Disease Burden of Patients With Osteoarthritis: Results of a Cross-Sectional Survey Linked to Claims Data

Johanna Callhoff,1 Katinka Albrecht,1 Imke Redeker,2 Toni Lange,3 Jens Goronzy,3 Klaus-Peter Günther,3 Angela Zink,2 Jochen Schmitt,3 Joachim Saam,4 and Anne Postler3

Objective. Osteoarthritis (OA) is a major reason for chronic pain, stiffness, and functional limitation. This study was undertaken to analyze factors associated with the burden of OA, taking the pattern of joint involvement into account.

Methods. From a random sample of 8,995 patients with OA (International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, German Modification codes M15 [polyarticular], M16 [hip], or M17 [knee]) from a German statutory health insurance database, 3,564 patients completed a survey including the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Patients with knee, hip, concomitant hip and knee, or polyarticular manifestation were compared concerning pain, stiffness, function, and impact on work and personal life. Data were linked to dispensation records. The association of age, sex, body mass index (BMI), symptom duration, and the World Health Organization–5 Well-Being Index (WHO-5) with WOMAC results was assessed in multiple linear regression models.

Results. Patients with knee (n = 1,448), hip (n = 959), hip and knee (n = 399), or polyarthritic (n = 758) OA were included. Concomitant hip and knee OA was accompanied by the highest WOMAC values (mean 44), frequent impairment of personal life (75%), and the highest use of analgesics (52% nonsteroidal antiinflammatory drugs, 22% opioids, and 37% others). In the regression analyses, BMI per 5 units and WHO-5 per 10% worsening were associated with an increase in WOMAC values of 4–5 points, irrespective of the joint manifestations.

Conclusion. Disease burden is high in patients with concomitant hip and knee OA and is connected with frequent prescription of analgesics. Involvement of several joints, BMI, and depressive symptoms need to be considered when using the WOMAC as an outcome instrument.

INTRODUCTION

Osteoarthritis (OA) is a major reason for chronic pain, joint stiffness, and functional limitation. In the majority of studies on the burden of OA, hip and knee OA are evaluated, while polyarthritic OA (POA) is less often considered. In the global burden of disease study, hip and knee OA were shown to be major contributors to global disability (1). So far, no disease-modifying drugs exist to provide causal OA therapy (2,3). Current treatment guidelines recommend information and education, weight loss for overweight patients, and physical therapy as the base of conservative treatment. Nonsteroidal antiinflammatory drugs (NSAIDs) are recommended for patients with persistent pain and (weak) opioids are considered the last option before total joint replacement (TJR) is indicated or if TJR is contraindicated (4). The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) is a composite instrument for the measurement of pain, stiffness, and functional limitation (5). Medication use and the WOMAC are most relevant to evaluate disease burden in OA.

In the EUROHIP study, Huber et al (6) have shown that arthritis in other major joints strongly affects the outcome of hip surgery after 1 year. Because TJR is the most frequently examined outcome within OA, data on disease burden of prior OA stages without mandatory indication of surgery are less comprehensive. The Osteo-
Callhoff et al. reported a lower health-related quality of life of patients with knee OA compared to that of the general population (7). To our knowledge, no data exist on the disease burden of unselected German patients with OA. The aim of this study was to compare the burden of OA in the knee, hip, and concomitant hip and knee and in the polyarthritic pattern. To evaluate disease burden, self-reported disease severity (using WOMAC) and the impact on personal and work life as well as dispensation records on analgesics and physical therapy were analyzed. We also compared hip and knee OA with or without concomitant POA, considering differences in age, sex, body mass index (BMI), and depressive symptoms.

**MATERIALS AND METHODS**

**Study population.** This study is part of the research project PROCLAIR (Linking Patient Reported Outcomes with Claims Data for Health Service Research in Rheumatology) (8). We used data from a German statutory health insurance fund (BARMER, with more than 9 million insured in 2018) to identify patients diagnosed with OA of the knee or hip or with POA (International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, German Modification [ICD-10-GM] codes M15–17) in ≥2 quarters of the year 2014. A sample was drawn from the patients who were continuously insured in 2014 and 2015, stratified by age (30–39, 40–49, 50–59, 60–69, 70–79 years), sex, and diagnosis (M15: POA, M16: OA of the hip, M17: OA of the knee). The strata contained 330 patients, except for men with POA ages 30–39 years. In this stratum, all 164 patients were selected. The total sample size was 9,734. Data for analysis were obtained from 2 sources: survey and claims data.

**Survey data.** After the exclusion of patients who had changed their health insurance or were deceased, in 2016 a survey was sent by mail to 8,995 patients with 1 reminder. The survey contained information on joints with current pain (last 7 days) or chronic pain (3 months in the last 2 years), symptom duration, primary physician treating the OA, WOMAC results (5,9), the World Health Organization–5 Well-Being Index (WHO-5), the impact of OA on personal and work life, and sociodemographic variables. The WHO-5 is a measure for well-being on a scale of 0–10 (where 0 = worst outcome and 10 = best outcome) (10). It is also used to identify patients at risk of depression. Values ≤28 indicate moderate to severe depression, 29–50 mild depression, and >50 no depression (10). The WHO-5 is used in a wide range of fields and shows favorable properties to detect major depression (11). The WOMAC and its subscores for pain, stiffness, and physical function are given as a percentage score, with 100 representing the worst outcome.

**Claims data.** For patients who gave their written informed consent, the survey data were linked to the individual claims data. Prescriptions of analgesics were identified using Anatomical Therapeutic Chemical classification system codes, counting patients as users if they had ≥1 prescription of the corresponding drug in that year (12).

**Assessment of nonresponse bias.** We analyzed whether there was a systematic difference between responders and nonresponders to the survey by comparing age, sex, the number of medication prescriptions as an index of comorbidity, whether an orthopedic specialist was seen in the corresponding year, and whether opioids, NSAIDs, or physical therapy were prescribed.

**Patient selection.** Four analysis groups were defined: POA, hip OA, hip and knee OA, and knee OA. Patients who were drawn in the samples for hip, hip and knee, or knee OA could have a concomitant claims diagnosis of POA. Patients who reported current or
chronic pain in the relevant joints (for POA every joint was relevant) were selected for a subgroup analysis. In the subgroup analysis, patients reporting pain in artificial joints only were excluded.

**Statistical analysis.** The results were weighted to match the distribution of all patients with OA in the claims data. This weighting ensures that the results are representative for all patients ages 30–79 years with POA, hip OA, hip and knee OA, and knee OA from the insurance population that was used. Subgroup analyses for the 4 analysis groups were performed with domain analyses, using procedures for complex survey samples in SAS/STAT software, version 9.4.

Values of the total WOMAC were compared for patients grouped by age, sex, BMI, WHO-5 groups, analgesics use, and unilateral or bilateral involvement of the joint. The association of WOMAC scores with age and sex, BMI, symptom duration, and the WHO-5 was assessed in multiple linear regression models. The models were adjusted for age and sex as confounders for the association of the other parameters with WOMAC scores. Multiple imputation, with 20 imputations for all variables used in the models, was performed using SAS software, version 9.4, with the fully conditional specification method, assuming data were missing at random.

**Ethics approval.** Ethics approval was obtained from the ethics committee of the Charité–Universitätsmedizin Berlin in March of 2015 (EA1/051/15). This research was conducted in agreement with the Declaration of Helsinki.

| Table 1. | Patient characteristics and health-related quality of life* |
|----------|-----------------------------------------------------------|
| **Variable** | **Missing, no.** | **POA (n = 758)** | **Hip OA (n = 959)** | **Hip/knee OA (n = 399)** | **Knee OA (n = 1,448)** |
| Age, mean years | 0 | 66 (66, 67) | 67 (66, 67) | 69 (69, 70) | 66 (65, 66) |
| 30–39, % | 0 | 0.5 (0.4, 0.7) | 1.0 (0.8, 1.2) | 0.3 (0.1, 0.4) | 1.3 (1.1, 1.6) |
| 40–49, % | 0 | 4 (3, 5) | 5 (4, 6) | 2 (1, 3) | 4 (3, 5) |
| 50–59, % | 0 | 20 (17, 23) | 16 (14, 19) | 10 (8, 13) | 19 (17, 21) |
| 60–69, % | 0 | 31 (27, 36) | 29 (26, 33) | 27 (22, 32) | 31 (28, 33) |
| 70–79, % | 0 | 44 (39, 49) | 48 (44, 52) | 60 (54, 65) | 43 (40, 46) |
| Female | 0 | 83 (82, 85) | 63 (61, 66) | 73 (69, 77) | 68 (67, 68) |
| Symptom duration, mean years | 471 | 14 (13, 16) | 13 (12, 14) | 15 (14, 17) | 14 (13, 15) |
| BMI, mean kg/m² | 91 | 27 (26, 27) | 27 (27, 27) | 29 (29, 29) | 29 (29, 30) |
| WOMAC total, mean | 685 | 38 (35, 40) | 37 (35, 39) | 44 (41, 46) | 38 (37, 40) |
| WOMAC stiffness, mean | 320 | 45 (42, 47) | 41 (39, 43) | 48 (45, 50) | 42 (40, 44) |
| WOMAC pain, mean | 496 | 39 (36, 41) | 37 (35, 39) | 43 (41, 46) | 39 (37, 40) |
| WOMAC function, mean | 321 | 35 (33, 37) | 35 (33, 37) | 43 (40, 46) | 37 (35, 38) |
| Bilateral OA | 1,765 | – | 54 (48, 60) | 56 (49, 63) | 60 (56, 64) |
| Concomitant RA† | 0 | 17 (13, 21) | 8 (6, 11) | 9 (5, 13) | 7 (5, 9) |
| Worsening symptoms in last 2 years | 132 | 58 (53, 63) | 54 (50, 58) | 61 (55, 67) | 54 (51, 57) |
| Impact on work life | 359 | 49 (44, 54) | 43 (39, 48) | 50 (43, 56) | 49 (46, 52) |
| Impact on personal life | 117 | 67 (63, 72) | 71 (67, 75) | 75 (70, 81) | 72 (69, 75) |

* Values are percentages unless stated otherwise (95% confidence intervals for both means and percentages are in parentheses). POA = polyarthritic osteoarthritis; OA = osteoarthritis; BMI = body mass index; WHO-5 = World Health Organization–5 Well-Being Index; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; RA = rheumatoid arthritis.
† Claims data diagnosis of International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, German Modification code M05/M06.
The proportion of women varied from 63% in hip OA to 83% in POA. The mean symptom duration varied between 13 and 15 years, the mean BMI was 27 kg/m² for POA and hip OA and 29 kg/m² for knee OA with or without hip OA. The frequency of obesity (BMI >30 kg/m²) was 25% in patients ages 70–79 years and between 34% and 38% in patients ages 30–69 years. Signs of at least mild depression (WHO-5 ≤50) were most frequently present in concomitant hip and knee OA patients (52%) compared to 42% to 47% in the other groups. There were no sex differences for depressive symptoms. Patients ages 40–49 and 50–59 years showed signs of moderate-to-severe depression most often (29% and 34% versus 19–26% in the other age groups).

WOMAC total mean values were highest in patients with OA of the hip and knee (mean 44), compared to 37 and 38 in the other groups. The WOMAC subcategories of stiffness, pain, and function were similarly distributed. More than half of the patients with hip and knee OA were affected bilaterally, and the WOMAC values in bilateral involvement were significantly higher when compared with unilateral involvement. In the POA group, 17% of patients also had a claims data diagnosis of rheumatoid arthritis (RA) compared to 8% in hip OA, 7% in knee OA, and 9% in hip and knee OA. Patients with hip and knee OA most frequently reported an impact on their personal life (75%). The proportion of patients who reported an impact on their work life did not differ much between the groups (43–50%).

Dispensation of analgesics was also highest in the group with concomitant hip and knee OA, with 36% of the patients reporting daily use of analgesics compared to 21–24% in the other groups.

Table 2. WOMAC values with 95% confidence intervals*

| Variable                  | POA (n = 758) | Hip OA (n = 959) | Hip/knee OA (n = 399) | Knee OA (n = 1,448) |
|---------------------------|---------------|------------------|-----------------------|---------------------|
| Age, years                |               |                  |                       |                     |
| 30–39                     | 29 (25, 34)   | 32 (28, 36)      | 44 (33, 56)           | 28 (24, 32)         |
| 40–49                     | 32 (28, 35)   | 35 (31, 39)      | 46 (39, 54)           | 36 (33, 39)         |
| 50–59                     | 35 (32, 39)   | 41 (38, 44)      | 47 (42, 52)           | 42 (39, 45)         |
| 60–69                     | 38 (34, 43)   | 36 (33, 40)      | 45 (40, 49)           | 36 (33, 39)         |
| 70–79                     | 39 (35, 44)   | 36 (32, 40)      | 42 (39, 46)           | 39 (36, 42)         |
| Sex                       |               |                  |                       |                     |
| Female                    | 38 (35, 41)   | 37 (34, 40)      | 45 (41, 48)           | 40 (38, 42)         |
| Male                      | 35 (32, 38)   | 37 (34, 39)      | 41 (37, 44)           | 36 (34, 38)         |
| BMI, kg/m²                |               |                  |                       |                     |
| >30                       | 40 (36, 44)   | 43 (39, 46)      | 47 (43, 51)           | 45 (43, 47)         |
| ≤30                       | 37 (34, 40)   | 36 (33, 38)      | 42 (39, 46)           | 34 (32, 36)         |
| WHO-5                     |               |                  |                       |                     |
| ≤28                       | 50 (46, 55)   | 54 (50, 57)      | 59 (55, 62)           | 54 (51, 57)         |
| 29–50                     | 46 (43, 50)   | 41 (37, 44)      | 48 (44, 53)           | 44 (42, 47)         |
| >50                       | 28 (25, 31)   | 30 (28, 33)      | 32 (29, 35)           | 30 (28, 32)         |
| Analgesics prescription†  |               |                  |                       |                     |
| Opioid                    | 54 (50, 59)   | 49 (45, 53)      | 54 (50, 58)           | 52 (49, 56)         |
| No opioid                 | 35 (32, 37)   | 35 (33, 37)      | 41 (38, 44)           | 36 (35, 38)         |
| NSAID                     | 42 (38, 45)   | 40 (37, 43)      | 47 (44, 50)           | 42 (40, 44)         |
| No NSAID                  | 34 (31, 38)   | 35 (32, 38)      | 39 (35, 43)           | 35 (33, 38)         |
| Other analgesics          | 44 (40, 49)   | 45 (41, 49)      | 48 (44, 52)           | 46 (43, 49)         |
| No other analgesics       | 35 (33, 38)   | 34 (32, 36)      | 41 (38, 44)           | 35 (34, 37)         |
| Affected joints           |               |                  |                       |                     |
| Bilateral OA              | –             | 45 (42, 48)      | 51 (48, 54)           | 45 (43, 47)         |
| Unilateral OA             | –             | 38 (35, 42)      | 38 (33, 42)           | 36 (33, 38)         |
| Total                     | 38 (35, 40)   | 37 (35, 39)      | 44 (41, 46)           | 38 (37, 40)         |

* WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; POA = polyarthritic osteoarthritis; OA = osteoarthritis; NSAID = nonsteroidal antiinflammatory drug.
† Values derived from claims data.
and 22% of patients with an opioid prescription in hip and knee OA, compared to 14% in the other groups (Figure 2). NSAIDs were prescribed for 45% of patients (with POA) to 52% (with hip and knee OA). Medication prescription rates did not differ substantially between the POA, hip OA, and knee OA groups. Patients who reported no use of analgesics had much lower prescription rates of physical therapy (22% in POA, 27% in hip OA, 48% in hip and knee OA, and 31% in knee OA). The mean WOMAC values of those patients ranged from 21 to 25.

Factors associated with the WOMAC. To identify particularly severely affected groups, the WOMAC was evaluated separately by age group, sex, symptom duration, BMI, WHO-5 category, use of opioids, NSAID, or other analgesics, and unilateral or bilateral involvement (Table 2). Older patients tended to have a higher WOMAC score, with the exception of concomitant hip and knee OA. In POA, hip and knee OA, and knee OA, women had slightly higher values. Overweight patients with a BMI >30 kg/m² had higher WOMAC values than patients with a BMI ≤30 kg/m². Patients who reported moderate-to-severe depressive symptoms (WHO-5 ≤28) had much higher WOMAC values in all OA groups than patients without depressive symptoms (54 versus 30 in hip OA, 54 versus 30 in knee OA). Across all groups, patients with pain medication prescriptions (opioids, NSAIDs, or other analgesics) had higher mean WOMAC values than patients without prescriptions. This difference was especially pronounced for opioid prescriptions (54 versus 35 in POA, 49 versus 35 in hip OA, 54 versus 41 in hip and knee OA, and 52 versus 36 in knee OA). Patients with bilateral involvement had higher WOMAC values than patients with unilateral disease (45 versus 38 in hip OA, 51 versus 38 in hip and knee OA, and 45 versus 36 in knee OA).

Multiple linear regression models. In multiple linear regression models, age was only associated with WOMAC scores for hip and knee OA (Table 3), while sex was only associated with WOMAC scores for hip OA. BMI was associated in all OA groups, with an increase of the WOMAC score of 4.8 (95% confidence interval [95% CI] 3.6, 6.0) for POA, 4.0 (95% CI 2.1, 5.9) for hip OA, 4.1 (95% CI 1.9, 6.4) for hip and knee OA, and 3.7 (95% CI 1.4, 6.1) for knee OA.

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**Table 3.** Results of 4 separate multiple linear regression models and 95% confidence intervals with WOMAC score as the dependent variable*

| Parameter | Reference | POA | Hip OA | Hip and knee OA | Knee OA |
|-----------|-----------|-----|--------|----------------|--------|
| Model 1:  |           |     |        |                |        |
| Age       | Per 10 years | 0.8 (-0.5, 2.1) | -0.4 (-2.1, 1.3) | 2.6 (0.4, 4.8) | -1.7 (-4.2, 0.9) |
| Male      | Female    | -3.5 (-6.2, -0.8) | -1.0 (-4.5, 2.5) | -2.9 (-7.0, 1.3) | -3.9 (-8.9, 1.0) |
| Model 2: BMI, kg/m²† | Per 5 units | 4.8 (3.6, 6.0) | 4.0 (2.1, 5.9) | 4.1 (1.9, 6.4) | 3.7 (1.4, 6.1) |
| Model 3: symptom duration† | Per 10 years | 3.4 (2.1, 4.6) | 4.0 (2.6, 5.3) | 2.2 (0.0, 4.4) | 3.3 (1.6, 5.0) |
| Model 4: WHO-5 (range 0–100)† | Per 10% worsening | 4.6 (4.1, 5.1) | 4.3 (3.8, 5.1) | 4.2 (3.3, 5.0) | 4.8 (3.9, 5.7) |

* WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; POA = polyarticular osteoarthritis; OA = osteoarthritis; BMI = body mass index; WHO-5 = World Health Organization–5 Well-Being Index.
† Model adjusted for age and sex.

**Table 4.** Differences between patients with unilateral and bilateral involvement*

| Variable | Hip OA | Hip and knee OA | Knee OA |
|----------|--------|----------------|--------|
| Age, mean years | | | |
| Female | 64 (63, 66) | 68 (67, 68) | 67 (66, 69) | 70 (69, 71) | 64 (64, 65) | 66 (66, 67) |
| WHO-5 ≤28 | 31 (23, 38) | 18 (14, 21) | 37 (28, 46) | 25 (17, 32) | 28 (23, 32) | 20 (16, 23) |
| 29–50 | 25 (18, 32) | 20 (15, 24) | 21 (13, 28) | 23 (16, 30) | 26 (21, 31) | 21 (18, 25) |
| >50 | 45 (37, 52) | 63 (58, 68) | 42 (33, 52) | 52 (44, 60) | 46 (41, 51) | 59 (55, 63) |
| WOMAC total, mean | 45 (42, 48) | 34 (31, 36) | 51 (48, 54) | 39 (35, 42) | 45 (43, 47) | 33 (31, 36) |
| Daily intake of analgesics | 30 (23, 37) | 18 (14, 22) | 46 (37, 56) | 30 (23, 37) | 28 (23, 32) | 22 (18, 25) |
| NSAID prescription† | 41 (34, 49) | 45 (41, 50) | 58 (48, 67) | 49 (41, 57) | 53 (48, 58) | 47 (43, 51) |
| Opioid prescription† | 22 (15, 29) | 12 (9, 14) | 25 (17, 34) | 19 (13, 26) | 15 (12, 19) | 14 (11, 17) |
| Other analgesics prescription | 32 (24, 39) | 25 (20, 29) | 30 (21, 39) | 41 (34, 49) | 30 (25, 35) | 25 (21, 29) |
| Physical therapy prescription | 48 (41, 56) | 45 (41, 50) | 61 (51, 70) | 59 (52, 67) | 49 (44, 54) | 46 (42, 50) |

* Values are percentages unless stated otherwise (95% confidence intervals for both means and percentages are in parentheses). For patients with hip and knee osteoarthritis (OA), both knees or both hips had to be symptomatic to be counted as affected bilaterally. WHO-5 = World Health Organization–5 Well-Being Index; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; NSAID = nonsteroidal antiinflammatory drug.
† Derived from claims data.
Comparison of patients with unilateral or bilateral involvement of the hip or knee. Patients with unilateral hip OA, knee OA, or hip and knee OA were compared to those with bilateral OA on the respective joints (Table 4). Among the groups with bilateral involvement, patients were slightly younger. More patients in the bilaterally affected groups showed signs of moderate to severe depression (hip OA: 31% bilateral versus 16% unilateral; hip and knee: 37% bilateral versus 25% unilateral; knee OA: 28% bilateral versus 20% unilateral). There were more patients with daily intake of analgesics, opioids, and other analgesics in the bilateral groups. The difference in opioid prescription was especially high in hip OA; 22% in the bilateral group versus 12% in the unilateral group were prescribed opioids. The proportion of patients with a prescription of NSAIDs and physical therapy did not differ substantially.

Comparison of patients with and without concomitant POA. For the 3 groups of hip OA, hip and knee OA, and knee OA, the patients with an additional claims diagnosis of POA were compared to those without POA (see Supplementary Table 2, available on the Arthritis Care & Research web site at http://onlinelibrary.wiley.com/doi/10.1002/acr.24058/abstract). Patients with POA were 1–5 years older, and there were more women in this group. Depressive symptoms were more prominent, and medication intake was higher in the groups with concomitant POA. Prescription rates of physical therapy were higher for patients with hip OA and POA than for patients with hip OA alone. For hip and knee and knee OA, these rates stayed roughly the same.

Subgroup analyses for patients with symptomatic OA. All analyses were repeated using only those patients who reported current (during the last 7 days) or chronic (for ≥3 months during the last 2 years) symptoms in the joints corresponding to the claims diagnosis. Supplementary Figure 1, available on the Arthritis Care & Research web site at http://onlinelibrary.wiley.com/doi/10.1002/acr.24058/abstract, shows how many patients remained in the analysis groups. Supplementary Table 1, available at http://onlinelibrary.wiley.com/doi/10.1002/acr.24058/abstract, shows the characteristics of these patients. No substantial changes in the analyses occurred if patients without current or chronic symptoms were excluded. The overall WOMAC score somewhat increased, but the differences between the OA manifestations remained.

DISCUSSION

The disease burden of OA was investigated in a random sample of patients with OA from a statutory health insurance data-base. The unique combination of survey data with claims data in the PROCLAIR study allowed us to analyze patient-reported outcomes with the background knowledge of all prescribed medications and physical therapy.

The study has yielded several results. Self-reported outcomes on disease burden differed, depending on the joint manifestation. Patients with concomitant hip and knee OA, bilateral hip or knee OA, and patients with hip or knee OA in addition to concomitant POA reported the greatest impairment on all WOMAC subscales, as well as the greatest impact on work and personal life. Pain in joints other than the target joint has been reported to be associated with worse outcomes on pain and function, which is plausible (13). However, WOMAC values are frequently used preoperatively to evaluate a single knee or hip joint status, for example in the surgeons’ recommendation for TJR (14,15). When cut points for treatment recommendations are discussed (16) or when WOMAC values are individually evaluated, our results show that all affected joints need to be considered.

The high disease burden in concomitant hip and knee OA is also reflected in a higher analgesics use. Dispensed prescriptions of analgesics in the claims data that were linked to patient-reported OA symptoms in the PROCLAIR study add to the knowledge on analgesics use in OA. Previous studies such as the Osteoarthritis Initiative have investigated self-reported analgesics use with the “brown bag” method (patients bring in all prescriptions) or performed telephone interviews (17). Overall use of NSAIDs and opioids in our claims records was higher compared to international data (18–20). Our data reveal a higher use of NSAIDs, opioids, and other analgesics in patients with concomitant hip and knee OA. We do not know the reason for opioid prescription, but for all OA groups, OA burden was highest for those with an opioid prescription, suggesting that patients most affected are prescribed opioids. In the context of current research on the comparative effectiveness of opioids and NSAIDs, the rate of opioid prescriptions will hopefully decline in the future. The findings of a systematic review and meta-analysis as well as the results of the SPACE pragmatic trial (21) suggest that NSAIDs offer similar levels of pain relief in OA (22) as opioids.

Up to 25% of the patients reported not using any analgesics. More than half of these patients stated that they did not want to take any medication, and the remainder stated that they did not need pain medication. Patient education might help to ensure that all patients who would likely benefit from medications have access to them.

Nonpharmacologic treatment for the management of OA is strongly recommended by the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (4), and exercise education has been shown to be effective in hip and knee OA (23,24). However, deficits in the use of exercise, weight management, and other behavioral and rehabilitation strategies as well as the overuse of opioid analgesics have been recognized (25). Prescription rates of physical therapy...
are quite low in this study (46–60%) and suggest that there is room for improvement concerning the use of physical therapy in the treatment of OA in Germany. Even lower prescription numbers have been reported from US claims data (20% physical therapy and <3% massage therapy) (26), but overall there are few data on the frequency of physical therapy in OA. A separate analysis in the PROCLAIM project also showed that only half of the patients with hip or knee OA were prescribed physical therapy in the year before joint replacement surgery (27).

Patients with POA had less pain medication and lower WOMAC values than patients with knee or hip OA. Nearly every fifth patient in this group also had a claims diagnosis of RA. This finding of a lower disease burden of POA or hand involvement caused by OA or RA is in accordance with the findings of Chua et al (28). They showed that OA patients had a similar burden as RA patients regarding pain as well as physical function, measured by the Health Assessment Questionnaire and by WOMAC in retrospectively reviewing several cohorts over time. However, WOMAC does not ask for specific impairment caused by finger or hand involvement.

Risk factors for disease burden in OA were described as personal risk factors (age, sex, obesity, genetics, diet) and joint-level risk factors by Palazzo et al (29). Of these factors, data on age, sex, and obesity were available in this study. While age was only associated with OA burden measured by the WOMAC for POA in this study, BMI as a measure for obesity was associated with higher WOMAC scores for all OA groups. Obesity is known as a modifiable risk factor for OA (30) and for functional limitation as well (31). Patients with knee OA show a significantly higher prevalence of obesity when compared with patients who have hip OA. Although a dose-response relationship between BMI and risk of hip OA exists (32), obesity is a more important risk factor for the development of knee OA (30,33). Higher levels of depressive symptoms according to WHO-5 were also associated with WOMAC scores in all groups. The association between depression and disease burden was also shown by Sharma et al (34) in a systematic literature review. Other reports indicate that comorbidity is also associated with pain and functional outcomes (35,36) and therefore needs to be accounted for.

The results of our study need to be viewed in the context of understanding that patients who sent back the survey were likely to be affected more severely than patients not responding (the prescription rate of NSAIDs and physical therapy was higher in responders). This nonresponse bias probably led to worse outcomes in the reported data. Approximately 30% of the patients reported no current or chronic symptoms. We did a subgroup analysis using only data from the patients who reported symptoms, and the results did not differ substantially. Given the fluctuating character of OA symptoms, this finding indicates that the claims diagnosis alone is useful to identify patients with OA.

This was a cross-sectional analysis. We therefore could not investigate any trends in time. Patients were selected based on 2 reported claims diagnoses of OA and in a subgroup analysis by patient-reported symptoms in the corresponding joints. A clinical diagnosis or radiographic grade of OA were not available. How patients with concomitant hip and knee OA are handled with respect to ICD-10 diagnoses is not clear. The description of the ICD-10-GM M15 code for POA is suitable for this group. Because there are substantial numbers of patients with concomitant diagnoses of hip and knee OA who have no POA diagnosis, coding these types of OA separately seems to be more common.

To our knowledge, this is the first study investigating disease burden of OA including unselected OA patients in Germany. The combination of claims and self-reported data ensured that there was no recall bias for medication or physical therapy and added patient-reported information to the comprehensive claims data.

The evaluation of disease burden in OA with instruments such as the WOMAC depends on the patterns of joint manifestation as well as on comorbid obesity and depressive symptoms. In OA management, the patients need to be viewed holistically, even if a single joint is the focus of care. The range of nonpharmacologic and medical therapeutic options should be used, paying greater attention to physical therapy options.

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AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be submitted for publication. Dr. Callhoff 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 conception and design. Callhoff, Albrecht, Lange, Goronzky, Günther, Zink, Schmitt, Postler.

Acquisition of data. Callhoff, Albrecht, Redeker, Saam.

Analysis and interpretation of data. Callhoff, Albrecht, Redeker, Lange, Goronzky, Günther, Zink, Schmitt, Postler.

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