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ORIGINAL ARTICLE

Case Management of Arthritis Patients in Primary Care: A Cluster-Randomized Controlled Trial

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Objective. **To assess whether providing information on arthritis self-management through general practitioners (GPs) increases the quality of life in patients with osteoarthritis and whether additional case management provided by practice nurses shows better results.**

Methods. **We conducted a pragmatic, cluster-randomized, controlled, 3-arm trial that included 1,021 patients from 75 primary care practices in Germany. GPs were randomized to intervention group I, group II, or a control group. GPs of both intervention groups participated in 2 peer group meetings. In intervention group II, additional case management was conducted via telephone by a practice nurse. The primary outcome was change in quality of life, assessed by the German version of the Arthritis Impact Measurement Scales Short Form (AIMS2-SF). Secondary outcomes were health service utilization, prescriptions, and physical activity. Data were controlled for depression using the Patient Health Questionnaire 9 as a potential confounder.**

Results. **Of 1,125 administered questionnaires, 1,021 were analyzed. Compared with the control group, no significant changes occurred in intervention group I with respect to the primary outcome. Performed radiographs decreased significantly ($P = 0.050$), whereas prescriptions of acetaminophen increased significantly ($P < 0.001$). In intervention group II, significant changes in the AIMS2-SF dimensions social ($P < 0.001$), symptom ($P = 0.048$), and lower body ($P = 0.049$) were identified. Radiographs ($P = 0.031$) and orthopedic referrals ($P = 0.044$) decreased whereas prescriptions of pain relievers increased significantly.**

Conclusion. **Improving the quality of life in patients with arthritis using arthritis self-management seems challenging. Simply providing this information through GPs is not sufficient but combining it with case management seems to be a promising approach.**

KEY WORDS. Osteoarthritis; Case management; Primary care; Quality of life; Health service utilization.

INTRODUCTION

Osteoarthritis (OA) is highly prevalent in the population and its prevalence is expected to increase in coming years (1). OA has a substantial impact on patients' quality of life (QOL), as it is frequently associated with pain and disability. Because some of the factors that affect the course of OA, such as body weight (2) and physical activity (3), are receptive to influence, programs such as arthritis self-management programs (ASMPs) or the Program for Rheumatic Independent Self Management (4) have been developed. Besides recommendations for physical activity and weight loss, these programs aim at increasing patients' ability to handle the disease by increasing self-efficacy. However, their effects, at least in patients with OA, seem to be weak, as a recent meta-analysis of self-management programs for certain chronic diseases has indicated (5). To date, these programs generally have taken place outside of medical care settings (6), but a recently published study by Buszewicz et al indicated that ASMPs may also have no substantial impact on QOL of primary care patients (7).

However, because the main care provider and primary contact person for most patients is the general practitioner (GP), it seems appropriate to evaluate interventions in a primary care setting (8). Programs such as ASMPs, which require participation in courses, are always subject to com-

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pliance problems. Because patients visit their GP for many reasons and information on arthritis self-management can be more easily and frequently provided in these visits than in courses, it would seem a worthwhile challenge to train GPs to provide this information. However, implementing interventions in a primary care setting creates several problems (9,10).

In Germany as well as in many other European countries, peer group meetings (quality circles) of physicians are a well-established concept and several studies have proven their impact on different outcome parameters, such as on prescriptions (11). Peer group meetings are characterized by a small number of participating physicians, usually less than 15, and by intense discussion among participants. Furthermore, recent studies have shown that case management is a promising approach to improving care for the chronically ill (12) because it enables a structured followup, which has been shown to be an important issue (13). Case management has been defined as "taking responsibility for following-up patients; determining whether patients were continuing the prescribed treatment as intended; assessing whether [. . .] symptoms were improving; and taking action when patients were not adhering to guideline based treatment or when they were not showing expected improvement" (14).

The goal of our study was to evaluate whether providing information on arthritis self-management through GPs can increase patients' QOL. Because prior research has indicated that case management is a promising approach to the treatment of chronic diseases, we assessed whether additional case management by the practice nurse shows better results than involving GPs only.

PATIENTS AND METHODS

The study was designed as a pragmatic, cluster-randomized, 3-arm intervention study, which is considered an appropriate approach when assessing implementations in a primary care setting (15). The study protocol was approved by the ethics committee of the University of Heidelberg prior to the start of the study. The study was conducted in accordance with medical professional codex and the Helsinki Declaration as of 1996 as well as the German Federal Data Security Law.

Recruitment of GPs. As displayed in the flowchart (Figure 1) created according to the Consolidated Standards of Reporting Trials (CONSORT) group (http://www.consort-statement.org), 503 GPs in the area of Baden-Wuerttemberg and Bavaria were invited to an information meeting regarding the study in a formal letter from the Department of General Practice and Health Services Research of the University of Heidelberg.

Patient inclusion criteria. To be eligible for inclusion, patients had to be age ≥18 years and diagnosed with OA in the knee or the hip according to the American College of Rheumatology criteria (16,17). Patients were contacted in consecutive order of appearance in the practice if the main reason for the current encounter was related to OA. After

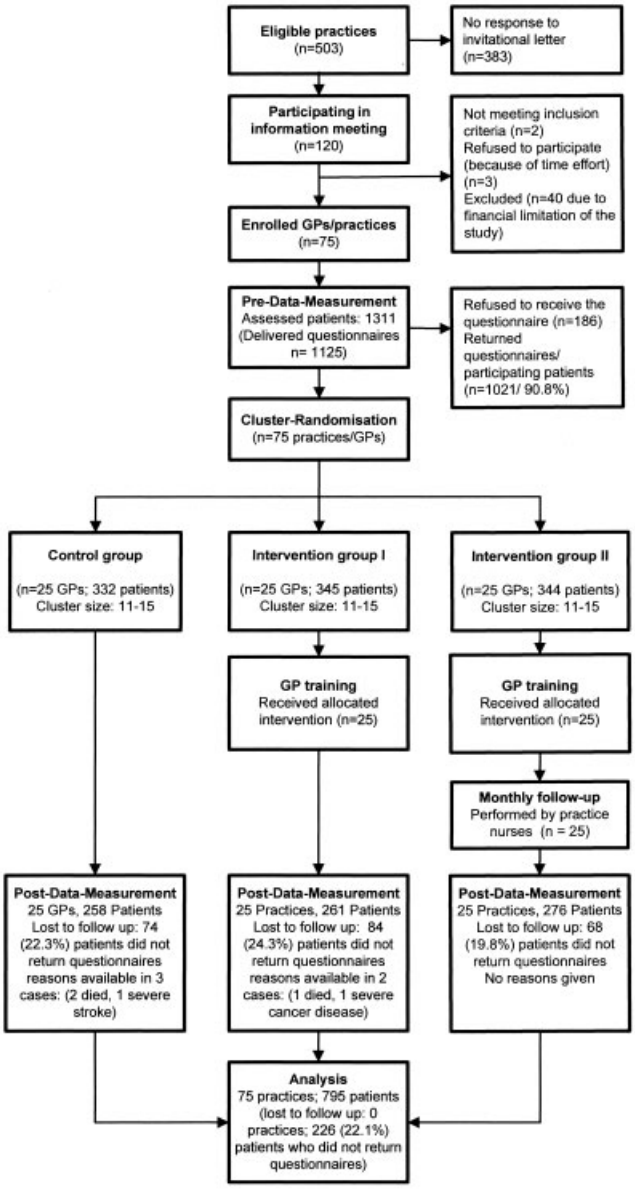

Figure 1. Study flowchart. GPs = general practitioners.

giving their written informed consent, patients received the questionnaire and a stamped envelope with the postal address of the university to enable them to return the questionnaires directly. The questionnaires for postintervention evaluation were sent to the patients by mail. Written reminders were used and GPs were also asked to remind patients to return the questionnaires. Patients were explicitly informed that neither the GP nor the practice team had any way of gaining knowledge of their answers.

Primary and secondary outcomes and assessment instruments. The primary outcome was QOL, assessed by the Arthritis Impact Measurement Scales Short Form (AIMS2-SF), an internationally validated instrument for the assessment of QOL in patients with arthritis. Secondary outcomes were physical activity, assessed using the short form of the International Physical Activity Question-

naire (IPAQ); health service utilization (encounters with GPs, orthopedics, or nonmedical practitioners of alternative medicine; number of physiotherapy sessions, radiographs, surgical interventions, injections to the joint); and prescriptions. Specialist care for patients with OA in Germany is provided by nonsurgical orthopedics and not by rheumatologists as in many other health care systems. Referral rates to these orthopedics are very high, as are the number of radiographs (18). We hypothesized that referral rates and number of radiographs would decrease.

To assess physical activity, we used the short form of the IPAQ (19). The IPAQ was developed by an international panel of experts and validated in 9 European countries, including Germany. Energy expenditure related to physical activity (metabolic equivalents, minutes/week) was calculated according to the IPAQ recommendations (available at http://www.ipaq.ki.se). It is known that depression aggravates the pain associated with OA and contributes considerably to the disability (20). Furthermore, prior analyses have demonstrated that depression is particularly frequent among patients with OA (21). Because depression could have a negative influence on the effect of the intervention, it was assessed by means of the Patient Health Questionnaire (PHQ-9) (22) to enable it to be controlled as a potential confounder. We also assessed the following chronic conditions as comorbidities: high blood pressure (>140/90 mm Hg), diabetes, chronic heart failure, coronary vessel disease, elevated cholesterol level (total cholesterol >200 mg/dl), ulcer or stomach disease, asthma/chronic obstructive pulmonary disease, renal insufficiency, (prior) cancer, and (prior) stroke. The baseline assessment was conducted in April 2005, before any intervention was performed. The group meetings with the GPs took place from the end of April until the end of June. The postintervention assessment was completed in December 2005, 6 months after the last group meeting and 9 months after the baseline assessment.

Sample size. Sample size calculations for cluster-randomized trials differ from sample size calculations for common randomized controlled trials and require, due to the cluster effect, larger numbers of patients to achieve the same power as trials randomized on the individual level (23). Based on the main outcome parameter (QOL) and the main outcome-assessment instrument (German version of the AIMS2-SF) (24), we performed a power calculation with the Cluster Randomization Sample Size Calculator, version 1.02 (University of Aberdeen, Aberdeen, UK) assuming a minimum detectable difference between groups of 10% (as being clinically relevant), an intracluster correlation coefficient (ICC) of 0.03 (based on results from comparable studies in primary care [25]), a power of 90%, and a significance level of 0.05. Assuming a dropout rate of 10%, we had to include 25 practices, each including 14 patients at most. Because the characteristics of the clusters were already recognized when planning the study, we aimed at minimizing some important factors that had the potential to decrease significance or bias the cluster design: 1) we stratified the selected practices according to the variables rural/urban, and 2) instead of including a large number of patients per practice, we enrolled a large number of practices and allowed only 15 patients per practice to decrease variation in cluster size.

Intervention. The intervention was developed using a stepwise approach according to the recommendations of Campbell et al (26), including qualitative prestudies to reveal the needs of doctors and patients as well as possible obstacles to implementation (27). We also conducted a pilot study to test the assessment instruments and to reveal possible barriers to their implementation (28). After each step, assessment tools and the intervention were reconsidered and refined in a consensus process, including GPs and self-help groups. The intervention was multifaceted, because prior research demonstrated that strictly educational interventions with GPs were less effective. GPs in intervention group I participated in 2 interactive peer group meetings of 8 hours each. These meetings focused on 3 main issues: the evidence-based treatment of OA in a primary care setting; arthritis self-management programs for patients; and the provision of motivational skills for working with patients, according to the 5-As approach (ask, advise, agree, assist, and arrange) (29). In addition to the meetings, GPs received a written summary of evidence-based treatments for OA in a primary care setting. This summary contained the recommendations of the European League Against Rheumatism (EULAR) group for the treatment of OA and information provided by the German Medical Association (30–32). Furthermore, GPs received written material for patients: a leaflet providing information about the cause and the treatment possibilities as well as coping strategies. The leaflets also contained contact addresses for the 2 largest self-help groups, the German League against Rheumatism (Deutsche Rheumaliga) and the German Osteoarthritis Help Foundation (Deutsche Arthrose Hilfe), for the patients. GPs also received booklets and audio CDs with a detailed exercise program, similar to some ASMPs, and were asked to provide these materials to every included patient. GPs in intervention group II participated in the same meetings, so that all GPs received the same information.

Implementing case management. In an add-on approach, practice nurses from intervention group II also participated in a course. During this course, the nurses were trained in case management. They learned about OA and how to call patients and monitor treatment using a structured OA-specific telephone questionnaire. The questionnaire assessed 3 dimensions of treatment in 11 items: pain, effects and side-effects of prescribed drugs, and adherence to the GPs' recommendations regarding physical activity. Patients' answers were grouped into 3 predefined categories based on urgency of the given information: immediate GP referral, information forwarded to the GP after the telephone call, and information forwarded at the end of the day. The categories were additionally displayed by green, yellow, and red flags on the questionnaire. For example, if a patient reported acute stomach pain, this information was marked with a red flag and the patient was immediately referred to the GP. This stepwise proce-

dure assured that the information was forwarded to the GP according to its urgency. Telephone monitoring started after the baseline assessment in May 2005 and ended in the middle of November, before the followup assessment. The telephone calls were conducted at least every 4 weeks.

Data collection and analysis. Each patient's set of questionnaires was linked to the GP's list via an identification number, so that data given by the patients could be cross-checked with the patients' file. Information on patients' medication and health care utilization was checked by 1 of 3 research assistants visiting each practice. This was done to estimate the reliability of patients' answers for a subsequent part of the project. If differences occurred, data from the medical file were used. Prescriptions were assessed via the Anatomical Therapeutic Chemical classification system code and recalculated and displayed in defined daily doses (DDD) according to the recommendations of the World Health Organization (WHO; available at www.whocc.no/atcddd/). The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults. Nonrespondents were identified by comparing received questionnaires with the GP's list of patients who were invited to participate. Sociodemographic data (sex, age, ethnicity, education level, work situation, family situation) were collected. Education level was defined as follows: 1 = elementary school or less, 2 = high school, and 3 = tertiary degree or higher.

Statistical analysis. A flowchart in accordance with the CONSORT statement for cluster-randomized trials was created to give an overview of the involvement of practices and patients throughout the trial. Analyses followed a prespecified plan, taking into account the cluster design. Descriptive statistics for baseline characteristics were displayed. Baseline data were compared using Student's *t*-test, or chi-square test for categorical data. In the case of missing data, the last observation carried forward method was used. If analyses of cluster-randomized controlled trials are performed on the patient level, the hierarchical structure has to be taken into account. To do so, we used the MLwiN package (Centre for Multilevel Modelling, University of Bristol, Bristol, UK). Following the recommendations of Campbell et al (33), we initially calculated the ICC for each specific variable, based on the baseline data of all patients. This ICC was used later in the analyses. Change in the means of both intervention groups was compared with the change in the means of the control group using analysis of covariance (ANCOVA). All analyses were performed based on intent-to-treat, regardless of whether patients really received the intended treatment, and post hoc correction for multiple testing (Bonferroni) was implemented.

RESULTS

Of the 503 invited GPs, 120 gave their written consent to participate in the study and attended an information session. Two practices did not meet the inclusion criteria and 3 GPs refused to participate due to time limitations. Of the remaining 115 practices, 75 were randomly selected, stratified into rural or urban, and randomly assigned to either the control group or 1 of the 2 intervention groups (Figure 1). Analysis of variation of cluster sizes revealed that the number of patients varied between 11 and 15 at baseline. No practice dropped out during the study (the chart displays the loss of patients). Of the 1,311 patients invited to participate by the GPs, 1,125 agreed to complete the set of questionnaires and 1,021 sets were returned to the university at baseline; in 795 (77.9%) cases, questionnaires were returned postintervention.

Missing data occurred mainly within the same questionnaire, and in most cases, the data could be completed from the patient file. An initial comparison of the 1,021 respondents and the nonrespondents revealed no significant differences with respect to sociodemographic variables (age, sex), disease characteristics (duration of disease), or number of comorbidities and prescribed medication. A total of 674 (66.0%) of the included patients were women with a mean ± SD age of 66.6 ± 15.3 years, whereas men had a mean ± SD age of 65.2 ± 14.8 years.

The baseline characteristics of the study sample, separated for the control group and the 2 intervention groups, are displayed in Table 1. Group comparison revealed no significant differences between the control group versus intervention group I and intervention group II.

The primary and secondary outcome measures at baseline are displayed in Table 2. QOL was reflected in 5 different AIMS2-SF dimensions, but because most of the participants were already retired, we excluded the work scale from further analysis because this dimension is only applicable if the patient is not retired. Regarding prescriptions, total numbers and percentages of patients receiving at least 1 DDD of the specific drug are mentioned. Group comparisons revealed no statistically significant differences in the outcome measures.

The results of the intervention are displayed in Table 3 as differences in mean scores between pre- and postintervention for each group. The provided *P* values resulted from comparison of changes in means between the control group and the respective intervention group. The analyses using ANCOVA were controlled for the covariates age, disease duration, ICC, and PHQ-9 score. As can be seen, changes in means did not differ between intervention group I and the control group with respect to the primary outcome. Significant results in intervention group I only occurred in the secondary outcome parameters: radiographs ($P = 0.050$) and percentage of prescriptions of acetaminophen ($P < 0.001$). In intervention group II, significant increases in QOL were revealed in the symptom scale ($P = 0.048$), reflecting patients' perceived pain; the lower limb scale ($P = 0.049$), assessing patients' functional ability in the lower limbs; and the social scale ($P < 0.001$). As in intervention group I, significant changes also occurred with respect to health service utilization: orthopedic referrals ($P = 0.044$) and radiographs ($P = 0.031$) decreased significantly. Prescriptions of acetaminophen ($P < 0.001$), nonsteroidal antiinflammatory drugs ($P = 0.019$), and opioids ($P < 0.001$) changed significantly. Referrals to nonmedical practitioners and physiotherapists showed no notable changes. Interestingly, the IPAQ score

Table 1. Characteristics of the study sample (n = 1,021) at baseline*

Characteristic	Control group (n = 25)	Intervention group I (n = 25)	Intervention group II (n = 25)
General practitioners			
Number	25	25	25
Working experience, mean ± SD years	23.1 ± 18.2	22.2 ± 19.1	21.9 ± 18.7
Location (rural/urban)	14/11	13/12	14/11
Patients			
Number	332	345	344
Female sex	229 (68.9)	214 (62.0)	231 (67.2)
Age, mean ± SD years	66.11 ± 15.02	65.59 ± 14.68	66.27 ± 15.19
Education level, mean ± SD	2.59 ± 1.07	2.45 ± 1.13	2.48 ± 1.02
Living in partnership	225 (66.3)	203 (58.8)	226 (65.7)
Retired from work	219 (65.7)	241 (69.9)	255 (74.1)
Kellgren score, mean ± SD	2.56 ± 0.87	2.71 ± 0.92	2.59 ± 0.79
Duration of OA, mean ± SD years	13.3 ± 14.1	13.9 ± 13.0	13.4 ± 14.2
PHQ-9 score, mean ± SD	15.2 ± 4.8	15.1 ± 4.9	15.4 ± 5.2
Comorbidities			
High blood pressure	187 (56.3)	195 (56.5)	182 (53.8)
Chronic heart failure	58 (17.5)	70 (20.3)	61 (17.7)
Coronary vessel disease	45 (13.6)	38 (11.0)	41 (11.9)
Diabetes	63 (19.0)	58 (16.8)	55 (16.0)
Cholesterol	126 (38.0)	136 (39.4)	140 (40.7)
COPD/asthma	37 (11.1)	36 (10.4)	35 (10.2)

* Values are the number (percentage) unless otherwise indicated. OA = osteoarthritis; PHQ-9 = Patient Health Questionnaire; COPD = chronic obstructive pulmonary disease.

Table 2. Primary and secondary outcome measures at baseline*

	Control group (n = 332)	Intervention group I (n = 345)	Intervention group II (n = 344)
Primary outcome			
Quality of life (AIMS2-SF scores)			
Lower body	2.65 ± 1.85	2.67 ± 1.88	3.01 ± 2.11
Upper body	1.33 ± 2.09	1.47 ± 2.25	1.68 ± 2.44
Symptom	4.81 ± 2.18	4.87 ± 2.13	5.02 ± 2.29
Affect	2.88 ± 1.33	2.89 ± 1.35	3.04 ± 1.39
Social	4.69 ± 1.80	4.52 ± 1.88	4.79 ± 1.80
Secondary outcomes			
Health service utilization			
GP contacts	4.82 ± 6.00	4.56 ± 6.13	5.01 ± 5.78
Referrals to orthopedics	1.76 ± 3.52	1.58 ± 3.43	1.76 ± 3.52
Radiographs	0.79 ± 2.78	0.82 ± 3.12	0.80 ± 3.01
Nonmedical practitioner	0.36 ± 3.28	0.11 ± 3.01	0.50 ± 4.20
Physiotherapy	5.81 ± 11.10	4.70 ± 9.10	5.22 ± 10.03
Acupuncture	0.97 ± 3.80	0.83 ± 3.45	0.77 ± 3.99
Physical activity/BMI			
IPAQ total score (MET, minutes/week)	2,356.2 ± 1,982.5	2,209.7 ± 1,979.2	2,401.1 ± 1,992.3
BMI, kg/m^2	28.39 ± 5.09	28.02 ± 4.45	28.12 ± 4.57
Prescriptions, no. (%)†			
Acetaminophen	22 (6.6)	31 (8.9)	25 (7.3)
Opioids	23 (6.9)	20 (5.8)	25 (7.3)
NSAID	139 (41.9)	138 (40.0)	149 (43.3)
Homeopathics	27 (8.1)	21 (6.1)	23 (6.7)

* Values are the mean ± SD unless otherwise indicated. AIMS2-SF = Arthritis Impact Measurement Scales Short Form; GP = general practitioner; BMI = body mass index; IPAQ = International Physical Activity Questionnaire; MET = metabolic equivalent; NSAID = nonsteroidal antiinflammatory drug.
† Numbers of patients receiving a defined daily dose.

Table 3. Mean changes in outcome measures between baseline and postintervention assessment in the control and intervention groups*

	Control group (n = 258)	Group I (n = 261)	ANCOVA *P* (group I vs. control)†	Group II (n = 276)	ANCOVA *P* (group II vs. control)†
Primary outcome					
Quality of life (AIMS2-SF scores)					
Lower body	0.03 (−0.21, 0.24)	0.19 (−0.01, 0.38)	0.349	0.40 (0.16, 0.64)	0.049
Upper body	−0.01 (−0.29, 0.28)	0.04 (−0.25, 0.29)	0.694	0.06 (−0.20, 0.27)	0.621
Symptom	0.09 (−0.09, 0.20)	0.36 (0.19, 0.56)	0.119	0.60 (0.28, 0.92)	0.048
Affect	0.05 (−0.12, 0.18)	−0.03 (−0.17, 0.11)	0.610	0.06 (−0.13, 0.20)	0.691
Social	0.07 (−0.05, 0.19)	0.09 (−0.02, 0.20)	0.776	0.54 (0.44, 0.86)	< 0.001
Secondary outcomes					
Health service utilization					
GP contacts	0.22 (−0.21, 0.45)	0.12 (−0.24, 0.36)	0.339	0.11 (−0.23, 0.34)	0.823
Referrals to orthopedics	0.01 (−0.05, 0.06)	0.09 (0.02, 0.15)	0.153	0.24 (−0.16, 0.31)	0.044
Radiographs	−0.06 (−0.13, 0.01)	0.07 (−0.01, 0.15)	0.050	0.09 (0.02, 0.16)	0.031
Nonmedical practitioners	0.04 (−0.02, 0.11)	0.02 (−0.06, 0.08)	0.687	0.03 (−0.06, 0.09)	0.225
Physiotherapy	0.04 (−0.05, 0.12)	0.07 (−0.04, 0.18)	0.242	0.14 (0.02, 0.23)	0.129
Acupuncture	−0.12 (−0.23, 0.02)	0.03 (−0.22, 0.25)	0.821	0.05 (−0.18, 0.27)	0.769
Physical activity/BMI					
IPAQ score	125.2 (103.8, 146.6)	131.5 (104.3, 157.2)	0.778	133.4 (118.6, 148.2)	0.667
BMI (kg/m^2)	0.09 (−0.06, 0.24)	−0.13 (−0.16, 0.03)	0.224	−0.14 (−0.17, 0.03)	0.134
Prescriptions, %‡					
Paracetamol	−1.31 (−3.01, 0.39)	7.43 (3.33, 11.53)	< 0.001	6.89 (2.93, 10.70)	< 0.001
Opioids	0.98 (−1.32, 3.28)	4.33 (3.32, 5.34)	0.077	8.80 (5.02, 12.58)	< 0.001
NSAID	2.31 (0.91, 3.71)	4.30 (2.82, 5.78)	0.076	6.54 (4.54, 8.54)	0.019
Homeopathics	1.71 (−0.49, 3.91)	1.58 (−0.52, 3.68)	0.168	2.94 (0.64, 5.24)	0.088

* Values are the mean change (95% confidence interval) unless otherwise indicated. ANCOVA = analysis of covariance; see Table 2 for additional definitions.
† ANCOVAs were adjusted for age, disease duration, PHQ-9 score, and intracluster correlation coefficient.
‡ Percentage of patients receiving a defined daily dose of the specified drug.

increased in all 3 groups, but differences between groups were not significant.

DISCUSSION

Multifaceted educational interventions with GPs provided through quality circles had no impact on patients' QOL or physical activity. However, the interventions seemed to reduce certain aspects of health service utilization, such as radiographs, and to change prescription patterns. Additional case management by practice nurses involving a frequent, structured followup with immediate feedback to GPs was able to increase certain dimensions of QOL such as pain and social contacts in patients with OA.

Although it is of great importance, providing arthritis self-management in primary care seems to be a big challenge. Buszewizc et al provided ASMPs directly to a large sample of primary care patients and achieved no significant changes in pain and physical functioning after 4 and 12 months (7). Contrary to that study, our intervention primarily focused on the GP, but the results of our intervention group I suggest that an approach that mainly uses educational interventions through GPs, even if the interventions are accompanied by written material and patient information leaflets, has no effect on patients' QOL. We were not able to evaluate how much of the information provided to the GPs finally reached the patient, but our results fit quite well with previous findings regarding the impact of educational interventions. Bloom reported that the impact on patients of educational interventions through GPs is low (34). Regarding the effect of case management, some impressive effects have already occurred in other contexts. Simple routine telephone calls were found to positively influence physical functioning and pain in patients with OA (35) and QOL of patients with diabetes (36). Our intervention was more complex than a simple telephone call and our results indicate that case management including a structured, disease-specific monitoring tool can have the same or even superior effects. Positive effects from case management have also been shown for depression (12), but previous studies have revealed inconsistent results for other diseases. It seems that the complexity of case management is correlated with the results (37). However, Moher et al (38) noticed that just setting up a patient register improved the planned followup of patients. Nevertheless, it remains unclear to what extent the effect in intervention group II, especially regarding the social scale, is due to the telephone calls or due to the frequent followup.

Regarding health service utilization, in both intervention groups the number of radiographs were reduced significantly, and in intervention group II so were referrals to orthopedics. This finding indicates that educational interventions may be appropriate to achieve effects on the GP level, in the form of referral rates. But it should be acknowledged that referral rates to nonsurgical orthopedics,

as well as number of radiographs, are extremely high in Germany (18). This may have helped achieve a significant reduction in referrals. It should also be mentioned that there have been studies in which outcomes such as guideline adherence were improved using a largely educational intervention through GPs (39).

With respect to the effects on prescription, it has to be acknowledged that the prescriptions of acetaminophen, the first-line treatment of OA according to most guidelines, and the proportion of patients receiving opioids were low at baseline. Therefore, significant changes were easy to achieve. Nevertheless, our findings confirm that peer group meetings can be useful instruments in changing prescription patterns (11). Interestingly, Moher et al recently demonstrated that a structured followup of patients with coronary heart disease is more effective if performed by practice nurses than by GPs (38). Regarding adherence to prescriptions, a recent study demonstrated that frequent telephone calls can increase patients' compliance significantly and even reduce mortality (40).

An interesting finding was that physical activity increased in all 3 groups with no significant changes between the groups. We assume that this occurred because the baseline assessment took place in early spring and the post-assessment took place 9 months later at a time when the weather is warmer and more compatible with outdoor activities. The possible effect of counseling provided by GPs seems to be weak, as a recent meta-analysis has indicated (41). However, Elley et al (42), who implemented counseling for physical activity by telephone calls, demonstrated that this intervention increased physical activity in patients, a finding that was confirmed by Castro and King (43).

Some limitations of the revealed effect should be acknowledged. First, the number of patients required to achieve the initially assumed power of 90% was not reached, but it should be noted that the number would have been adequate for a power of 80%. Regarding the validity of the data, some data such as consulting nonmedical practitioners could not be infallibly recorded on the medical file. Moreover, information about prescriptions and referrals was only available if initiated by the GP.

Besides the large sample size of primary care patients, the study has additional strengths: 1) we used a disease-specific assessment instrument for QOL that may be more sensitive to patient-relevant changes; 2) to our knowledge, this is the first study to assess case management in patients with OA; and 3) we controlled our data for severity of depression, the prevalence of which is known to be increased in patients with OA (21). Depression has a detrimental effect on certain important dimensions of QOL such as pain and physical ability. Regarding the generalizability of our results, the 75 GPs most likely reflect a representative sample in terms of localization, working experience, practice size, and nursing support.

Providing arthritis management seems challenging, and educational interventions on the GP level, even if multifaceted, do not appear to achieve significant effects on QOL. Additional case management by practice nurses increases the effect and improves certain dimensions of patients' QOL significantly. Our results encourage further research using similar approaches in other chronic diseases.

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AUTHOR CONTRIBUTIONS

Dr. Rosemann had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study design. Rosemann, Gensichen, Szecsenyi.
Acquisition of data. Rosemann.
Analysis and interpretation of data. Rosemann, Joos, Gensichen.
Manuscript preparation. Rosemann, Joos, Gensichen, Szecsenyi.
Statistical analysis. Laux.

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