients throughout the study, was blinded to the group status (group 1 vs group 2) of the participants, as were all members of her office staff (with the exception of one study coordinator). Participants, in turn, were instructed not to discuss their group status or any aspect of the prayer intervention with the clinician. Each patient, the clinician, and the office staff were also blinded to the patient's distant prayer group status. Although blinded to their actual distant prayer status, patients were asked at each follow-up visit whether they believed they were receiving the distant prayer intervention.

Dropouts

Four of the 44 initial participants did not complete any follow-up information after the baseline evaluation and were excluded from further analyses. Two died of natural causes unrelated to the study (one each in groups 1 and 2), and two failed to complete any follow-up visits (both in group 1), leaving a final sample size of 40 ($n = 26$ for group 1, $n = 14$ for group 2). Two of the four study dropouts had been assigned to receive distant prayer (one each in groups 1 and 2), leaving final group sizes of 19 for the distant prayer group (13 from group 1, 6 from group 2) and 21 for the non-distant prayer group (13 from group 1, 8 from group 2).

Ancillary Treatment

Both groups received standard medical treatment for RA and other medical conditions during the study period. Medical decisions and medications were not altered in any manner by the study protocol. No attempts were made to alter the patients' religious beliefs or their incidental, nonexperimental use of prayer (by themselves or others) for healing.

Statistical Analysis

Four primary analyses were done. To limit problems with multiple comparisons, multivariate procedures were used initially and were followed by univariate procedures if findings showed evidence of statistical significance. Since the four study dropouts contributed no outcome data, we included data only from patients completing the full protocol ($N = 40$).

Primary Analyses. The first analysis was a matched preintervention and postintervention comparison for the entire sample ($N = 40$), comparing baseline preintervention data with postintervention data at the final, 12-month follow-up visit. The second analysis was a comparison of baseline and 6-month follow-up data for the initial prayer intervention group (group 1, $n = 26$) versus the waiting-list control group (group 2, $n = 14$). The third analysis was a matched, preintervention and postintervention comparison for group 2 ($n = 14$), comparing data from 6 months before intervention to 6 months after intervention. The final analysis was a comparison of baseline preintervention data and postintervention data at the final, 12-month follow-up visit for the group receiving experimental, distant intercessory prayer ($n = 19$) versus the group not receiving experimental, distant prayer ($n = 21$).

Multivariate Analysis. For each of the four primary analyses, a multivariate analysis was also done. Repeated measures analysis of variance and multivariate linear regression models of the 10 principal medical outcome variables (tender joints, swollen joints, grip strength, ESR, CRP, patients' pain, global functioning, and fatigue ratings, and AIMS and MHAQ scores) were fit providing estimates of the average change in outcome for the 10 study variables over time, adjusted for within-patient correlation.^{24,25} The GEE method provided estimates. Multivariate Wald tests were used to test the null hypothesis that none of the outcome variables changed over time. For the multivariate tests, $P < .05$ was considered significant, and univariate analyses followed.

Univariate Analysis. Two-group comparisons (eg, in-person prayer intervention group vs waiting-list control group) of unmatched data were analyzed using unpaired t tests for the five variables with continuous data (tender joints, swollen joints, grip strength, ESR, CRP) and Mann-Whitney U tests for the five variables with ordinal data (patients' pain and fatigue ratings, patients' and clinician's assessment of global functioning, and AIMS and MHAQ scores). Preintervention and postintervention comparisons of matched data were analyzed with paired t tests for continuous data and Wilcoxon matched-pairs signed rank tests for ordinal data. All univariate analyses were completed using SPSS/PC+ software, version 5.0.²⁶

Overall Improvement. In addition, patients were assessed according to the ACR criteria

for overall improvement in RA (ACR20), which is defined as at least a 20% improvement in both tender and swollen joints and a 20% improvement in three of five additional measures: pain, disability, patient and physician global assessments, and an acute-phase reactant (eg, ESR or CRP).²⁷ Comparisons between groups regarding ACR20 criteria were analyzed with Fisher's Exact Tests (calculated using Microstat 2.09 software²⁸), and the matched preintervention versus postintervention comparison for group 2 (analysis 3) was analyzed with the McNemar test.²⁹

Secondary Analyses. The possibly confounding effects of study group composition (group 1 vs group 2, distant vs non-distant prayer groups), antirheumatic medication use, spiritual and religious factors, and patients' levels of expectancy for improvement and belief in having received distant prayer were examined using these methods for continuous and ordinal data.

RESULTS

Primary Analyses

Primary Analysis 1—entire sample (N = 40), preintervention vs postintervention. Multivariate analysis of the entire sample (N = 40) showed significant overall improvement after intervention in the 10 major outcome variables at the final, 12-month follow-up visit when compared with preintervention baseline values ($P < .0001$). Univariate analysis (Table 2) showed that over the course of the study, patients increased mean grip strength (244.3 vs 278.8 mm Hg, $P = .039$) and had significant reductions in the mean number of tender joints (16.8 vs 5.7, $P < .0001$), swollen joints (9.8 vs 3.1, $P < .0001$), patient-rated pain (4.5 vs 3.1 cm, $P = .004$), patient-rated fatigue (4.5 vs 3.1 cm, $P = .007$), and level of functional impairment (AIMS scores, 121.2 vs 107.7, $P = .0002$; MHAQ scores, 36.2 vs 32.9, $P = .012$).

Thirty-one of the 40 patients (78%) had at least a 20% reduction in the number of tender and swollen joints over the course of the study; 22 (55%) met full ACR20 criteria for clinical improvement, including 15/26 (58%) of group 1 and 7/14 (50%) of group 2 participants.

Primary Analysis 2—group 1 (n = 26) vs group 2 (n = 14), baseline vs 6-month data. Multivariate analysis showed significant overall improvement in the 10 outcome variables over a 6-month postintervention follow-up period for group 1 (n = 26) when compared with a 6-month preintervention follow-up period for

the waiting-list control group (group 2, n = 14) ($P < .0001$). Univariate analysis (Table 3) showed a greater reduction over the 6-month follow-up period for group 1 versus group 2 in the mean number of tender joints (differences of -7.1 vs 0.5, $P = .016$) and for MHAQ scores (differences of -3.6 vs 1.5, $P = .04$), as well as a trend toward greater improvement for group 1 in seven of the other eight variables, particularly the patients' mean global functioning ratings (differences of 0.1 cm vs -1.2 cm, $P = .058$).

Group 1 participants were more likely to reduce both their tender and swollen joint counts by at least 20% over the first 6 months of the study compared with the group 2 waiting-list controls during the same period (15/26 [58%] vs 2/14 [14%], $P = .017$) and were also more likely to meet full ACR20 criteria (10/26 [38%] vs 0/14 [0%], $P = .019$).

Primary Analysis 3—group 2 (n = 14), preintervention vs postintervention. For group 2 alone (n = 14), multivariate analysis showed significant overall improvement in the 10 outcome variables over the 6-month postintervention period when compared with the 6-month preintervention period ($P = .001$). Univariate analysis showed significantly greater reductions in the number of tender joints (mean difference of -14.5, $P = .01$) and swollen joints (mean difference of -6.4, $P = .049$) for group 2 patients in the 6 months after intervention when compared with the 6 months before intervention.

Group 2 participants were more likely to have at least 20% reductions in both swollen and tender joints in the 6 months after the prayer ministry intervention compared with the 6 months before the intervention (10/14 [71%] vs 2/14 [14%], $P = .013$). Although more group 2 participants also met full ACR20 criteria in the 6 months after the prayer intervention compared with the 6 months before the intervention, this comparison did not reach statistical significance (5/14 [29%] vs 0/14 [0%], $P = .074$).

Primary Analysis 4—distant prayer (n = 19) vs no distant prayer (n = 21), preintervention vs postintervention. Neither multivariate nor univariate analysis showed a statistically significant overall improvement after intervention in the 10 outcome variables for the group receiving supplemental experimental, distant intercessory prayer (n = 19) when compared with the group receiving no supplemental experimental, distant prayer (n = 21).

Of the 19 patients receiving distant prayer, 15 (79%) had more than 20% reduction in both the tender joint and swollen joint counts compared with 16 of the 21 patients (76%) in the non-distant prayer group. Of the 19 distant prayer patients, 10 (53%) met ACR20 criteria for clinical improvement, compared with 12 of 21 patients (57%) who did not receive experimental distant prayer. These differences were not statistically significant.

Secondary Analyses

Study Group Composition. There were no significant baseline differences between groups 1 and 2 or between the distant prayer and the non-distant prayer groups. At 12-month follow-up, two outcomes were significantly different between groups 1 and 2: group 1 patients had greater reductions in levels of CRP (mean differences: -5.4 vs 0.8 mg/dL, $P = .018$) and functional impairment (mean differences in MHAQ scores: -4.9 vs -0.2 , $P = .052$).

Antirheumatic Medications. There were no statistically or clinically significant differences in antirheumatic medication use over the course of the study (Table 1).

Spiritual and Religious Factors. The effects of spiritual and religious factors were assessed by examining results from the three instruments measuring spiritual well-being, intrinsic religiosity, and religious commitment. Individuals with a higher (ie, above the median) degree of spiritual well-being at baseline had greater improvement than others in grip strength (mean differences of 85.3 vs 12.3 mm Hg, $P = .02$). Levels of intrinsic religiosity were unrelated to any of the 10 major study outcomes. Individuals with a higher (ie, above the median) degree of religious commitment at baseline were more likely than others to have improvement in functional capacity (mean differences in AIMS scores: -19.9 vs -7.4 , $P = .035$) but were less likely to have improvement in the number of swollen joints (-4.7 vs -8.6 , $P = .034$).

Patients' Level of Expectancy for Improvement. Patients' baseline and immediate post-prayer levels of expectancy for improvement in physical, emotional, spiritual, or overall status were unrelated to study outcomes.

Beliefs Regarding Distant Prayer. Although only 19 of the 40 patients (48%) who completed the study actually received distant prayer and individuals were blinded to distant prayer treatment status, 29 (73%) believed at the end of the study that they had been in the group

receiving distant prayer. These patients were more likely than others to have improvement in global function (1.3 vs -1.2 cm, $P = .003$) and reductions in pain (-2.1 vs 0 cm, $P = .02$) and functional impairment (AIMS scores: -18.3 vs -2.4 , $P = .016$) at 12-month follow-up.

DISCUSSION

In this investigation, patients with longstanding, moderately severe RA derived significant short-term and long-term physical benefits from in-person intercessory prayer, but no additional benefits from supplementary distant prayer were observed.

The clinical improvement at 1-year follow-up seen in this study is not characteristic of the natural history of the disease or the expected treatment course of individuals with longstanding disease who are taking stable doses of medication. While early, aggressive treatment of disease is intended to maintain function, and significant remissions are occasionally seen—either spontaneously or induced by treatment^{30,31}—long-term prognosis is often poor and characterized by a gradual, progressive decline in function.³²

Although other study populations are not necessarily similar to those in our study, the magnitude of the clinical effects on joint swelling and tenderness found in our study resembles that found from the initiation of a new DMARD. For example, in four early studies of methotrexate,^{33,36} the swollen joint count was reduced by 28% to 64%, the joint tenderness count was reduced by 41% to 70%, and patient-rated pain was reduced by 42% to 44%. These findings compare favorably with the 68% and 66% reductions, respectively, in swollen and tender joint counts and the 31% reduction in patient-rated pain found in our intervention, even though 48% of patients were already taking methotrexate at the beginning of the study. On the other hand, the significant improvements in grip strength (21% to 50%), patient-rated global functioning (36% to 57%), and ESR (22% to 46%) reported in the methotrexate studies were not matched by the results of our investigation: grip strength and patient-rated global functioning increased 14% and 19%, respectively, while mean ESR increased by 2%.

Although, once again, the study populations are not necessarily similar, the clinical benefits shown in our study generally exceed those reported from group educational interventions for patients with RA. In such studies,³⁷⁻⁴¹ tender and joint count

reductions of 10% to 15% and reductions in pain of 10% to 23% have been noted.

Limitations

There are some significant limitations in our study. First, a convenience sample of volunteers (largely elderly, white, retired women) in a private practice was studied; generalizability to other samples in different settings cannot be assumed. For example, patients in this study were more religious than the general population.² They were more likely to attend worship at least once per week (53% vs 43%), to believe that religion is very important in their lives (79% vs 55%), and to describe themselves as “born-again” Christians (58% vs 33%). While the baseline levels of spiritual well-being, intrinsic religiosity, and religious commitment had few and mixed effects on clinical outcomes, it is not known whether individuals of different faith traditions or with little inclination or interest in prayer would benefit from intercessory prayer.

Second, initial group assignment (group 1 vs group 2) was not randomized, as originally intended but instead was based on patients' dates of enrollment, convenience, and availability for receiving the in-person intervention on the scheduled dates. Despite this shortcoming, there were no significant baseline demographic and clinical differences between groups, though there were several minor differences favoring group 1 in the ultimate responsiveness to treatment.

In addition, the groups were smaller than expected and unequal in size, contrary to the intention of the original design. These developments limited the statistical power of the findings; for example, there was only a 67% chance of finding a true difference of 20% at the $P = .05$ (two-tailed) level between the preintervention and postintervention tender joint counts for the final sample size of 40 patients.

Third, it is possible that there were significant Hawthorne and placebo effects, leading to improvement in the treatment group that is not attributable to the direct effects of in-person intercessory prayer alone. Placebo effects are commonly seen in patients with RA,⁴² as in most other illnesses. Nevertheless, we found that patients' levels of expectancy for healing, either before the study or immediately after the intervention, were not significantly related to long-term outcome. On the other hand, while actual receipt of experimental, distant prayer did not offer additional benefits

beyond those of in-person prayer, patients' beliefs at the study's conclusion in having received distant prayer correlated highly with improvement in global well-being and reductions of pain and functional impairment.

Fourth, patients receiving in-person intercessory prayer were not blinded to their receipt of treatment. In fact, in hopes of enhancing its specificity and effectiveness, patients actively participated in the prayer intervention by describing their personal spiritual needs and offering prayer requests to the prayer ministers. This study was designed to evaluate the usual practices of an experienced intercessory prayer ministry team, which characteristically uses an individualized approach for each patient receiving prayer.

Future studies are needed to distinguish the specific effects of in-person prayer from those obtained by receiving sympathetic clinical attention alone. Possible control groups for future investigations might include individuals receiving “sham” prayer, alternative forms of “touch therapy” (eg, therapeutic touch, chiropractic, physical therapy), or nonspiritually focused group interaction (eg, patient education classes or group psychotherapy).

Finally, the specific mechanism of effect for these findings could not be conclusively determined. Intercessory prayer is a complex, multifaceted intervention, similar to cognitive-behavioral therapy and other psychosocial programs. It combines the putative therapeutic agent of intercessory prayer with additional, adjunctive effects, including provision of group education, mutual support, counseling, and personal coping strategies that may have contributed to some of the clinical benefits seen in the study.^{43,44} Thus, it is important to emphasize that this investigation evaluated the effects of experimental intercessory prayer *ministry* by an experienced team, and not intercessory prayer alone. Furthermore, no effort was made to halt or alter any nonexperimental prayer activities intended to enhance the patient's health by the patient, family, friends, and/or clergy.

One unexpected and unexplained finding was that the improvement in swollen and tender joints and reduction in pain and functional disability observed in our study was not accompanied by a parallel reduction in serum inflammatory markers (ESR and CRP). Therefore, it is possible that the detected clinical improvement might be attributable more to alteration of patients' perceptions regard-

ing their illness than to changes in inflammatory pathways affecting their joints.

Methodology

Despite its limitations, we believe this investigation helps to extend our understanding of the effects of intercessory prayer on human health and uses some methods that may be useful in other studies. The waiting-list design permits the conduct of sequential studies using the same sample. In the first 6 months, we conducted an effectiveness trial,⁴⁵ examining two groups matched for their interest in participating in a trial of prayer. In the second 6 months, we added a time series (within-group) design in which members of one group (group 2) served as their own controls for the subsequent intervention. The time series design reduces confounding variables and doubles the effective sample size, because each person contributes observations during both the control period and the experimental period.⁴⁶ The sample size, while small, was extensively evaluated in a prospective, longitudinal manner using standardized subjective and objective measures recommended by leading rheumatologic authorities. Attention was paid to important confounding variables, including concurrent medical treatment, spiritual and religious factors, and patients' level of expectancy for improvement.

Implications

This study suggests that in-person intercessory prayer ministry may be a useful adjunct to standard medical care in the care of certain patients with RA.⁴⁷ Further explorations of this understudied but potentially valuable form of treatment are needed, including (1) more detailed investigations of the mechanism of action for the effect of intercessory prayer (eg, with detailed laboratory, radiologic, and immunologic preintervention and postintervention evaluations and with more careful control of possible placebo effects, by using sham prayer, physical therapy, or group education control groups); and (2) efforts to explore the generalizability of the findings to patients with other types of rheumatic, general medical, and psychiatric disorders, as well as with varying types and degrees of spiritual and religious beliefs and practices.

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