Work and Health in Early Arthritis

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Chapter 1

General Introduction

1. Introduction

Rheumatoid arthritis (RA) is an autoimmune disease characterized by chronic inflammation of the joints, which may result in joint damage. Any joint may be affected, but most commonly small joints in the hands and feet, wrists, elbows, and knees are involved. The onset of RA increases with age, and rises substantially from the ages of 40 to 50 years onwards. The prevalence is about 1% in the Western world, and women are two to three times more likely to be affected than men[1, 2]. Important consequences of RA are pain and disability. Disability may range from limitations in executing a simple task to restrictions in societal roles, including participation in paid employment[3-6].

"I was great for 4 years and then I flared so badly I could barely walk to work or write. Lifting up a pencil was killing me. So you could be going along and everything is on track and then everything just falls apart." (Quote of RA patient) [7]

1.1. The influence of (rheumatoid) arthritis on work

Workers with rheumatoid arthritis have an increased risk of adverse work-related outcomes. In persons with longstanding RA, the prevalence of paid employment is estimated to be 4% to 28% lower compared to the general population, whereas the prevalence of (partial) disability pensions is 11% to 52% higher[8-12]. Several studies found that the increase in work disability was highest during the first years of RA[9, 13, 14]. In European cohort studies, about one third of the RA patients quitted employment during the first 2-3 years of disease[15-17]. Work disability ranged from 23% to 31% after 1 to 2 years, and from 30% to 72% after five years[8, 13, 14].

Rheumatic diseases cover over 100 different rheumatic conditions. Across these different rheumatic conditions, work disability is in general less frequently reported than in persons with RA[18]. Nevertheless, in workers with any form of arthritis or rheumatism, working life expectancy is about 4.2 years lower in men and 3.1 years in women[19]. Since only 24% to 39% of the persons with arthritis that quit employment will succeed in regaining a paid job, prevention of work loss seems crucial[20, 21].

In addition to employment status, the performance at work of persons with rheumatic diseases is increasingly gaining attention. This includes sick leave and productivity loss while being present at work. Sick leave has more frequently been observed among workers with various longstanding rheumatic conditions[10, 22-24]. A reduced productivity at work was described by almost half of the workers with RA and/or osteoarthritis[25]. In another study, a productivity loss at work of 2.5% due to arthritis in those receiving treatment was found. Productivity loss especially occurred during physically strenuous activities in the job[26]. The indirect costs of a reduced performance at work are substantial, and may exceed the costs resulting from work disability[25].

Risk factors of work disability in RA patients include the severity of the disease as well as individual and job-related characteristics, which is in line with the framework of the International Classification of Functioning, Disability and Health (ICF)[6]. Poor physical function has consistently been described as a strong determinant of increased work disability. Higher levels of pain may also play a role[27]. Some studies found that the clinical characteristics disease duration, high number of swollen joints, and high erythocyte sedimentation rate were related to an increased work disability, whereas others did not[5, 27]. The demographic variables older age and lower educational level strongly predict increased work disability[5, 27]. Besides, Chorus et al. (2001)[28] showed that those passively coping with pain and limitations were more likely to be unemployed. Well-known job-related risk factors are blue-collar work and high physically demanding work[5, 27]. Other work-related characteristics, such as not supervising others, not being self-employed, low job autonomy or lack of control over work pace and activities, and lack of support at work, have also been related to an increased likelihood of work disability[28-32].

"As I'm the supervisor (of the road construction)…, I direct and distribute the work; it's my responsibility, which is lucky . . . It would have been very different if I have been a road worker having to stand shovelling half a day time alongside an excavator". . ." if I would had had a heavy work it would not have been easy to continue." (Quote of RA patient) [33]

Some of these disease-related, individual and job-related risk factors of work disability have not only been described in persons with RA, but also in persons with other rheumatic diseases[34].

Until now, most research has focused on employment status, especially on work disability. Work disability is a rather crude outcome measure, which only gives insight in the final stage of the process leading to work loss. Sick leave usually precedes work disability[35-37]. Moreover, sick leave and productivity loss while present at work reflect a reduced capacity to meet the demands of the job. However, insight in the occurrence of sick leave and productivity loss at work is limited. Prospective studies to determine the relative contribution of clinical, individual, and job-related factors to sick leave and productivity loss are lacking. In addition, most research described the performance at work in persons with chronic rheumatic diseases. As a consequence, little is known on the early phase of inflammatory joint complaints, when patients seek care and the diagnosis is not yet known. This early phase may be crucial for remaining employed.

1.2. The influence of working conditions on prognosis

In contrast to the influence of rheumatic diseases on work, the influence of working conditions on prognosis, i.e. the other direction of the relation between arthritis and work, has rarely been studied. Workers with longstanding RA and/or osteoarthritis have reported that work interfered with managing arthritis[38]. In a cross-sectional study, extensive hand use in occupational activities was associated with higher pain intensity in the hand joints of persons with longstanding RA[39]. Outside the workplace, in randomized controlled trials, mechanical loading of the joints in dynamic exercise training did not increase pain, disease activity or joint damage in RA patients[40, 41]. However, no prospective study on the influence of working conditions on prognosis has been performed yet.

1.3. Reasons to focus on work and health in early arthritis

Rheumatic diseases influence work participation, and working conditions might influence prognosis of the disease. However, little is known on sick leave and productivity loss at work in an early phase of inflammatory joint conditions, and prospective studies on risk factors are lacking. Especially in the early phase of inflammatory joint conditions, knowledge of these risk factors is of interest, since clinical and work characteristics may be amendable to change as a part of early tertiary intervention. Secondly, the influence of working conditions on the prognosis in early inflammatory joint conditions is unknown. Insight in the impact of work characteristics could provide guidance on how to continue employment from complaints onset onwards without hampering the prognosis.

2. Objectives of this thesis

The primary objectives of this thesis are:

1. To describe the influence of early inflammatory joint conditions, individual factors, and work-related factors on health and performance at work.
2. To determine the influence of work-related factors on the prognosis of early inflammatory joint conditions.

3. Study population

In order to study the primary objectives of this thesis, data with one year of follow-up of the Rotterdam Early Arthritis CoHort (REACH) were used. REACH is an ongoing inception cohort study with four years of follow-up, with assessments at baseline, after 6 months, after 12 months, and yearly thereafter. REACH aims to study the etiopathogenesis, diagnostic strategies, and outcome of persons with inflammatory joint complaints for less than 12 months.

General practitioners and rheumatologists (1 university hospital, several general hospitals) in the greater area of Rotterdam have invited patients to participate in REACH from July 2004 onwards. After a general practitioner or rheumatologists refers a patient to REACH, a telephone interview and medical examination is performed to verify inclusion and exclusion criteria (Figure 1). Patients are included in REACH if:

1. clinical synovitis in at least one joint, or complaints in at least two joints in combination with at least two of the following criteria ascertained during medical examination by a member of the REACH team: morning stiffness longer than one hour, bilateral compression pain in the metacarpophalangeal joints or metatarsophalangeal joints, symmetrical presentation, positive family history, non-fitting shoes, non-fitting rings, pins and needles in fingers, or unexplained fatigue for less than 1 year, and,
2. joint complaints exist for less than 12 months with no requirement of a minimum duration.

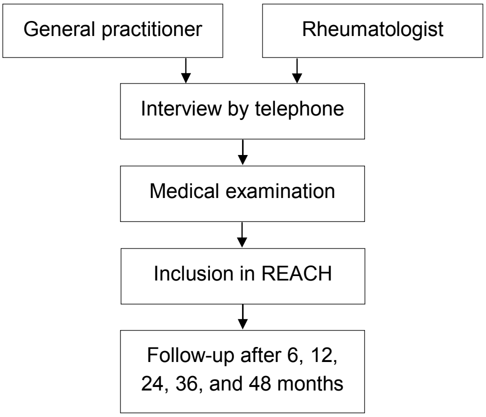
Patients are excluded if:

1. complaints are due to trauma/mechanical problems, or
2. age is under 16 years old, or
3. no written communication is possible in Dutch, English, French or Turkish, or
4. a prior diagnosis of rheumatoid arthritis, spondyl arthropathy, Sjögren's syndrome, systemic lupus erythematosus or juvenile arthritis had been made by a rheumatologist.

In this thesis, patients who were sent by general practitioners or rheumatologists for inclusion in REACH up to July 2006 were studied. This date was chosen to ensure that every study in this thesis will describe the same study population.

Data collection at baseline and during follow-up includes a large array of detailed medical examination and self-reported questionnaires. The medical examination includes medical history, physical examination, laboratory tests, and X-rays. Questionnaires

Figure 1. Inclusion in the Rotterdam Early Arthritis CoHort (REACH)



cover, among others, demographic variables, health-related quality of life, employment, and psychosocial characteristics. When patients enter the study, they can choose to provide only limited medical data and/or self-reported questionnaires.

Cohort studies of persons with early arthritis have previously been set up[42-45]. One of the most distinctive features of REACH compared to earlier studies is the inclusion of persons with characteristics indicating inflammatory disease, whereas clinical synovitis is not present. As a consequence, persons are included in REACH in an earlier phase of disease and with a greater variety of early inflammatory arthropathies.

4. Outline of this thesis

Following this general introduction, Chapter 2 to 5 will address the first objective of this thesis, i.e. the influence of inflammatory joint conditions, individual, and work-related factors on health and performance at work. Chapter 6 will focus on the second objective of this thesis, i.e. the influence of working conditions on the prognosis of early inflammatory joint conditions.

Chapter 2 gives an overview of the literature on the consequences of rheumatoid arthritis for the performance of social roles, including work participation. To gain insight in perceived health among persons with early inflammatory joint conditions, Chapter 3 presents a cross-sectional study on health-related quality of life (HRQOL), and related clinical and individual characteristics. In Chapter 4, a cross-sectional study describes the occurrence of sick leave in the six months before persons with early inflammatory joint conditions seek care. An attempt is made to identify clinical, individual and work-related characteristics related to sick leave. Following this study, Chapter 5 presents a longitudinal study with one year of follow-up on predictors of sick leave and productivity loss at work. The occurrence of job adaptations due to the inflammatory joint conditions is also described in this study. In Chapter 6, a prospective study on the influence of work-related factors on the prognosis of early inflammatory joint conditions is presented. Focus is on the prognosis of pain, physical functioning, and the number of swollen joints. Chapter 7 discusses the main findings of the previous chapters within the light of the objectives of this thesis. Methodological considerations and recommendations for clinical practice and future research are presented.

References

1. Hakim A, Clunie G. Oxford handbook of rheumatology. Oxford: Oxford University Press; 2002.
2. Silman AJ, Hochberg MC. Epidemiology of rheumatic diseases second edition. Oxford: Oxford University Press; 2001.
3. Hazes JM. Determinants of physical function in rheumatoid arthritis: association with the disease process. Rheumatology (Oxford) 2003;42 Suppl 2:ii17-21.
4. Lapsley HM, March LM, Tribe KL, Cross MJ, Courtenay BG, Brooks PM. Living with rheumatoid arthritis: expenditures, health status, and social impact on patients. Ann Rheum Dis 2002;61(9):818-21.
5. Verstappen SM, Bijlsma JW, Verkleij H, et al. Overview of work disability in rheumatoid arthritis patients as observed in cross-sectional and longitudinal surveys. Arthritis Rheum 2004;51(3):488-97.
6. WHO. International Classification of Functioning, Disability and Health: ICF. Geneva: World Health Organization; 2001.
7. Mancuso CA, Paget SA, Charlson ME. Adaptations made by rheumatoid arthritis patients to continue working: a pilot study of workplace challenges and successful adaptations. Arthritis Care Res 2000;13(2):89-99.
8. Albers JM, Kuper HH, van Riel PL, et al. Socio-economic consequences of rheumatoid arthritis in the first years of the disease. Rheumatology (Oxford) 1999;38(5):423-30.
9. Barrett EM, Scott DG, Wiles NJ, Symmons DP. The impact of rheumatoid arthritis on employment status in the early years of disease: a UK community-based study. Rheumatology (Oxford) 2000;39(12):1403-9.
10. Dadoniene J, Stropuviene S, Venalis A, Boonen A. High work disability rate among rheumatoid arthritis patients in Lithuania. Arthritis Rheum 2004;51(3):433-9.
11. van Jaarsveld CH, Jacobs JW, Schrijvers AJ, van Albada-Kuipers GA, Hofman DM, Bijlsma JW. Effects of rheumatoid arthritis on employment and social participation during the first years of disease in The Netherlands. Br J Rheumatol 1998;37(8):848-53.
12. Verstappen SM, Boonen A, Bijlsma JW, et al. Working status among Dutch patients with rheumatoid arthritis: work disability and working conditions. Rheumatology (Oxford) 2004.
13. Jantti J, Aho K, Kaarela K, Kautiainen H. Work disability in an inception cohort of patients with seropositive rheumatoid arthritis: a 20 year study. Rheumatology (Oxford) 1999;38(11):1138-41.
14. Sokka T, Kautiainen H, Mottonen T, Hannonen P. Work disability in rheumatoid arthritis 10 years after the diagnosis. J Rheumatol 1999;26(8):1681-5.
15. Hakkinen A, Sokka T, Lietsalmi AM, Kautiainen H, Hannonen P. Effects of dynamic strength training on physical function, Valpar 9 work sample test, and working capacity in patients with recent-onset rheumatoid arthritis. Arthritis Rheum 2003;49(1):71-7.
16. Hallert E, Husberg M, Jonsson D, Skogh T. Rheumatoid arthritis is already expensive during the first year of the disease (the Swedish TIRA project). Rheumatology (Oxford) 2004;43(11):1374-82.
17. Korthals-de Bos I, Van Tulder M, Boers M, et al. Indirect and total costs of early rheumatoid arthritis: a randomized comparison of combined step-down prednisolone, methotrexate, and sulfasalazine with sulfasalazine alone. J Rheumatol 2004;31(9):1709-16.
18. Mau W, Listing J, Huscher D, Zeidler H, Zink A. Employment across chronic inflammatory rheumatic diseases and comparison with the general population. J Rheumatol 2005;32(4):721-8.

19. Lacaille D, Hogg RS. The effect of arthritis on working life expectancy. J Rheumatol 2001;28(10):2315-9.
20. Allaire S, Wolfe F, Niu J, Lavalley MP. Contemporary prevalence and incidence of work disability associated with rheumatoid arthritis in the US. Arthritis Rheum 2008;59(4):474-80.
21. Straaton KV, Maisiak R, Wrigley JM, White MB, Johnson P, Fine PR. Barriers to return to work among persons unemployed due to arthritis and musculoskeletal disorders. Arthritis Rheum 1996;39(1):101-9.
22. Kessler RC, Maclean JR, Petukhova M, et al. The effects of rheumatoid arthritis on labor force participation, work performance, and healthcare costs in two workplace samples. J Occup Environ Med 2008;50(1):88-98.
23. Kleinman NL, Brook RA, Patel PA, et al. The impact of gout on work absence and productivity. Value Health 2007;10(4):231-7.
24. Muchmore L, Lynch WD, Gardner HH, Williamson T, Burke T. Prevalence of arthritis and associated joint disorders in an employed population and the associated healthcare, sick leave, disability, and workers' compensation benefits cost and productivity loss of employers. J Occup Environ Med 2003;45(4):369-78.
25. Li X, Gignac MA, Anis AH. The indirect costs of arthritis resulting from unemployment, reduced performance, and occupational changes while at work. Med Care 2006;44(4):304-10.
26. Burton WN, Chen CY, Schultz AB, Conti DJ, Pransky G, Edington DW. Worker productivity loss associated with arthritis. Dis Manag 2006;9(3):131-43.
27. Sokka T, Pincus T. Markers for work disability in rheumatoid arthritis. J Rheumatol 2001;28(7):1718-22.
28. Chorus AM, Miedema HS, Wevers CW, van der Linden S. Work factors and behavioural coping in relation to withdrawal from the labour force in patients with rheumatoid arthritis. Ann Rheum Dis 2001;60(11):1025-32.
29. Yelin E, Meenan R, Nevitt M, Epstein W. Work disability in rheumatoid arthritis: effects of disease, social, and work factors. Ann Intern Med 1980;93(4):551-6.
30. Lacaille D, Sheps S, Spinelli JJ, Chalmers A, Esdaile JM. Identification of modifiable work-related factors that influence the risk of work disability in rheumatoid arthritis. Arthritis Rheum 2004;51(5):843-52.
31. Reisine S, McQuillan J, Fifield J. Predictors of work disability in rheumatoid arthritis patients. A five-year followup. Arthritis Rheum 1995;38(11):1630-7.
32. Reisine ST, Grady KE, Goodenow C, Fifield J. Work disability among women with rheumatoid arthritis. The relative importance of disease, social, work, and family factors. Arthritis Rheum 1989;32(5):538-43.
33. Nilsson I, Fitinghoff H, Lilja M. Continuing to work after the onset of rheumatoid arthritis. Work 2007;28(4):335-42.
34. Boonen A, de Vet H, van der Heijde D, van der Linden S. Work status and its determinants among patients with ankylosing spondylitis. A systematic literature review. J Rheumatol 2001;28(5):1056-62.
35. de Buck PD, de Bock GH, van Dijk F, van den Hout WB, Vandenbroucke JP, Vliet Vlieland TP. Sick leave as a predictor of job loss in patients with chronic arthritis. Int Arch Occup Environ Health 2006;80(2):160-70.
36. Reisine S, Fifield J, Walsh SJ, Feinn R. Factors associated with continued employment among patients with rheumatoid arthritis: a survival model. J Rheumatol 2001;28(11):2400-8.

37. Zirkzee EJ, Sneep AC, de Buck PD, et al. Sick leave and work disability in patients with early arthritis. Clin Rheumatol 2008. Jan;27(1):11-9.

38. Gignac MA, Sutton D, Badley EM. Reexamining the arthritis-employment interface: perceptions of arthritis-work spillover among employed adults. Arthritis Rheum 2006;55(2):233-40.

39. Allaire S, Wolfe F, Niu J, Baker N, Michaud K, LaValley M. Extent of occupational hand use among persons with rheumatoid arthritis. Arthritis Rheum 2006;55(2):294-9.

40. de Jong Z, Munneke M, Zwinderman AH, et al. Is a long-term high-intensity exercise program effective and safe in patients with rheumatoid arthritis? Results of a randomized controlled trial. Arthritis Rheum 2003;48(9):2415-24.

41. Gaudin P, Leguen-Guegan S, Allenet B, Baillet A, Grange L, Juvin R. Is dynamic exercise beneficial in patients with rheumatoid arthritis? Joint Bone Spine 2008;75(1):11-7.

42. Sokka T, Willoughby J, Yazici Y, Pincus T. Databases of patients with early rheumatoid arthritis in the USA. Clin Exp Rheumatol 2003;21(5 Suppl 31):S146-53.

43. Symmons DP, Barrett EM, Bankhead CR, Scott DG, Silman AJ. The incidence of rheumatoid arthritis in the United Kingdom: results from the Norfolk Arthritis Register. Br J Rheumatol 1994;33(8):735-9.

44. van der Horst-Bruinsma IE, Speyer I, Visser H, Breedveld FC, Hazes JM. Diagnosis and course of early-onset arthritis: results of a special early arthritis clinic compared to routine patient care. Br J Rheumatol 1998;37(10):1084-8.

45. Zeidler H, Merkesdal S, Hulsemann JL. Early arthritis and rheumatoid arthritis in Germany. Clin Exp Rheumatol 2003;21(5 Suppl 31):S106-12.

Chapter 2

Consequences of rheumatoid arthritis for performance of social roles - a literature review

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Abstract

Objective. To obtain quantitative estimates of restrictions in participation, i.e., the performance of social roles, in patients with rheumatoid arthritis (RA).

Methods. Participation categories were selected from the International Classification of Functioning, Disability and Health (ICF) (preliminary) Comprehensive Core Set for RA. A literature search was performed utilizing PubMed and PsychInfo. Articles were included if: (1) performance in at least one of the participation categories was described; (2) patients with RA were compared to a healthy reference population or their performance over time was described; (3) published between 1995 and 2005; and (4) written in English.

Results. Seven participation categories were selected from the Comprehensive Core Set for RA, resulting in 50 articles included in the review. Almost all studies focused on remunerative employment (n = 30), recreation and leisure (n = 17), or both (n = 3). RA patients had an increased risk of being without a paid job compared to well adjusted reference groups (absolute difference 4% to 28%, odds ratios 1.2 to 3.4). Restrictions in employment occurred already within the early phase of RA and varied greatly among studies. Two years after diagnosis, disability benefits increased up to roughly 30% in some European cohorts. In the category of recreation and leisure most studies focused on socializing (n = 16). Patients with longstanding RA experienced a decrease in socializing (range, Cohen's d, –0.46 to –1.0), but changes over time were minor.

*Conclusion***.** RA patients experience restrictions in the performance of remunerative employment and in recreation and leisure (socializing). Due to the lack of studies, no conclusions on other ICF categories describing social roles could be made.

Introduction

An important consequence of rheumatoid arthritis (RA) is disability, ranging from limitations in executing a simple task to restrictions in societal roles[1-3]. Within the framework of the International Classification of Functioning, Disability and Health (ICF), disability can be described as limitations in "activities" (execution of a task or action) and restrictions in "participation" (involvement in a life situation)[4,5]. Measurement and knowledge of the functional consequences of RA have traditionally focused on activities[6], e.g., dressing and grooming, as assessed by the Health Assessment Questionnaire (HAQ). However, there is growing interest in the influence of RA on the performance of social roles, i.e., participation, such as in employment[7]. In this review, participation refers to the social roles that individuals have in their current environment. The performance of social roles as an outcome measure in RA may drive rehabilitation and treatment, in addition to outcomes in the domain of "activities."

Participation comprises a broad array of societal functions, and it is not evident which areas are (most) important to assess in patients with RA. An important proposition was recently introduced with the preliminary RA Comprehensive ICF Core Set of Activities and Participation[8]. This denotes 32 categories of the ICF with which the prototypical spectrum of problems in function of RA patients can be described. This preliminary version was constructed on the basis of an extensive consensus process among 17 experts from 12 countries — 7 physicians specializing in physical and rehabilitation medicine, 7 rheumatologists, one nurse, one occupational therapist, and one physical therapist. The consensus process integrated evidence on relevant ICF categories according to patients, a Delphi exercise among experts, and a systematic review on the type of outcome assessments in clinical trials[9-11].

The preliminary Comprehensive ICF Core Set offers a good starting point to assess and describe participation in patients with RA, but its application is complicated by several factors. First, in the proposed set no distinction is made between "activities" and "participation." In the ICF it is argued that this distinction depends on the needs and purposes of a study, and guidelines are provided[4]. A second factor concerns insight into participation restrictions. Although the content of the comprehensive set is currently being tested worldwide, no review of the literature with respect to the influence of RA on the participation categories included in the set and their sensitivity to treatment and prevention has been published yet. Such a review may be very helpful in the process of identifying relevant participation categories in particular studies. Third, participation categories can be selected from the preliminary set, but little is known about the best method to measure these social roles[12].

In order to improve insight into the consequences of RA on participation, the RA Comprehensive ICF Core Set was taken as a starting point to select social roles. Interest was focused, not on the occurrence of restrictions in social roles, but on quantification of the effect of RA. Thus, the aim of this review is to obtain quantitative estimates of restrictions in participation, i.e., the performance of social roles, in patients with RA.

Methods

Selection of participation categories from the RA Comprehensive ICF Core Set

The RA Comprehensive ICF Core Set of Activities and Participation was used as a starting point[8]. As the set comprises both activities and participation, a classification method proposed by the World Health Organization was applied to select only those categories referring to participation, i.e., social roles.

The classification method applies at the level of the chapters by which activities and/or participation are described in the ICF. The 9 ICF chapters include: (1) learning and applying knowledge, (2) general tasks and demands, (3) communication, (4) mobility, (5) self-care, (6) domestic life, (7) interpersonal interactions and relationships, (8) major life areas, and (9) community, social and civic life[4]. According to the classification, chapters refer to activities, to participation, or to both. The relevant chapters describing participation were selected, reflecting the personal view of the authors. From all 9 ICF chapters one or more categories were included in the RA Comprehensive ICF Core Set. Through the classification method at chapter level, participation categories could be identified.

Table 1. Number of studies included in this review that describe the selected participation categories

ICF Chapter containing participation	Categories included in the RA Comprehensive ICF Core Set, describing participation	Articles describing participation category (n= 50)$^{\#}$ (Studies containing longitudinal data)
(6) Domestic life	- Assisting others (assisting others and being concerned about others' well-being)	1 (1)*
(7) Interpersonal interactions and relationships	- Family relationships (creating and maintaining kinship relationships) - Intimate relationships (creating and maintaining close or romantic relationships)	1 (1)* 4 (2)
(8) Major life areas	- Remunerative employment (engaging in all aspects of work for payment) - Work and employment, other specified and unspecified (e.g. illegal employment, not unpaid employment)	33 (22) 0 (0)
(9) Community, social and civic life	- Community life (engaging in all aspects of community social life) - Recreation and leisure (engaging in any form of play, recreational or leisure activity)	2 (1) 20 (11)

*: This study contains one measure addressing both categories, $^{\#}$: In 6 studies 2 participation categories were described and in 2 studies 3 categories were described.

Table 1 shows the ICF chapters dealing with participation according to the authors. All categories on participation in the RA Comprehensive ICF Core Set were included. Categories in the Comprehensive ICF Core Set that the authors considered to represent “activities” were excluded, such as activities of daily living comprising writing (Chapter 1), carrying out daily routine (Chapter 2), using communication devices and techniques (Chapter 3), fine hand use, walking, using transportation (Chapter 4), and dressing and eating (Chapter 5). The ICF chapter “Domestic life” was thought to represent both activities and participation. The category “assisting others” was considered to refer to participation, while “acquisition of goods and services,” “doing housework,” and “preparing meals” were thought to refer to activities. In total, 7 ICF categories representing social roles were selected to guide the extraction of data on social roles.

Literature study

A literature search for the 7 ICF participation categories was performed in Pubmed and PsychInfo. The search terms were “rheumatoid arthritis” in combination with “disability,” “handicap,” “participation,” and one of the selected ICF categories or subcategories (Table 1). Articles were included if: (1) performance in at least one of the selected participation categories was described[4,12-14]; (2) performance of RA patients in social roles was compared with a healthy reference population (cross-sectional studies, longitudinal studies), or performance among RA patients was described over time (longitudinal studies); (3) the articles were published between 1995 and 2005; and (4) articles were written in English.

Longitudinal studies without a reference population were included in this review to provide evidence for changes in the performance of social roles over time. Intervention studies could also be included, since almost all patients currently receive treatment and treatment may affect the impact of RA on social roles. Only studies published between 1995 and 2005 were included, because treatment and intervention in RA have changed considerably in the past decade.

The literature search identified 350 abstracts, from which 143 articles were retrieved for further review. Of these articles, 35 were excluded as they did not assess participation categories or provided only summary scores from which participation could not exclusively be studied. Due to the lack of a reference population or a description of social roles over time, 43 articles were excluded. Other studies were excluded if they reported findings for RA patients and non-RA patients (n = 9) or overlapped with studies already included (n = 6). In total, 50 articles were included for study.

In the data extraction procedure, information from all articles was collected for: RA population (number, age, sex, diagnostic criteria, disease duration, treatment, type of population, selection on work participation/disability, country); reference population (number, selection, adjustment to RA population); study design (cross-sectional/longitudinal, follow-up period, intervention); and measurement of the performance of social roles, and performance of social roles by RA patients and reference populations. Data extracted on the performance of social roles included the number or percentage of persons experiencing (no) restrictions and continuous variables derived from questionnaires. Data extraction was performed by one author (GG) according to a standardized format, and extracted data were reviewed by a second author (AB) for consistency and completeness. In cases of doubt, data were discussed until agreement was reached (GG, AB).

A distinction was made between studies on early RA (disease duration ≤ 2 years) and established RA (disease duration > 2 years). In addition, medical treatment was recorded to allow for a treatment effect on the performance of social roles, since the recent introduction of disease modifying antirheumatic drug (DMARD) combination therapy and biologicals has had a profound effect on disease prognosis[15]. Treatment was considered to be conservative when a pyramid approach had been used. Treatment was considered intensive when a prompt start with DMARD therapy, combination treatment, and/or biological therapy was reported[16]. Studies were judged by 2 authors (GG, JH); in cases of doubt, conservative treatment was chosen.

Findings are expressed primarily as (1) odds ratios (OR), (2) Cohen's d statistic, and (3) percentages. OR as a measure of association was calculated by means of a 2 x 2 table with approximate 95% confidence intervals (CI). If the number of subjects in the reference population was not described, the reference population was assumed to contain as many subjects as the RA population in order to calculate the 95% CI. Cohen's d, reflecting the standardized difference between 2 means, was calculated with $d = (M_1 - M_2)/(SD_{pooled})$. The 95% CI of Cohen's d was calculated with $d \pm 1.96*(SD_{pooled}/\sqrt{(n-1)})$. If only the standard deviation of the RA population was available, this value was taken as the SD_{pooled}. In order to interpret the relevance of the effect, a Cohen's d value of 0.2 was thought to represent a small difference (–), 0.5 a medium difference (±), and 0.8 a large difference (+). In this review a negative Cohen's d reflects a decreased performance in a social role. A similar overview of the relevance of results was done for odds ratios, with values ≥ 2.0 considered a large effect (+), values between 1.5 and 2.0 a medium effect (±), and odds ratios < 1.5 a small effect (–).

For all trials, data from different treatment groups within the study population were pooled if no significant differences in restrictions in social roles between groups were reported.

Results

In total, 50 articles were included[17-66]. Almost all studies focused on remunerative employment (n = 30) or recreation and leisure (n = 17) or both (n = 3) (Table 1). In 38 out of 50 studies patients satisfied the 1958/1987 American College of Rheumatology criteria[17,18,21-27,29,30,32,35,38,40-47,49-51,53-58,60-66] and in the remaining studies patients were clinically diagnosed (n = 10)[20,28,31,33,34,36,37,39,48,59] or satisfied the ICD-9 code (n = 2)[19,52]. In only 3 studies did patients receive intensive DMARD treatment[34,35,43].

Studies on paid employment are presented in Table 2 and Table 3, respectively, showing the cross-sectional studies comparing RA patients to reference populations and the longitudinal studies on RA patients. Findings with respect to recreation and leisure are given in Table 4 and Table 5.

Remunerative employment

Performance of paid employment or lack thereof was defined in different ways: (1) (not) having paid employment, abbreviated as "(no) work"; (2) number of days on work disability/sick leave; (3) work productivity; (4) (no) work disability (partial/permanent, official/self-reported, with or without social benefits); (5) (early) retirement; and (6) work loss without benefits. Twenty-three out of 33 studies used a self-constructed questionnaire/interview to obtain employment data, while others used disability registries[17,19,32,42,43,47,50], diaries[35], the Work Limitation Questionnaire[37], or the Activity Enumeration Index[33].

In 12 cross-sectional studies the prevalence of not having a paid job was higher in patients with established RA compared to general population samples[17,18,21-23,27,39,54,55,57,65,66] (Table 2). The absolute difference ranged from 4% to 28%, and overall odds ratios ranged from 1.2 to at most 3.4, when RA patients were compared to adjusted subgroups from the general population (n = 8)[17,18,21,22,55,57,65,66]. Odds ratios were somewhat higher and more variable when RA patients were compared to less comparable reference groups (absolute differences between 13% and 43%, range of OR 1.9–8.4), such as reference groups selected on being healthy[27,39,54] or patients' caregivers[23].

Decreased employment (OR 2.0–2.7) was mirrored by (partial) work disability in 5 studies (absolute difference 11% to 52%, OR 2.5–33.1)[17,18,22,55,57]. The risk of unemployment seemed to be higher among RA patients in older age groups (n = 4)[22,44,55,66], although one study[65] did not support this observation. Chorus, et al[21] described an increased risk of unemployment with increasing disease duration, which achieved significance from 6 years of RA onwards.

Nine longitudinal studies described that work participation was already restricted in the early phase of RA (Table 3)[17,18,29,30,32,35,41,50,63]. The proportion of patients with early RA who were employed was reduced by about one-third during the first 2 years of follow-up in 3 studies[29,30,35], and another study found that the highest decline in work participation

Table 2. Cross-sectional studies on work participation in RA patients compared to reference populations

Author, country	RA population				Measurement	Reference population	(Calculated) restrictions in work participation compared to reference population					
	Selection	Disease duration (yr)[a]	N (%F)[a]	Age (SD)[a]			OR no work [% No work in patients]	Relevance	OR (partial) work disability [% WD in RA patients]	Relevance	Sick leave [Number of days/% in RA patients]	Relevance
(55) NL	Hospital based	2.8 (1.6)	211	25-64	Q	GP[b]	2.55 [61%] M: 3.44 [47%] F: 1.46 [67%]	+	5.94 [37%]	+		
(17) NL	Hospital based	2.8 (1.8)	132 (62)	<65	R	GP[b]	M: 1.98 [49%] F: 1.44 [77%]	±	M: 5.13 [25%] F: 18.8 [23%]	+		
(18) UK	Population based, work before and at RA onset	4.2 (1.1)	110 (65)	-	Q	N= 110[b]	2.44 [42%]	+	32.0 [33%] (=Full WD)	+		
(57) NL	Hospital based	4.3 (2.6)	293 (73)	50 (10)	Q	GP[b]	2.03 [44%] M: 2.09 [29%] F: 1.90 [55%]	+	2.45 [21%] M: 1.78 [19%] F: 2.89 [21%]	+		
(23) BR	Hospital based	8.3 (5.4)	62 (89)	46	Q	N= 62[e]	5.52 [87%]	+				
(54) UK	Hospital based	9.8 (14)	13 (100)	42 (8)	Q	N= 24[c]	1.87 [38%]	±				
(22) LT	Hospital based	10.4 (8.6)	238 (86)	52 (10)	Q	GP[b]	2.70 [59%] M: 1.95 [68%] F: 5.54 [54%]	+	33.1 [55%]	+	d: 1.53 [46 d/yr]	+

Table 2. Continued

Author, country	RA population				Measu-rement	Reference population	(Calculated) restrictions in work participation compared to reference population					
	Selection	**Disease duration** (yr)[a]	**N** (%F)[a]	**Age** (SD)[a]			**OR no work**		**OR (partial) work disability**		**Sick leave**	
							[% No work in patients]	Relevance	[% WD in RA patients]	Relevance	[Number of days/% in RA patients]	Relevance
(21) NL	Hospital based	11.9	1056 (72)	49	Q	GP[b]	1.20 [39%] M: 1.47 [26%] F: 1.11 [52%]	-	RR WD: 6-10 yr: 1.1 11-15 yr: 1.3 16-20 yr: 1.6 ≥21yr: 1.8	±		
(27) NO	Hospital based	20 (10)	264 (100)	57 (11)	Q	N= 61[b,c]	6.8 [60%]	+				
(39) CAN	Hospital based	≥ 1	143	50 (12)	Q	N= 142[b,c]	8.35 [57%]	+				
(19) UK	Population based, work	-	469 (28)	50	R	N= 469[b]					OR sick leave claim: 3.81[70%]	+
(33) USA	Hospital based	-	381	≥50	AEI	N= 147[b]	No valued work performed: 1.62 [53%]	±				
(65) DE	Hospital based	-	± 25000	41-60	Q	GP[b]	M: 2.88 [37%] (west) M: 3.43 [53%] (east) F: 2.03 [59%] (west) F: 3.22 [66%] (east)	+				
(66) DE	Hospital based	-	6996	18-60	Q	GP[b]	M: 2.29[42%] F: 2.07 [58%]	+				

[a]:Disease duration, number of subjects, sex, and age of the population correspond to the study (sub)population for which restrictions in social roles are shown in this table. R: registry, Q: self constructed questionnaire/interview, GP: general population, [b]: adjustments made for age and sex, [c]: reference population selected on being healthy, [e]: reference population are caregivers of RA patients, d: Cohen's d, RR: rate ratio, +: large difference/effect, ±: medium difference/effect, -: small difference/effect, WD= work disability, AEI= Activity Enumeration Index, NL: the Netherlands, BR: Brazil, DE: Germany, LT: Lithuania, NO: Norway, CAN: Canada.

Table 3. Longitudinal studies of work participation in RA patients

Author, country	RA population				Measu-rement	Follow-up (yr)	(Calculated) changes in work participation between baseline and follow-up		
	Selection	**Disease duration** (yr)[a]	**N** (%F)[a]	**Age** (SD)[a]			**Work**	**Permanent work disability/ disability benefits**	**Other**
(32) FI	Hospital based, work at disease onset	<6 mo	103 (78)	45	R	20		1 yr: 31%, 3 yr: 33%, 8 yr: 50%, 15 yr: 72%, 20 yr: 80%	
(50) FI	Hospital based, work at diagnosis	6.4 mo	82 (73)	40	R	9.9		1 yr: 5%, 2 yr: 23%, 3 yr: 26%, 5 yr: 30%, 8 yr: 38%	
(41) DE	Hospital based, work at RA onset, no benefits except for RA	7 (3.5) mo	133 (63)	47 (9)	Q	2.5 (2.3)	-41%	17%	Sick leave: 1 yr: 82% (113 (11)d) 2 yr: 35% (26 (6)d) Work loss, no benefits: 9%
(29) FI	Hospital based	9 (11) mo	62 (61)	49 (11)	Q	2	-29% [baseline 84%]	+25% [baseline 13%]	
(26) SE	Hospital based	11.4 (6.6) mo	106 (67)	53 (13)	Q	6-7	baseline: 47%, 1 yr: 52%, 2 yr: 52%, 5 yr: 41%	baseline: 36%, 1 yr: 29%, 2 yr: 29%, 5 yr: 23%	Retirement: baseline: 17%, 1 yr: 19%, 2 yr: 19%, 5 yr: 28%
(30) SE	Hospital based	<1	211 (69)	55 (15)	Q	1	-15% [baseline 50%]		Sick leave: +9% [baseline 44%] Early retirement: +6% [baseline 6%]
(40) DE	Hospital based, work at study onset	≤1	73 (73)	49 (39-55)[h]	Q	6 (2)	-53%	37%	Work loss without benefits: 8% Normal retirement: 8%
(35) [f] NL	Hospital based	<2	65	-	Q, diary	1	-13% [baseline 42%]	+10% [baseline: 9%]	Retired: +6% [baseline 16%]

Table 3. Continued

Author, country	RA population				Measurement	Follow-up (yr)	(Calculated) changes in work participation between baseline and follow-up		
	Selection	**Disease duration** (yr)^{a}	**N** (%F)^{a}	**Age** (SD)^{a}			**Work**	**Permanent work disability/ disability benefits**	**Other**
(43) ^{f} FI	Hospital based	<2	138	18-65	R	5			d (work disability days: IT vs CT): 0.75 [IT: 29 days; CT: 15 days]
(63) UK	Hospital based, work at study onset	<2	353 (60)	<60: 93%	Q	5	-40%		
(17) NL	Hospital based, work at baseline	2.8 (1.8)	76	<65	R	0-6		baseline: 14%, 1 yr: 18%, 2 yr: 29%, 3 yr: 42%, 4 yr: 44%, 5 yr: 72%	
(18) UK	Population based, work at RA onset	First examination shortly after disease onset	CH1: 160 (71) CH2: 134 (61)	49 (11)	Q	8.6	CH1: 4.2 yr: -47%, 8.6 yr: -63% CH2: 4.2 yr: - 40%	CH1: 4.2 yr: 33%, 8.6 yr: 42% CH2: 1 yr:23%, 2yr: 33%, 4.2 yr: 37%	CH1: Retirement: 4.2 yr: 10% 8.6 yr: 18% CH2: Retirement: 4.2 yr: 1.5%
(62) USA	Hospital based	Shortly after disease onset	509	51 (13)	R	18		11 yr: 25%, 24.8 yr:50%	
(58) HR	Hospital based	6.6	95 (81)	50	Q	3.6	-22% [baseline 44%]	+20% [baseline 6%]	Old age pension: +2% [baseline 12%]
(47) DE	Hospital based	7.4 (8.4)	338 (76)	57 (12)	R	1		+ 0.4% [baseline: 29%]	
(44) USA	Hospital based, work at study onset	8.5 (67)	472 (71)	<64: 89%	Q	9	1 yr: -15%, 2 yr: -22%, 3 yr: -31%, 4 yr: -35%, 5 yr: -44%, 6 yr: -50%, 7 yr: -57%, 8 yr: -62%, 9 yr: -68%		

Table 3. Continued

Author, country	RA population				Measu-rement	Follow-up (yr)	(Calculated) changes in work participation between baseline and follow-up		
	Selection	**Disease duration** (yr)[a]	**N** (%F)[a]	**Age** (SD)[a]			**Work**	**Permanent work disability/ disability benefits**	**Other**
(37) USA	Population based, work, no plan to retire within 2 yr	10.6 (9)	87 (87)	48 (9)	Q, WLQ	6 mo Ref: N= 173 (41 (10) yr, 73% F)	RA: -3% Ref: -2%		d (productivity RA): -0.17 [baseline: -3.7% productivity lost] d(productivity ref): +0.75 [baseline: -2.3% productivity lost] d (absence RA): -0.33 [baseline 0.7] d(absence ref):+1.18 [baseline 0.8]
(38) SE	Hospital based	12 (10)	96 (88)	55 (12)	Q	1			Difficulties at work: +19% [baseline 27]
(34)[f] SE	Hospital based	-	93	<65	Q	1			Work capacity: +2% [baseline: 31%] d (sick leave): +0.13 [baseline: 1.6 d]
(33) USA	Hospital based	-	381	≥50	AEI	5 Ref: N= 147[b]			Difference in valued work of RA and reference: -1% [change RA: -26%][g]
(42) FI	Hospital based, work at study onset	-	26	-	R	2		23%	
(52) USA	Population based, no work	-	23 (87)	18-55	Q	1	9% [baseline: 0%]		

See Table 2 for abbreviations, [f]: (part) of the patient population received intensive treatment, [g]: score between brackets reflects the difference between baseline and follow-up in RA patients, Ref: reference population, IT: Intensive treatment, CT: conservative treatment, CH1: cohort 1, CH2: cohort 2, [h]: median (interquartile range), FI: Finland, HR: Croatia, SE: Sweden.

took place during the first years of RA[18]. After 2.5 to 6 years, 40% to 53% of the employed patients had stopped working[18,40,41,63]. A study on patients with longstanding RA found that employment decreased at a constant rate[44]. Four out of 6 studies with detailed data on work disability over time described that the increase in work disability was highest during the early phase of RA[18,32,50], or that work disability was already remarkably high at study onset[26]. The prevalence of officially registered work disability was 31% after one year according to one study[32], and was 23% and 29% after 2 years in 2 other European studies[17,50]. In the established phase of RA, official disability benefit prevalences ranged from 30% to 72% after 5 years[17,32,50]. In contrast, a study by Wolfe, et al[62] in the USA reported a much lower registered work disability, as only 25% of the RA patients received benefits after 11 years of RA.

In addition to employment status, more refined measures of work participation have been used. A large proportion of RA patients experienced sick leave during the early phase of RA, and sick leave prevalences of 53% and 82% were reported after one year of followup[30,41]. In addition, patients with established RA reported more days of sick leave than the general population (46 days vs 11 days, respectively)[22]. One study found a decrease in work productivity and an increase in days missed from work in patients with established RA over a 6-month period, but this was not accompanied by an increased loss of employment[37].

Early intensive medical treatment for 2 years resulted in significantly fewer days lost due to sick leave and work disability compared to conservative treatment after 5 years in the FIN-RACo study[43]. The COBRA study (short-term intensive treatment), however, did not report a significant effect on absenteeism during the first year of follow-up of patients with early RA[35]. One observational study on patients with established RA receiving biological therapy for more than one year showed that work capacity and sick leave days did not deteriorate over a one-year period[34].

In summary, the performance of paid employment was restricted in RA patients compared with reference populations. Paid employment decreased and work disability increased from the early phase of RA onward. Intensive treatment may positively affect work participation.

Recreation and leisure

In the ICF category “recreation and leisure,” performance in “socializing” was studied most frequently (16 out of 20 studies; Tables 4 and 5)[20,23-25,27,28,31,36,42,46,49,51,53,59,60,64]. Socializing consisted of engaging in informal or casual gatherings with others, such as visiting friends or relatives or meeting informally in public places[4]. Instruments used to measure socializing were: (1) the Medical Outcomes Study Short-Form General Health Survey (SF-36) — social function[20,23,36,51,53,59,60,64]; (2) Arthritis Impact Measurement Scales 2 (AIMS2) — social activities[25,46,49]; (3) Social Network Delineation Questionnaire (SNDQ) — total

Table 4. Cross-sectional studies of recreation and leisure in RA patients compared to reference populations

Author, country	RA population				Measurement	Reference population	(Calculated) restrictions in recreation and leisure compared to reference population	
	Selection	**Disease duration** (yr)[a]	**N** (%F)[a]	**Age** (SD)[a]			**[Score RA patients]**	**Relevance**
(60) UK	Population based	5.5 (5.2-5.9)[h]	302 (67)	60	SF-36	GP[b]	Social functioning in RA= 75% reference score [75]	na
(20) UK	Hospital based	6 (1.5-12)[h]	83 (56)	58[h]	SF-36	GP[b]	d (social functioning)= -1 [52]	+
(53) USA	Hospital based	6.8 (8.3)	438 (73)	54 (12)	SF-36	GP	Social functioning in RA= 71% reference score [60]	na
(23) BR	Hospital based	8.3 (5.4)	62 (89)	46	SF-36	N= 62[e]	d (social functioning)= -0.92 [59]	+
(51) NO	Hospital based	12.9	944 (79)	62	SF-36	GP[b]	d (social functioning) = -0.63 [67][j]	±
(59) USA	Hospital based	14.2 (9.5)	43 (63)	57 (12)	SF-36	GP, Patients' partners	d (social function vs. GP): -0.46 [71] d (social function vs. partners): M: -0.51, F: -0.33	-
(36) AUS	Hospital based	15.6 (9.9)	81 (80)	58 (11)	SF-36	GP[i]	d (social function): - 0.48 [71]	-
(46) NL	Hospital based	19.0 (11)	231 (62)	64 (12)	AIMS2	N= 131[b]	d (social activities): -0.75 [5.6]	±
(27) NO	Hospital based	20 (10)	264 (100)	57 (11)	SNDQ	N= 61[b,c]	d (total network size): -0.37 [15]	-
(39) CAN	Hospital based	≥ 1	128	50 (12)	Diary	N= 124[b,c]	d (time spent with leisure): 0.03 [38 hr/wk] d (time spent with valued+ competent leisure): -0.42 [9.4 hr/wk]	-
(33) USA	Hospital based	-	381	≥50	AEI	N= 147[b]	OR parties, trips, vacation: 0.94 [80%] OR cultural leisure outside home: 0.60 [72%] OR sedentary leisure in home: 1 [99%]	- + -

See Tables 2-3 for abbreviations, [i]: adjustment made for age, [b]: adjustments made for age and sex, [h]: median (interquartile range), [j]: data reflect Cohen's d after adjusting RA population to reference population of age 60 (57%F), [c]: reference population selected on being healthy, [e]: reference population are caregivers of RA patients, SNDQ: Social Network Delineation Questionnaire, AEI: Activity Enumeration Index, na: not applicable, AUS: Australia.

Table 5. Longitudinal studies of recreation and leisure in RA patients

Author, country	**RA population**				**Measure-ment**	**Follow-up** (yr)	**(Calculated) changes in recreation and leisure between baseline and follow-up**	
	Selection	**Disease duration** (yr)[a]	**N** (%F)[a]	**Age** (SD)[a]			**[Baseline score of RA patients]**	**Relevance**
(25) AUS	Hospital based	2.8 (2.5)	81 (100)	42 (11)	AIMS	1	Social activity: +7% [4.1]	na
(24) NL	Hospital based	3.5 (2.1)	59 (71)	54 (12)	IRGL	1	d (social network size): 0.10 [1.7]	-
(53) USA	Hospital based	6.8 (8.3)	438 (73)	54 (12)	SF-36	1	Change in score of SF-36 social functioning: placebo: 0 (68) leflunomide group: +9.8 (68) MTX group: + 7.7 (68)	na
(48) CHN	Hospital based	7.1 (9.8)	45 (87)	51 (13)	Question-naire of Weinberger	9 mo	d (exercise in intervention group): 0.89 [5.4] d (exercise in control group): -0.39 [5.3]	+ -
(64) USA, CAN	Hospital based	11 (10)	691 (73)	55 (20-90)	SF-36	3 mo	d (social function placebo): -0.11 [57][k] d (social functioning 2xday 500 mg naproxen): 0.15 [60][k] d (social functioning 2xday 200 celecoxib): 0.36[55][k]	- - -
(31) UK	Hospital based	11	96	22-84	DRP	3 mo	d (social activities)= -0.16 [4.8]	-
(38) SE	Hospital based	12 (10)	96 (88)	55 (12)	Q	1	No decrease in problems with hobbies Frequency exercise (times/wk): +7% [1.4]	na
(28) NO	Hospital based	20 (10)	161 (100)	57 (11)	SNDQ SSQT	18 (4) mo	d (total network size): 0.02 [15.4][k] d (social companionship): no change[k]	- -
(49) SE	Population based	69%>10	66 (74)	-	AIMS	5	d (social activities): -0.11 [3.7]	-
(42) FI	Hospital based, work at study onset	-	26 (-)	-	PDI	6 mo	d (social activity): -0.18 [32] d (recreation): 0.20 [48]	- -
(33) USA	Hospital based	-	381 (-)	≥50	AEI	5 Ref: N= 47[b]	Difference RA and reference Recreation (parties/trips/vacation): -7% [-14%][g] Cultural leisure outside home: -4% [-16%][g] Sedentary leisure in home: -1% [-2%][g]	na

See Table 2-3 for abbreviations, [k]: data of other treatment group(s) not shown, [g]: score between brackets reflects the difference between score at baseline and follow-up in RA patients, IRGL: Impact of Rheumatic Diseases on Health and Lifestyle Questionnaire, DRP: Disease Repercussion Scale, SNDQ: Social Network Delineation Questionnaire, SSQT: Support Questionnaire for Transactions, PDI: Pain Disability Index, AEI: Activity Enumeration Index, CHN: China.

network size[27,28]; (4) Impact of Rheumatic Diseases on Health and Lifestyle questionnaire (IRGL) — social network[24]; (5) Disease Repercussion Scale (DRP) — social activities[31]; (6) Pain Disability Index — social activity[42]; and (7) the Support Questionnaire for Transactions (SSQT) — social companionship[28].

Nine cross-sectional studies found that patients with established RA reported reduced socializing compared to reference populations[20,23,27,36,46,51,53,59,60] (Table 4). In 6 studies Cohen's d ranged from −0.46 to −1 when participation was assessed by the SF-36 (difference 11 to 27 points) or AIMS2 (difference 0.94 points), generally indicating medium to large restrictions[20,23,36,46,51,59].

Six longitudinal studies indicated that socializing did not change remarkably in patients with established RA during a follow-up period of 3 months to 5 years[24,25,28,31,36,42,49] (Table 5). In 5 out of 6 studies Cohen's d ranged from −0.18 to 0.02, indicating only small changes in socializing. Two studies suggested that restrictions in socializing might be reduced using conservative treatment[53] and nonsteroidal antiinflammatory drugs[64] in patients with established RA.

In summary, performance in the subcategory "socializing" was restricted when compared with reference populations in cross-sectional studies. In studies describing socializing in patients with established RA over time, however, socializing remained relatively stable.

Four out of 20 studies described recreation and leisure in more general terms in established RA. Recreation and leisure was measured by the Pain Disability Index — recreation[42], the Activity Enumeration Index[33], a diary[39], and a self-constructed questionnaire[38]. Two longitudinal studies suggested that changes in recreation and leisure of patients with established disease were small[38,42]. However, one study observed that active recreational activities outside the house were restricted and decreased more in RA patients over a 5-year period, but sedentary leisure activities in the house were not restricted, compared to the reference group[33]. Further, a cross-sectional study found that RA patients spent less time with satisfactory leisure (d = −0.42)[39].

Discussion

This study clearly showed that patients with RA experience restrictions in participation, i.e., the performance of social roles, in daily life. Most notably, the performance of remunerative employment was restricted in patients with early RA and established RA. Evidence for restrictions in socializing, a subcategory of recreation and leisure, was found for patients with established RA. Indications exist that restrictions in paid employment can be reduced by intensive treatment. Due to the lack of studies on other participation categories selected from the preliminary RA Comprehensive ICF Core Set, we could make no conclusions on the occurrence and full extent of restrictions.

It should be stressed that the RA Comprehensive ICF Core Set was used in this study as a starting point for identification of relevant categories of participation and subsequent search for articles to be included in the review. Our findings therefore depend on the authors' opinion of what may represent participation. A small difference in interpretation of the concept of participation would have resulted in slightly different results. In addition, the overview of quantitative estimates of restrictions in social roles we present cannot be interpreted as a validation study of the Comprehensive Core Set. Some limitations should be considered with respect to this review. Key words, titles, and abstracts of useful articles may not always suggest that the consequences of RA in the domain of participation were measured. Although it is possible that we therefore missed some useful studies, we believe this will not substantially affect the essence of our findings. In addition, studies containing useful information may not be described in this review as a result of the restrictions we imposed with respect to the design of the study, and because findings had to reflect the participation categories of interest and no other participation categories or activities. We are confident that these relatively strict measures provided the best insight in the selected social roles. It must be acknowledged that considerable heterogeneity in measurement methods was present. For example, social function as assessed by the SF-36 differs from questions on the number of persons in the social network (IRGL). Similarly, officially recognized work disability may underestimate the effect of RA on employment and is often not reciprocal to paid employment. The quality of the reference groups differed between studies and the choice of the reference group influenced the observed differences in participation. Given the differences in definition and measurement of social roles, we did not attempt a formal meta-analysis on the overall effect of RA on social roles. This review focused on describing observed differences and not on their statistical significance. The reason is that some confidence intervals may have been very wide due to lack of information on the number of subjects in the reference group. Moreover, only 2 out of 30 longitudinal studies included a reference group. In all other longitudinal studies, it therefore remained unclear which part of the changes in the performance of social roles could be ascribed to RA and which part would also appear among aging healthy subjects. Further, longitudinal studies including only patients employed at study onset might have underestimated the overall influence of RA on employment, as these studies only focused on patients that succeeded in remaining employed until study onset. Finally, the amount of information that was equally and systematically described in studies was limited. Therefore, it was not possible, for example, to summarize time trends.

We found that paid employment was the most frequently studied social role in outcome and intervention studies of RA. From a patient's perspective, employment is valued as an important outcome[69]. A considerable proportion of RA patients experienced sick leave, quit their employment, or became work disabled during the first few years of RA.

Thus, from the very early phase of RA onward, there is a need for preventive measures and intervention to maintain participation in this social role. Measures should include medical treatment, but also interventions at work, such as adaptations in the workplace or adjustments of job activities[70].

In accord with findings of our review, paid employment has been integrated in the brief RA ICF Core Set[8]. OMERACT 7 has recognized employment as the main outcome measure in the domain of participation, but did not recommend that it be routinely included in clinical trials yet. Our findings strongly support that if consequences of RA are assessed for the ICF domain of "participation" in outcome and intervention studies, work participation is one of the first outcomes of choice. Several measures are available to assess remunerative employment. Employment can best be assessed with refined measures such as work disability days and work productivity (e.g., the Work Limitation Questionnaire)[71]. These measures provide more insight into participation and are more sensitive to change than the crude employment status[35,43]. In addition to insight into the performance of a social role, assessment of paid employment provides the possibility of determining the indirect costs of illness to society, and can be used in cost-effectiveness analyses of treatment strategies.

The proportion of RA patients experiencing work restrictions over time differed across countries. The higher proportion of RA patients experiencing work restrictions in The Netherlands and Finland compared to the USA may be partly explained by differences in the social benefits system (which is considered an environmental factor in the ICF). A recent study by Chung and colleagues confirmed the influence of the accessibility of disability benefits on work disability[72]. In ankylosing spondylitis, it has also been described that more favourable disability benefits probably result in greater work disability[73]. The influence of environmental factors on employment status complicates comparisons among RA patients in different countries and in different time periods. However, work productivity may be more comparable among studies than employment status.

After paid employment, socializing, a subcategory of recreation and leisure, was most frequently studied in RA patients. RA patients value the performance of recreation and leisure in general as important[69,74,75]. Neither this category nor its subcategory, socializing, has been included in the brief ICF Core Set and the OMERACT core set. However, a large proportion of the RA patients is either above employable age, chooses not to have a paid job, or is permanently work disabled. Additional measurement of socializing may therefore be of interest in all outcome and intervention studies assessing the consequences of RA in the domain of participation. Socializing can be assessed by the well known generic SF-36 (social functioning) instrument or the disease-specific AIMS2 (social activities), both of which are often used in patient research. However, these outcome measures were not designed to assess the performance of social roles within the framework of the ICF. More appropriate questionnaires can probably be expected in the near future.

The restrictions in the subcategory socializing and in recreation and leisure in general did not show a dramatic deterioration over time. This could be due to the long disease duration of subjects in the selected studies or the relatively short follow-up periods. However, it also seems likely that RA patients may adapt their needs to their capacities, and hence present a relatively stable situation. This was supported by the fact that the performance of sedentary recreation remained stable, while the performance of specific types of active recreation, requiring more adaptation, decreased. Socializing may be influenced by medical treatment. A recent study described in abstract format found that social functioning improved in patients receiving intensive treatment as measured by the SF-36[76]. Unfortunately, none of the reports included in this review studied recreation and leisure in patients with early RA.

Five out of 7 participation categories that we selected from the preliminary RA Comprehensive ICF Core Set were seldom studied, and therefore no conclusions on the occurrence of restrictions can be made. Findings were not described in detail since they cannot easily be combined[15,33,42,45,56,59,61]. Generally, it is not feasible to routinely assess all 7 ICF categories in the domain of participation among patients with RA. To date, only evidence of restrictions in the performance of employment and of socializing exists. Future studies are needed for more insight into which selection of social roles is of the most interest during different stages of life of patients of RA, and in how these social roles can best be measured.

Intensive medical treatment aiming at remission has been shown to influence the consequences of RA in the ICF domains of “body function and structure” and “activities”[15,77]. There are indications that early intensive treatment may also positively affect work participation (FIN-RACo[43]). However, this effect may not be achieved with short-term intensive treatment (e.g., 6 months) (COBRA) and/or short followup[35]. When intensive treatment enhances work participation, this would add to the cost-effectiveness, and hence would support the availability of the treatment. It is to be expected that more studies on the effect of intensive treatment on participation will be performed in the near future.

In summary, patients with RA experience restrictions in the performance of social roles, i.e., in remunerative employment and in recreation and leisure (socializing). Intensive treatment may reduce restrictions in employment. Our findings in this review support the inclusion of at least work characteristics and a measure of socializing (e.g., the generic SF-36) in outcome and intervention studies examining the consequences of RA in the ICF domain of participation.

References

1. Scott DL, Smith C, Kingsley G. Joint damage and disability in rheumatoid arthritis: an updated systematic review. Clin Exp Rheumatol 2003;21 Suppl 31:S20-7.
2. Carr A, Hewlett S, Hughes R, et al. Rheumatology outcomes: the patient's perspective. J Rheumatol 2003;30:880-3.
3. Verstappen SM, Bijlsma JW, Verkleij H, et al. Overview of work disability in rheumatoid arthritis patients as observed in cross-sectional and longitudinal surveys. Arthritis Rheum 2004;51:488-97.
4. International Classification of Functioning, Disability and Health: ICF. Geneva: World Health Organization; 2001.
5. Jette AM, Haley SM, Kooyoomjian JT. Are the ICF activity and participation dimensions distinct? J Rehabil Med 2003;35:145-9.
6. Cieza A, Stucki G. Understanding functioning, disability, and health in rheumatoid arthritis: the basis for rehabilitation care. Curr Opin Rheumatol 2005;17:183-9.
7. Puolakka K, Kautiainen H, Mottonen T, et al. Early suppression of disease activity is essential for maintenance of work capacity in patients with recent-onset rheumatoid arthritis: five-year experience from the FIN-RACo trial. Arthritis Rheum 2005;52:36-41.
8. Stucki G, Cieza A, Geyh S, et al. ICF Core Sets for rheumatoid arthritis. J Rehabil Med 2004;44 Suppl:87-93.
9. Weigl M, Cieza A, Andersen C, Kollerits B, Amann E, Stucki G. Identification of relevant ICF categories in patients with chronic health conditions: a Delphi exercise. J Rehabil Med 2004;44 Suppl:12-21.
10. Brockow T, Cieza A, Kuhlow H, et al. Identifying the concepts contained in outcome measures of clinical trials on musculoskeletal disorders and chronic widespread pain using the International Classification of Functioning, Disability and Health as a reference. J Rehabil Med 2004;44 Suppl:30-6.
11. Ewert T, Fuessl M, Cieza A, et al. Identification of the most common patient problems in patients with chronic conditions using the ICF checklist. J Rehabil Med 2004;44 Suppl:22-9.
12. Stucki G, Cieza A. The International Classification of Functioning, Disability and Health Core Sets for rheumatoid arthritis: a way to specify functioning. Ann Rheum Dis 2004;63 Suppl 2:ii40-ii45.
13. Perenboom RJ, Chorus AM. Measuring participation according to the International Classification of Functioning, Disability and Health. Disabil Rehabil 2003;25:577-87.
14. Cieza A, Brockow T, Ewert T, et al. Linking health-status measurements to the International Classification of Functioning, Disability and Health. J Rehabil Med 2002;34:205-10.
15. Mottonen T, Hannonen P, Leirisalo-Repo M, et al. Comparison of combination therapy with single-drug therapy in early rheumatoid arthritis: a randomised trial. FIN-RACo Trial Group. Lancet 1999;353:1568-73.
16. Combe B, Landewe R, Lukas C, et al. EULAR evidence based recommendations for the management of early rheumatoid arthritis [abstract]. Ann Rheum Dis 2005;64 Suppl III:S212.
17. Albers JM, Kuper HH, van Riel PL, et al. Socio-economic consequences of rheumatoid arthritis in the first years of the disease. Rheumatology Oxford 1999;38:423-30.
18. Barrett EM, Scott DG, Wiles NJ, Symmons DP. The impact of rheumatoid arthritis on employment status in the early years of disease: a UK community-based study. Rheumatology Oxford 2000;39:1403-9.

19. Birnbaum HG, Barton M, Greenberg PE, et al. Direct and indirect costs of rheumatoid arthritis to an employer. J Occup Environ Med 2000;42:588-96.
20. Birrell FN, Hassell AB, Jones PW, Dawes PT. How does the Short Form 36 Health Questionnaire (SF-36) in rheumatoid arthritis (RA) relate to RA outcome measures and SF-36 population values? A cross-sectional study. Clin Rheumatol 2000;19:195-9.
21. Chorus AM, Miedema HS, Wevers CJ, van der Linden S. Labour force participation among patients with rheumatoid arthritis. Ann Rheum Dis 2000;59:549-54.
22. Dadoniene J, Stropuviene S, Venalis A, Boonen A. High work disability rate among rheumatoid arthritis patients in Lithuania. Arthritis Rheum 2004;51:433-9.
23. das Chagas Medeiros MM, Ferraz MB, Quaresma MR. The effect of rheumatoid arthritis on the quality of life of primary caregivers. J Rheumatol 2000;27:76-83.
24. Evers AWM, Kraaimaat FW, van Riel PLCM, de Jong AJL. Tailored cognitive-behavioral therapy in early rheumatoid arthritis for patients at risk: a randomized controlled trial. Pain 2002;100:141-53.
25. Ferguson SJ, Cotton S. Broken sleep, pain, disability, social activity, and depression symptoms in rheumatoid arthritis. Aust J Psychol1996;48:9-14.
26. Fex E, Larsson BM, Nived K, Eberhardt K. Effect of rheumatoid arthritis on work status and social and leisure time activities in patients followed 8 years from onset. J Rheumatol 1998;25:44-50.
27. Fyrand L, Moum T, Wichstrom L, Finset A, Glennas A. Social network size of female patients with rheumatoid arthritis compared to healthy controls. Scand J Rheumatol 2000;29:38-43.
28. Fyrand L, Moum T, Finset A, Glennas A. The effect of social network intervention for women with rheumatoid arthritis. Fam Proc 2003;42:71-89.
29. Hakkinen A, Sokka T, Lietsalmi AM, Kautiainen H, Hannonen P. Effects of dynamic strength training on physical function, Valpar 9 work sample test, and working capacity in patients with recent-onset rheumatoid arthritis. Arthritis Rheum 2003;49:71-7.
30. Hallert E, Husberg M, Jonsson D, Skogh T. Rheumatoid arthritis is already expensive during the first year of the disease (the Swedish TIRA Project). Rheumatology Oxford 2004;43:1374-82.
31. Harwood RH, Carr AJ, Thompson PW, Ebrahim S. Handicap in inflammatory arthritis. Br J Rheumatol 1996;35:891-7.
32. Jantti J, Aho K, Kaarela K, Kautiainen H. Work disability in an inception cohort of patients with seropositive rheumatoid arthritis: a 20 year study. Rheumatology Oxford 1999;38:1138-41.
33. Katz PP. The impact of rheumatoid arthritis on life activities. Arthritis Care Res 1995;8:272-8.
34. Kobelt G, Eberhardt K, Geborek P. TNF inhibitors in the treatment of rheumatoid arthritis in clinical practice: costs and outcomes in a follow up study of patients with RA treated with etanercept or infliximab in southern Sweden. Ann Rheum Dis 2004;63:4-10.
35. Korthals-de Bos I, Van Tulder M, Boers M, et al. Indirect and total costs of early rheumatoid arthritis: a randomized comparison of combined step-down prednisolone, methotrexate, and sulfasalazine with sulfasalazine alone. J Rheumatol 2004;31:1709-16.
36. Lapsley HM, March LM, Tribe KL, Cross MJ, Courtenay BG, Brooks PM. Living with rheumatoid arthritis: expenditures, health status, and social impact on patients. Ann Rheum Dis 2002;61:818-21.

37. Lerner D, Adler DA, Chang H, et al. Unemployment, job retention, and productivity loss among employees with depression. Psychiatr Serv 2004;55:1371-8.

38. Lindroth Y, Brattstrom M, Bellman I, et al. A problem-based education program for patients with rheumatoid arthritis: evaluation after three and twelve months. Arthritis Care Res 1997;10:325-32.

39. MacKinnon JR, Miller WC. Rheumatic arthritis and self esteem: the impact of quality occupation. J Occup Science 2003;10:90-8.

40. Mau W, Bornmann M, Weber H, Weidemann HF, Hecker H, Raspe HH. Prediction of permanent work disability in a follow-up study of early rheumatoid arthritis: results of a tree structured analysis using RECPAM. Br J Rheumatol 1996;35:652-9.

41. Merkesdal S, Ruof J, Schoffski O, Bernitt K, Zeidler H, Mau W. Indirect medical costs in early rheumatoid arthritis: composition of and changes in indirect costs within the first three years of disease. Arthritis Rheum 2001;44:528-34.

42. Nordstrom DC, Konttinen YT, Solovieva S, Friman C, Santavirta S. In- and out-patient rehabilitation in rheumatoid arthritis. A controlled, open, longitudinal, cost-effectiveness study. Scand J Rheumatol 1996;25:200-6.

43. Puolakka K, Kautiainen H, Mottonen T, et al. Impact of initial aggressive drug treatment with a combination of disease-modifying antirheumatic drugs on the development of work disability in early rheumatoid arthritis: a five-year randomized followup trial. Arthritis Rheum 2004;50:55-62.

44. Reisine S, Fifield J, Walsh SJ, Feinn R. Factors associated with continued employment among patients with rheumatoid arthritis: a survival model. J Rheumatol 2001;28:2400-8.

45. Reisine S, Fifield J, Winkelman DK. Employment patterns and their effect on health outcomes among women with rheumatoid arthritis followed for 7 years. J Rheumatol 1998;25:1908-16.

46. Riemsma RP, Taal E, Rasker JJ, Houtman PM, Van Paassen HC, Wiegman O. Evaluation of a Dutch version of the AIMS2 for patients with rheumatoid arthritis. Br J Rheumatol 1996;35:755-60.

47. Ruof J, Hulsemann JL, Mittendorf T, et al. Costs of rheumatoid arthritis in Germany: a micro-costing approach based on healthcare payer's data sources. Ann Rheum Dis 2003;62:544-9.

48. Siu AM, Chui DY. Evaluation of a community rehabilitation service for people with rheumatoid arthritis. Patient Educ Couns 2004;55:62-9.

49. Soderlin MK, Nieminen P, Hakala M. Arthritis Impact Measurement Scales in a community-based rheumatoid arthritis population. Clin Rheumatol 2000;19:30-4.

50. Sokka T, Kautiainen H, Mottonen T, Hannonen P. Work disability in rheumatoid arthritis 10 years after the diagnosis. J Rheumatol 1999;26:1681-5.

51. Stavem K, Lossius MI, Kvien TK, Guldvog B. The health-related quality of life of patients with epilepsy compared with angina pectoris, rheumatoid arthritis, asthma and chronic obstructive pulmonary disease. Qual Life Res 2000;9:865-71.

52. Straaton KV, Maisiak R, Wrigley JM, White MB, Johnson P, Fine PR. Barriers to return to work among persons unemployed due to arthritis and musculoskeletal disorders. Arthritis Rheum 1996;39:101-9.

53. Strand V, Tugwell P, Bombardier C, et al. Function and health-related quality of life: results from a randomized controlled trial of leflunomide versus methotrexate or placebo in patients with active rheumatoid arthritis. Leflunomide Rheumatoid Arthritis Investigators Group. Arthritis Rheum 1999;42:1870-8.

54. Turner Cobb JM, Steptoe A, Perry L, Axford J. Adjustment in patients with rheumatoid arthritis and their children. J Rheumatol 1998;25:565-71.

55. van Jaarsveld CH, Jacobs JW, Schrijvers AJ, van Albada-Kuipers GA, Hofman DM, Bijlsma JW. Effects of rheumatoid arthritis on employment and social participation during the first years of disease in The Netherlands. Br J Rheumatol 1998;37:848-53.

56. van Lankveld W, van Helmond T, Naring G, de Rooij DJ, van den Hoogen F. Partner participation in cognitive-behavioral self-management group treatment for patients with rheumatoid arthritis. J Rheumatol 2004;31:1738-45.

57. Verstappen SM, Boonen A, Bijlsma JW, et al. Working status among Dutch patients with rheumatoid arthritis: work disability and working conditions. Rheumatology Oxford 2005;44:202-6.

58. Vlak T, Eldar R. Disability in rheumatoid arthritis after monotherapy with DMARDs. Int J Rehabil Res 2003;26:207-12.

59. Walsh JD, Blanchard EB, Kremer JM, Blanchard CG. The psychosocial effects of rheumatoid arthritis on the patient and the well partner. Behav Res Ther 1999;37:259-71.

60. Wiles NJ, Scott DG, Barrett EM, et al. Benchmarking: the five year outcome of rheumatoid arthritis assessed using a pain score, the Health Assessment Questionnaire, and the Short Form-36 (SF-36) in a community and a clinic based sample. Ann Rheum Dis 2001;60:956-61.

61. Williamson D, Robinson ME, Melamed B. Pain behavior, spouse responsiveness, and marital satisfaction in patients with rheumatoid arthritis. Behav Modif 1997;21:97-118.

62. Wolfe F, Hawley DJ. The longterm outcomes of rheumatoid arthritis: Work disability: a prospective 18 year study of 823 patients. J Rheumatol 1998;25:2108-17.

63. Young A, Dixey J, Kulinskaya E, et al. Which patients stop working because of rheumatoid arthritis? Results of five years' follow up in 732 patients from the Early RA Study (ERAS). Ann Rheum Dis 2002;61:335-40.

64. Zhao SZ, Fiechtner JI, Tindall EA, et al. Evaluation of health-related quality of life of rheumatoid arthritis patients treated with celecoxib. Arthritis Care Res 2000;13:112-21.

65. Zink A, Braun J, Listing J, Wollenhaupt J. Disability and handicap in rheumatoid arthritis and ankylosing spondylitis — results from the German rheumatological database. German Collaborative Arthritis Centers. J Rheumatol 2000;27:613-22.

66. Zink A, Listing J, Klindworth C, Zeidler H. The national database of the German Collaborative Arthritis Centres: I. Structure, aims, and patients. Ann Rheum Dis 2001;60:199-206.

67. Reisine S, McQuillan J, Fifield J. Predictors of work disability in rheumatoid arthritis patients. A five-year followup. Arthritis Rheum 1995;38:1630-7.

68. Scott DL. Leflunomide improves quality of life in rheumatoid arthritis. Scand J Rheumatol Suppl 1999;112:23-9.

69. Ahlmen M, Nordenskiold U, Archenholtz B, et al. Rheumatology outcomes: the patient's perspective. A multicentre focus group interview study of Swedish rheumatoid arthritis patients. Rheumatology Oxford 2005;44:105-10.

70. Mancuso CA, Paget SA, Charlson ME. Adaptations made by rheumatoid arthritis patients to continue working: a pilot study of workplace challenges and successful adaptations. Arthritis Care Res 2000;13:89-99.

71. Hazes JMW, Geuskens GA, Burdorf A. Work limitations in the outcome assessment of rheumatoid arthritis [editorial]. J Rheumatol 2005;32:980-2.

72. Chung C, Sokka T, Arbogast P, Pincus T. Work disability in early rheumatoid arthritis: differences across two systems in the US and Finland [abstract]. Ann Rheum Dis 2005;64 Suppl III:S71.

73. Boonen A, van der Heijde D, Landewe R, et al. Work status and productivity costs due to ankylosing spondylitis: comparison of three European countries. Ann Rheum Dis 2002;61:429-37.

74. Verhoeven AC, Boers M, van der Linden S. Validity of the MACTAR questionnaire as a functional index in a rheumatoid arthritis clinical trial. J Rheumatol 2000;27:2801-9.

75. Katz PP, Yelin EH. Activity loss and the onset of depressive symptoms: do some activities matter more than others? Arthritis Rheum 2001;44:1194-202.

76. Westhovens R, Rahman MU, Han C, Bala M, Han J, Yocum D. Infliximab treatment results in a rapid improvement in all aspects of quality of life assessed by the SF-36 in patients with rheumatoid arthritis: results from the START trial [abstract]. Ann Rheum Dis 2005;64 Suppl III:S392.

77. Goekoop-Ruiterman YPM, de Vries-Bouwstra JK, Allaart CF, et al. Clinical and radiological outcomes of four different treatment strategies in patients with early rheumatoid arthritis (the BeSt study): a randomized, controlled study. Arthritis Rheum 2005;52:3381-90.

Chapter 3

Clear associations between demographic and psychosocial factors and health-related quality of life in patients with early inflammatory joint complaints

Geuskens GA, Burdorf A, Evers AWM, Hazes JMW. Clear associations between demographic and psychosocial factors and health-related quality of life in patients with early inflammatory joint complaints. J Rheumatol 2008; 35(9):1754-61

Abstract

Objective. To identify demographic and psychosocial characteristics associated with health-related quality of life (HRQOL) in patients with early inflammatory joint complaints.

Methods. In this cross-sectional study, patients had inflammatory joint complaints for less than 12 months. Data were collected on clinical characteristics, demographics, lifestyle, behavioural coping, perceived health control, and social support. HRQOL was assessed by 8 dimensions of the Medical Outcome Study Short Form-36 Health Survey. Multiple regression analysis was used to determine the associations between clinical, demographic, lifestyle, and psychosocial characteristics with HRQOL.

Results. In total, 359 patients were included, of which 24% were classified as RA, 34% as mono- or oligo-poly arthritis, and 42% as inflammatory joint complaints without clinical synovitis. Among all patients, the health dimensions physical function, physical role functioning, and bodily pain were most affected. The diagnostic group, erythrocyte sedimentation rate, disease duration, and comorbidity explained 4%–9% of the variance in HRQOL dimensions, whereas the combined demographic and psychosocial characteristics explained an additional 21%–29% of HRQOL. HRQOL was negatively associated with younger age, lower education, non-Dutch origin, passive behavioural coping with pain, lower perceived health control, and low social support. Passive behavioural coping with pain had the strongest association with HRQOL.

Conclusion. In patients with early inflammatory joint complaints, HRQOL was associated more strongly with personal characteristics than with clinical characteristics. From the time of onset of complaints onwards, physicians should take psychosocial factors and demographics into account to obtain an optimal disease outcome.

Introduction

Patients with inflammatory joint complaints often present with comparable clinical signs and symptoms, despite different underlying pathologies and prognosis. Health-related quality of life (HRQOL) and restrictions in function differ among patients from disease onset onwards[1]. Because clinical characteristics that are targeted by physicians during treatment cannot fully explain differences in HRQOL[2,3], other characteristics must play a role. Since one of the main goals of treatment is to maintain an optimal HRQOL[4], insight into these characteristics is important for disease management. According to the model of the International Classification of Function, Disability and Health (ICF), HRQOL is influenced by both clinical characteristics and personal and environmental factors. Personal factors include demographic, lifestyle, and psychosocial characteristics[5]. In patients with longstanding RA, reduced health status has been related to older age, female sex, lower education level[6], low socioeconomic status[7], unemployment[6,7], and a variety of psychosocial characteristics including low perceived health control[8], low self-efficacy in handling the disease[8,9], passive behavioural coping[10,11], and low social support[10,12]. Since most research has studied patients with longstanding rheumatoid arthritis (RA), it is largely unknown whether these demographic and psychosocial characteristics already exert their influence on health during the early phase of inflammatory joint complaints. Moreover, it seems that the demographic and psychosocial factors related to reduced health in patients with RA are generic factors related to health in a broad spectrum of rheumatic diseases[8,13]. However, similarities in the association between demographic and psychosocial characteristics, and health among diagnostic groups, have been studied insufficiently.

Better insight into the demographic and psychosocial characteristics determining HRQOL in patients with early inflammatory joint complaints can influence the choice of treatment and possibly improve prognosis. Of particular interest are characteristics that are amenable to change. In addition, insight into the personal characteristics determining HRQOL may provide knowledge about which patients seek medical care in an early phase of complaints[14]. The purpose of this cross-sectional study was to identify demographic and psychosocial characteristics associated with HRQOL in patients with early inflammatory joint complaints.

Methods

Study population

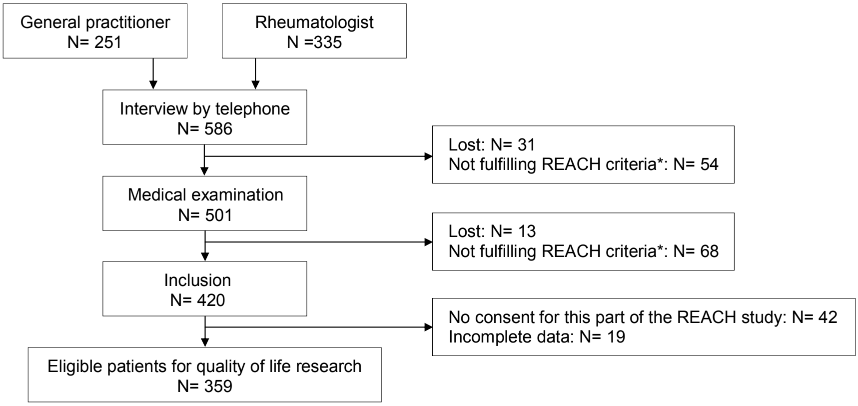
Our cross-sectional study presents the first baseline assessments of the Rotterdam Early Arthritis CoHort (REACH). REACH is an ongoing inception cohort study with 4 years of follow-up. REACH aims to study the etiopathogenesis, diagnostic strategies, and outcome of patients with inflammatory joint complaints of less than 12 months' duration. General practitioners and rheumatologists (1 university hospital, 2 general hospitals) in the greater area of Rotterdam invited patients to participate in REACH from July 2004 onwards. Data collection includes a large array of detailed medical examinations and questionnaires. When patients enter the study, they can choose to provide only limited medical data and/or self-reported questionnaires. For the present study, data were available for patients who were sent by general practitioners or rheumatologists for inclusion in this study up to July 2006. This time period was chosen to ensure follow-up studies would include the same study population.

General practitioners selected patients with arthritis in at least one joint or patients experiencing complaints in at least 2 joints without synovitis. The general practitioners ascertained that complaints existed for less than 12 months and were not due to trauma/mechanical problems. In addition, subjects had to be older than age 16 years. During an interview by telephone and subsequent medical examination by a rheumatologist, the inclusion criteria were verified. Patients were included if (1) joint complaints existed for less than 12 months with no requirement of a minimum duration; and (2) arthritis in at least one joint or complaints in at least 2 joints in combination with at least 2 of the following criteria ascertained during medical examination by a member of the REACH team: morning stiffness longer than 1 hour, bilateral compression pain in metacarpophalangeal or metatarsophalangeal, symmetrical presentation, positive family history, non-fitting shoes, non-fitting rings, "pins and needles" in fingers, or unexplained fatigue for less than 1 year; and (3) complaints predominantly present in the morning and at night that improve with movement. Patients were excluded if (1) complaints were due to trauma/mechanical problems, (2) age was under 16 years, (3) no written communication was possible in Dutch, or (4) a prior diagnosis of RA, ankylosing spondylitis, Sjögren's syndrome, systemic lupus erythematosus or juvenile arthritis had been made by a rheumatologist before inclusion in this study.

For patients visiting rheumatologists directly, a similar verification procedure was applied. For all patients enrolled through general practitioners or rheumatologists, a rheumatologist set the diagnosis.

At the end of July 2006, notification to 586 patients was given by general practitioners (n = 251) and rheumatologists (n = 335) (Figure 1). In total, 166 patients did not fulfil inclusion criteria during the interview by telephone (n = 54) or the medical examination (n = 68), or were lost before actual inclusion (n = 44). Patients lost before actual inclusion were significantly more often male compared to participants (39% vs 27% male), but no differences in age existed. After inclusion, 61 out of 420 patients (15%) were excluded from the current study due to incomplete data collection (5%, n = 19) or as a result of the patient's choice at entry to the study to provide only limited medical data and/or questionnaires (10%, n = 42). The age and sex of these patients was not significantly different from the study population. Therefore, 359 patients were eligible. This study was approved by the ethics committees of the 3 participating hospitals. All patients gave written informed consent.

Figure 1. Inclusion of patients with early inflammatory joint complaints



*: Patients were included in REACH if (1) joint complaints existed for less than 12 months, and (2) arthritis in at least one joint or complaints in at least 2 joints in combination with other factors indicating inflammatory complaints was ascertained (see text).

Measurements

Clinical characteristics

Patients with inflammatory joint complaints were classified into 3 mutually exclusive diagnostic groups based on the diagnosis made by a rheumatologist: (1) definite or probable RA, (2) specified or nonspecified mono- or oligo/poly- arthritis, non-RA, and (3) inflammatory joint complaints without apparent synovitis. Swollen joint count (SJC; 44 joints) was assessed and categorized into no synovitis, 1–2 swollen joints, and 3 or more swollen joints. Since diagnostic group and SJC were strongly related (r = 0.66), only diagnostic group was included in the statistical analysis. Erythrocyte sedimentation rate (ESR, mm/h) was measured and classified into low (< 10 mm/h), intermediate (10–25 mm/h), and high (> 25 mm/h) on the basis of tertile scores. ESR values were regarded as absent if measured more than 2 weeks before/after physical examination (n = 39). The duration of inflammatory complaints was defined as the period between symptom onset and medical examination. Based on the median number of weeks since complaint onset, disease duration was classified as short or long. A broad range of co-morbidities was ascertained, including lung disease, cardiovascular diseases, diabetes mellitus, cancer, gastrointestinal diseases, kidney diseases, diseases of the gall bladder and liver, diseases of the thyroid gland, neurological diseases, and psychiatric disease. If one or more comorbidities existed, patients were classified as having a comorbid condition (yes/no).

Demographic characteristics and lifestyle

Patients were questioned about their age, sex, and ethnicity. Ethnicity was defined by country of birth of the mother if both parents were born abroad or by country of birth of the parent that was born abroad[15]. Two categories were made, e.g., Dutch citizens (no parent born abroad) and non-Dutch citizens (at least one parent born abroad). Education according to the highest level attained was categorized as low (≤ 9 yrs: primary school, lower and intermediate secondary schooling or lower vocational training), intermediate (10-14 yrs: higher secondary schooling or intermediate vocational training), and high (≥ 15 years: higher vocational training or university). Employment status was defined as having paid employment (yes/no). Marital status was ascertained, and patients were classified as living alone or living with others.

Body mass index was calculated by weight in kilograms divided by the square of the height in meters and categorized into normal (< 25 kg/m2), overweight (25–30 kg/m2), and obese (> 30 kg/m2). Smoking was expressed by current smoking status (yes/no).

Psychosocial characteristics

Behavioural coping was assessed by 2 scales of the Coping of Rheumatic Stressors (CORS) questionnaire. The scale “decreasing activities to cope with pain” was measured by 8 items on a 4-point scale (seldom or never, sometimes, often, very often) and similarly the scale “pacing to cope with limitations” was measured by 10 items. Sum scores were computed that ranged from 8–32 and 10–40, respectively. A higher sum score indicates more frequent use of the coping strategy. Both scales have good internal consistency and high test-retest reliability[16-18]. In our present study, Cronbach’s alpha for decreasing activity to cope with pain was 0.86, and Cronbach’s alpha for pacing was 0.92. Since both scales were highly correlated (r = 0.77), only “decreasing activities to cope with pain” was included in the statistical analysis as it was considered to be most relevant in patients with early joint complaints[11,17].

Perceived control over health outcomes was measured by the Multidimensional Health Locus of Control Questionnaire (MHLC). The MHLC assesses 3 different dimensions of perceived health control by means of 3 scales (Cronbach’s alpha 0.68 to 0.78). The “internal” scale reflects the belief that people are personally responsible for their own health, the “physician” scale reflects that a physician is responsible for one’s health, and the “chance” scale reflects the belief that health depends on chance, luck, or fate. Each scale contains 6 statements with answers on a 6-point scale (strongly disagree to strongly agree)[19,20]. The subscale scores range from 6 to 36, with a higher score indicating that a patient's belief is stronger in the particular health locus of control. The scales are not opposite ends of the same spectrum, and it is possible to have, for example, both internal and physician beliefs about health status at the same time. In this study, correlations among the subscales were low (r = 0.01–0.33), and Cronbach's alpha was 0.49 to 0.76.

Social support was assessed by a subscale of the Inventory for Social Support (ISB), which is part of the Impact of Rheumatic Diseases on General Health and Lifestyle questionnaire. The subscale reflects the perceived availability of emotional and instrumental support and has a documented reliability of Cronbach's alpha of 0.88[10,21]. The scale consists of 5 items with answers on a 4-point scale (almost never, sometimes, regularly, often) and the sum score ranges from 5 to 20, with higher scores indicating that more social support is experienced (Cronbach's alpha 0.90). Due to the highly skewed distribution of this scale, the sum score was categorized into 2 categories based on the median score (low/high).

The correlations among the psychosocial factors reducing activity in order to cope with pain, perceived health control, and social support were low (Spearman r = 0.00 to 0.35).

Health-related quality of life

HRQOL was assessed by the Medical Outcome Study Short Form-36 Health Survey (SF-36). The SF-36 is a generic 36-item questionnaire covering 8 dimensions: physical functioning (PF), physical role functioning (PR), bodily pain (BP), general health (GH), vitality (VI), social functioning (SF), and mental health (MH)[22,23]. From the 8 separate dimensions of the SF-36, component summary scores were calculated to provide a global measure of physical (PCS) and mental (MCS) functioning. The 8 dimensions and 2 summary scores may range from 0 to 100, and a higher score indicates a better HRQOL. In order to evaluate the HRQOL among patients in the study population, a comparison was made with a random sample from the Dutch general population[24]. Due to a strong ceiling effect, the dimensions emotional role functioning and physical role functioning were not included in the statistical analysis.

Statistical analysis

Differences between continuous variables were tested with the unpaired Student t-test and differences among frequencies with the chi-square test. Associations between continuous variables and between variables on an ordinal scale were studied with, respectively, Pearson correlation and Spearman rank correlation coefficient. The level of statistical significance was defined as $p \leq 0.05$. The internal consistency of measurement scales was expressed by Cronbach's alpha.

Multiple linear regression analysis was conducted to determine the associations between clinical, demographic, lifestyle, and psychosocial characteristics, with 6 subscales of the SF-36 and the 2 component summary scores. The following procedure was applied to identify characteristics associated with each scale of the SF-36. First, 6 blocks of interrelated variables were defined: (1) the demographic characteristics age, sex, and ethnicity; (2) education and employment status; (3) clinical characteristic diagnostic group, ESR, duration of complaints, and comorbidity; (4) lifestyle factors smoking and body mass index; (5) behavioural coping with pain and perceived health control; and (6) social support and marital status. The analysis started with multivariate regression models within each block to determine which independent variables in each block of interrelated determinants were of interest to consider in the final model. Variables with a p value ≤ 0.20 were selected for further investigation. Subsequently, starting with the variables selected in the previous step, final multivariate regression models were constructed. In the final regression models with scales of the SF-36 as dependent variables, independent variables with a p value ≤ 0.05 for at least one scale of the SF-36 were retained in all models, as well as age and sex by default. In order to compare the influence of variables with a different scale, standardized regression coefficients were also calculated, expressing the influence of a shift of one standard deviation in the scale of the variables on the outcome of interest.

All statistical analyses were performed with the statistical package SPSS 11.0 for Windows.

Results

Table 1 describes the characteristics of 359 patients with early inflammatory joint complaints. About 24% of the study population was diagnosed as RA (n = 86) and 35% (n= 124) was classified as (non-RA) arthritis. In 39 out of 124 patients (31%) with non-RA arthritis, monoarthritis was found, in 62 patients (50%) oligoarthritis, and in 23 patients (19%) polyarthritis. Patients classified as having inflammatory joint complaints without clinical synovitis (n = 149) were diagnosed with arthralgia/myalgia (n = 49), inflammatory joint complaints without clinical synovitis, without further specification (n = 47), osteoarthritis (n = 37), and others (n = 16). Diagnostic group was strongly associated with swollen joint count (r = 0.66). At least one comorbidity was present in 50% of the patients. Cardiovascular (24%) and respiratory disease (11%) were the most prevalent.

Figure 2 presents the scores on the subscales of the SF-36. Compared to the Dutch reference population, patients experienced notably worse physical function, physical role functioning, and bodily pain. For physical role functioning, 44% of the patients reported the minimum score of 0, whereas 61% of the patients reported the maximum

Table 1. Characteristics of patients with early inflammatory joint complaints (n= 359)

Characteristics	**Rheumatoid arthritis** (n= 86)	**(Non-RA) arthritis, specified and non-specified** (n= 124)	**Inflammatory joint complaints without clinical synovitis** (n= 149)
Clinical factors			
Duration of complaints, wks, median (IQR)	16 (17)	11(18)	18 (20)
Swollen joint count, 44 joints, median (IQR)	4.0 (6.5)	2.0 (3.0)	0 (0)
ESR, mm/hr, median (IQR)	25 (27)	22 (30)	8 (10)
Comorbidity, %	49%	44%	54%
Demographic factors			
Age, yrs, mean (SD)	53 (14)	50 (15)	48 (13)
Female, %	72%	57%	86%
Non-Dutch citizens, %	22%	17%	19%
Education, %			
Low	58%	56%	52%
Intermediate	27%	33%	27%
High	15%	11%	21%
Paid employment, %	56%	59%	60%
Marital status, % living alone	13%	20%	14%
Life style			
Smoking, %	30%	28%	28%
BMI, %			
Normal (<25 kg/m^2)	41%	35%	41%
Overweight (25-30 kg/m^2)	36%	49%	38%
Obese (>30 kg/m^2)	23%	16%	21%
Psychosocial factors			
Decreasing activities to cope with pain (8-32), mean (SD)	15.8 (5.0)	15.7 (4.7)	15.0 (4.6)
Pacing to cope with limitations (10-40), mean (SD)	22.8 (7.1)	22.3 (6.7)	20.5 (6.5)
Perceived health control (6-36), mean (SD)			
Intern	20.1 (4.5)	20.8 (5.0)	19.9 (5.1)
Physician	20.7 (4.1)	19.8 (4.1)	19.1 (3.9)
Chance	20.0 (4.6)	19.7 (5.5)	20.1 (5.5)
Social support (5-20), median (IQR)	17.0 (8.0)	17.5 (6.5)	17.0 (7.0)
Health-related Quality of Life (0-100), mean (SD)			
Physical functioning	56 (24)	60 (25)	65 (21)
Physical role	28 (36)	39 (41)	40 (40)
Bodily pain	39 (19)	44 (22)	47 (19)
General health	53 (18)	60 (19)	54 (18)
Vitality	56 (20)	57 (20)	54 (20)
Emotional role	63 (43)	72 (42)	72 (41)
Social functioning	70 (26)	70 (27)	73 (23)
Mental health	71 (19)	71 (24)	70 (18)
Physical component summary score	33 (9)	36 (10)	37 (9)
Mental component summary score	51 (12)	51 (11)	50 (11)

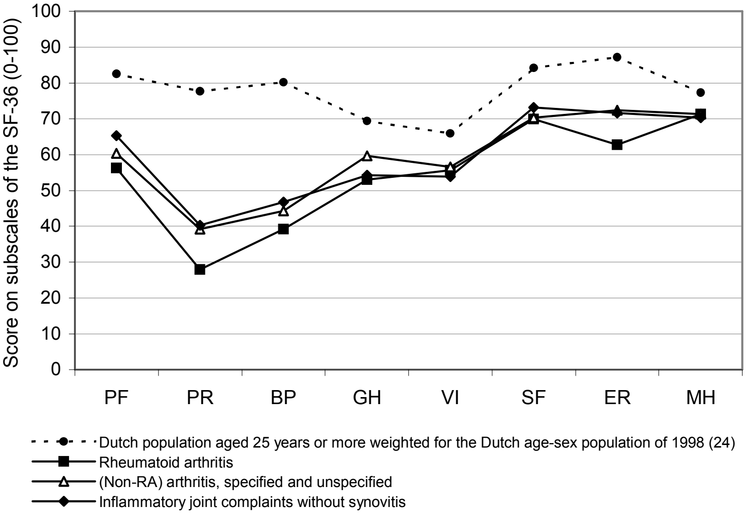
ESR: erythrocyte sedimentation rate; BMI: body mass index; IQR: interquartile range.

score of 100 for emotional role functioning. The interrelations among the subscales physical functioning, pain, general health, vitality, social functioning, and mental health were 0.30 to 0.62, with the lowest association between bodily pain and mental health ($r = 0.30$) and the highest association between vitality and social functioning ($r = 0.62$). The correlation between physical functioning and bodily pain was 0.59.

In Table 2 the associations of the SF-36 with blocks of interrelated clinical, demographic, lifestyle, and psychosocial characteristics are given. Physical function was 15.7 points worse in patients with high levels of ESR, and score for bodily pain was 9.3 points worse.

In all subscales of the SF-36, significant worse HRQOL was reported by patients with a non-Dutch origin (6.0 to 13.8 points lower score) and by patients with a greater decrease in activity to cope with pain. The following characteristics were not associated with HRQOL (p > 0.20): smoking, obesity/overweight, and marital status (Table 2).

Figure 2. Health-related quality of life of patients with early inflammatory joint complaints as measured by the SF-36 components physical functioning (PF), physical role functioning (PR), bodily pain (BP), general health (GH), vitality (VI), social functioning (SF), emotional role functioning (ER), and mental health (MH) (SF-36)



In the final multivariate linear regression analysis, diagnostic group, ESR, disease duration, and comorbidity together explained 4%–9% of the variance in the subscales of the SF-36, whereas adding demographic and psychosocial characteristics to the model increased the explained variance with 21%–29%, to the total explained variance in HRQOL of 25% to 36% (Table 3). For the physical (PCS) and mental (MCS) component summary scores, clinical factors explained, respectively, 11% and 5% of the variance, while demographic and psychosocial factors explained an additional 28% and 17% of the variance in HRQOL.

Table 4 shows that the score on the dimensions physical functioning, pain, general health, vitality, social functioning, and mental health decreased by 0.8 to 2.5 points, with an increase of one unit in the coping style "decreasing activity to cope with pain." Adjusted for other factors, an increase in the score on this coping style of one standard deviation (in this study population equal to 4.7 points) was associated with an 11.6-point worse score for physical functioning and a 9.6-point worse score for bodily pain. For several dimensions of HRQOL, younger age, non-Dutch origin, low education level, lower

Table 2. The associations within groups of clinical, demographic, lifestyle, and psychosocial characteristics, with scales of the SF-36 in multivariate linear regression analyses in patients with early inflammatory joint complaints

Characteristics	**PF** (0-100) β	**BP** (0-100) β	**GH** (0-100) β	**VI** (0-100) β	**SF** (0-100) β	**MH** (0-100) β
RA vs IJC without clinical synovitis	-3.32	-3.51	0.06	3.90	1.41	2.34
(Non-RA) arthritis vs IJC without clinical synovitis	0.32	1.39	6.97*	6.20*	1.62	2.12
Intermediate ESR (10-25) vs low ESR (<10)	-5.39†	-5.29†	0.12	2.01	1.23	3.64†
High ESR (>25) vs low ESR (<10)	-15.7*	-9.28*	-5.12†	-4.63†	-7.90*	-0.42
Duration of complaints, long vs short	1.21	7.00*	0.46	3.13†	4.39†	3.30†
Comorbidity	-0.67	-1.58	-6.17*	-1.77	-2.97	-4.92*
Age, yrs	-0.10	-0.01	0.04	0.26*	0.13†	0.08
Sex, male vs female	-0.51	0.34	1.16	4.00†	-1.49	-0.61
Ethnicity, non-Dutch vs Dutch citizens	-8.49*	-6.03*	-6.10*	-7.94*	-13.8*	-10.2*
Intermediate vs low education level	3.29	2.47	-2.47	-2.40	0.21	-0.80
High vs low education level	9.79*	10.0*	1.64	6.82*	2.05	3.18
Employment	2.87	0.61	4.14*	-2.22	2.19	1.20
Smoking	-1.46	0.06	0.29	-0.78	-0.79	0.11
Overweight vs normal	-2.11	0.13	1.64	0.82	-1.44	0.00
Obese vs normal	-5.29†	-2.30	-2.95	-1.93	0.79	2.21
Decreasing activity to cope with pain (8-32)	-2.59*	-2.08*	-1.21*	-1.91*	-2.65*	-0.94*
Intern perceived health control (6-36)	0.28	0.21	0.69*	0.13	0.20	0.07
Physician perceived health control (6-36)	-0.54†	-0.06	-0.71*	0.33	-0.34	-0.75*
Chance perceived health control (6-36)	-0.32†	-0.46*	-0.58*	-0.07	-0.36†	-0.22
Marital status, alone vs with others	-1.35	-0.47	-2.88	-4.06†	-1.61	0.41
Social support, high vs low	4.16†	0.19	5.19*	7.27*	7.25*	10.1*

*: $p \leq 0.05$, †: $p \leq 0.20$, PF: physical functioning, BP: bodily pain, GH: general health, VI: vitality, SF: social functioning, MH= mental health; IJC= Inflammatory joint complaints; ESR: erythrocyte sedimentation rate.

Table 3. Explained variance (R^2) in scales of the SF-36 by groups of characteristics in multivariate linear regression analysis in patients with early inflammatory joint complaints

Characteristics	**PF** R^2	**BP** R^2	**GH** R^2	**VI** R^2	**SF** R^2	**MH** R^2
Clinical, % (diagnostic group, ESR, disease duration, comorbidity)	9	9	7	4	4	4
Clinical + demography, % (+ age, sex, ethnicity, education)	11	13	11	12	9	9
Clinical + demography + psychosocial factors, % (+ decreasing activity to cope with pain, perceived health control, social support)	34	36	30	31	33	25

PF: physical functioning, BP: bodily pain, GH: general health, VI: vitality, SF: social functioning, MH: mental health.

perceived health control, and low social support were also associated with poor HRQOL (Table 4). A worse PCS score was significantly associated with intermediate or high ESR levels, greater decrease in activity to cope with pain, and more attributing health to chance. A lower MCS score was associated with high ESR levels, greater decrease in activity in order to cope with pain, and low social support.

When interaction terms were added to the final multivariate models, observed associations between education, behavioural coping, and social support and HRQOL did not differ significantly among diagnostic groups or among patients with different ESR levels. Moreover, similar results were found when RA patients were compared to both other diagnostic groups, or when swollen joint count instead of diagnostic group was included in the analysis. The number of comorbidities was significantly associated only with the subscale general health, with 2 or more comorbidities being associated with worse general health than one or no comorbidity.

Table 4. The influence of clinical, demographic and psychosocial characteristics on scales of the SF-36 in multivariate linear regression analysis in patients with early inflammatory joint complaints

Characteristics	**PF** (0-100) β	**BP** (0-100) β	**GH** (0-100) β	**VI** (0-100) β	**SF** (0-100) β	**MH** (0-100) β
Intercept	101.70	68.44	75.62	50.73	107.17	85.55
Clinical factors						
Diagnosis						
RA vs IJC without clinical synovitis	-3.90	-4.12	-0.59	2.55	1.23	2.43
(Non-RA) arthritis vs IJC without clinical synovitis	-0.95	0.92	5.78*	5.04*	1.06	1.04
ESR, mm/hr						
Intermediate (10-25) vs low (<10)	-3.89	-4.80	0.59	0.90	0.84	3.59
High (>25) vs low (<10)	-7.94*	-3.60	-2.10	-2.59	-1.74	2.11
Duration of complaints, long vs short	0.01	6.35*	0.39	3.08	3.37	2.25
Comorbidity, yes vs no	3.23	0.89	-5.56*	-1.60	-0.54	-3.25
Demographic factors						
Age, yrs	0.06	0.09	0.25*	0.29*	0.21*	0.19*
Sex, male vs female	-0.78	-1.78	-0.87	3.14	-2.94	-0.26
Ethnicity, non-Dutch vs Dutch citizens	-2.63	-1.56	-0.06	-2.56	-7.02*	-6.80*
Education						
Intermediate vs low	2.28	1.14	-3.78	-1.17	0.40	0.60
High vs low	4.11	7.50*	-1.66	4.26	-0.97	1.66
Psychosocial factors						
Decreasing activities to cope with pain (8-32)	-2.44*	-2.03*	-0.93*	-1.71*	-2.46*	-0.76*
Perceived health control						
Intern (6-36)	0.37	0.24	0.68*	0.09	0.22	0.11
Physician (6-36)	-0.26	0.41	-0.92*	0.27	-0.27	-0.82*
Chance (6-36)	-0.34	-0.54*	-0.60*	-0.05	-0.39	-0.25
Social support, high vs low	3.09	0.46	4.02*	5.83*	6.56*	8.99*

*: $p \leq 0.05$. PF: physical functioning, BP: bodily pain, GH: general health, VI: vitality, SF: social functioning, MH: mental health.

Discussion

HRQOL among patients with early inflammatory joint complaints was strongly associated with demographic and psychosocial characteristics, and to a lesser extent with clinical characteristics. Diagnostic group, ESR, disease duration, and comorbidity explained 4%–9% of the variance in HRQOL dimensions, whereas the combined demographic and psychosocial characteristics explained an additional 21%–29%. In addition to well-know factors such as age, ethnicity, and education, we found that behavioural coping, perceived health control, and social support were related with health.

Patients seeking care with early inflammatory joint complaints reported notably reduced physical function, reduced role functioning due to physical problems, and increased pain compared to the reference population, irrespective of their specific diagnosis. The pattern in scores on the SF-36 resembled the pattern in restrictions generally found in patients with chronic rheumatic diseases[24-26]. Within this pattern in HRQOL, the differences among patients in the extent to which complaints intruded upon health were more strongly associated with personal factors than with clinical factors. This aligns well with the biopsychosocial model[27]. The personal factors related to health in this study population have previously been described in patients with various chronic rheumatic conditions[6,8,13,26]. Therefore, our study extends these previous findings by showing that in an early stage of disease, well-known demographic factors and behavioural coping with pain, perceived health control, and social support already are more strongly related to HRQOL than clinical factors. In addition, the associations between psychosocial and demographic characteristics and health seem to be generic across different diagnostic groups, at least in an early phase of disease.

A similar pattern of associations between demographic and psychosocial factors and dimensions of the SF-36 was found for those SF-36 dimensions that were strongly related. Among the psychosocial factors, behavioural coping was a major influence. An increase of one standard deviation in the coping style of decreasing activities to cope with pain resulted in 10% more pain and a reduction of 12% in physical functioning. Behavioural coping is thought to be relatively stable over time, and may be independent of disease activity and duration[13]. In addition, passive behavioural coping with pain has been related to subsequent worse outcome in patients with RA[10,11,17]. It could therefore be hypothesized that it is more likely that passive behavioural coping has resulted in a reduced health than reduced health inducing a passive coping style. However, due to the cross-sectional design of our study, reversed directionality cannot be excluded and thus no assumption on causation can be made. In agreement with our findings for behavioural coping, more internal and less external perceived health control was related to better health. Previous studies have shown that low perceived health control and high helplessness feelings can unfavourably affect outcome in chronic rheumatic conditions[8,28,29]. Moreover, in chronic pain patients, external attribution of health has been related to ineffective coping styles to control pain, and to avoiding increasing activity to cope with pain[30].

In our cross-sectional study, the baseline data of an ongoing inception cohort study, REACH, were used. Since the prevalence of inflammatory joint complaints in the general population is unknown, little insight exists in potential selection processes during referral of patients by physicians to this inception cohort study. If selection bias has occurred, it seems that physicians are more likely to have notified patients about REACH if patients reported serious complaints. Additional analysis showed that entering the study via notification by a general practitioner or a rheumatologist did not contribute to reported differences in health. Further, due to the response of 85% after inclusion, we are confident that a response bias has not influenced the results of this study to a large extent. Individuals' self-report tendencies may have influenced our findings, since both the psychosocial factors and HRQOL were self-reported measures. However, the correlations among the psychosocial factors behavioural coping, health locus of control, and social support were low. Further, these psychosocial factors did not have associations of similar magnitude across all dimensions of the SF-36. Therefore, we think that individuals' self-report tendencies did not contribute markedly to an overestimation of the associations. The analyses we presented did not take physical health into account when characteristics related to the mental dimensions of HRQOL were studied, and vice versa. However, additional analysis showed that taking these constructs into account did not affect the essence of our findings.

To our knowledge, no study has described characteristics related to differences in HRQOL in patients with inflammatory joint complaints visiting primary care in an early phase of disease. The characteristics of our study population provided some insight into which patients seek medical care in an early phase of inflammatory joint complaints. Patients reported considerable pain and physical limitations, and it could be hypothesized that these complaints prompted medical care-seeking. In order to improve HRQOL, early medical treatment is needed. However, physicians should be aware that self-reported HRQOL is not only affected by clinical factors such as ESR and diagnosis. In a very early stage of disease, the valuation of health is already strongly related to demographic factors and psychosocial factors such as passive behavioural coping, perceived control over health, and social support. This implies that treatment may need to be tailored to these characteristics in order to obtain an optimal HRQOL in the early phase of inflammatory joint complaints.

References

1. Geuskens GA, Burdorf A, Hazes JMW. Consequences of rheumatoid arthritis for performance of social roles- a literature review. J Rheumatol 2007;34:1248-60.
2. Thyberg I, Skogh T, Hass UA, Gerdle B. Recent-onset rheumatoid arthritis: a 1-year observational study of correlations between health-related quality of life and clinical/laboratory data. J Rehabil Med 2005;37:159-65.
3. Escalante A, del Rincon I. How much disability in rheumatoid arthritis is explained by rheumatoid arthritis? Arthritis Rheum 1999;42:1712-21.
4. Hazes JM. Determinants of physical function in rheumatoid arthritis: association with the disease process. Rheumatology Oxford 2003;42 Suppl 2:ii17-21.
5. International Classification of Functioning, Disability and Health: ICF. Geneva: World Health Organization; 2001.
6. Groessl EJ, Ganiats TG, Sarkin AJ. Sociodemographic differences in quality of life in rheumatoid arthritis. Pharmacoeconomics 2006;24:109-21.
7. Brekke M, Hjortdahl P, Thelle DS, Kvien TK. Disease activity and severity in patients with rheumatoid arthritis: relations to socioeconomic inequality. Soc Sci Med 1999;48:1743-50.
8. Cross MJ, March LM, Lapsley HM, Byrne E, Brooks PM. Patient self-efficacy and health locus of control: relationships with health status and arthritis-related expenditure. Rheumatology Oxford 2006;45:92-6.
9. Brekke M, Hjortdahl P, Kvien TK. Self-efficacy and health status in rheumatoid arthritis: a two-year longitudinal observational study. Rheumatology Oxford 2001;40:387-92.
10. Evers AW, Kraaimaat FW, Geenen R, Jacobs JW, Bijlsma JW. Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. Behav Res Ther 2003;41:1295-310.
11. van Lankveld W, Naring G, van't Pad Bosch P, van de Putte L. The negative effect of decreasing the level of activity in coping with pain in rheumatoid arthritis: an increase in psychological distress and disease impact. J Behav Med 2000;23:377-91.
12. Minnock P, Fitzgerald O, Bresnihan B. Quality of life, social support, and knowledge of disease in women with rheumatoid arthritis. Arthritis Rheum 2003;49:221-7.
13. Boonen A, van der Heijde D, Landewe R, et al. Is avoidant coping independent of disease status and stable over time in patients with ankylosing spondylitis? Ann Rheum Dis 2004;63:1264-8.
14. Badley EM. Arthritis in Canada: what do we know and what should we know? J Rheumatol 2005;32 Suppl 72:39-41.
15. Keij I. Numbers of foreigners according to various definitions. Maandstatistiek van de bevolking 2000;48:14-7.
16. van Lankveld W, Naring G, van der Staak C, van't Pad Bosch P, van de Putte L. De ontwikkeling van de CORS. Coping met reuma stressoren. Gedrag en Gezondheid 1993;21:40-8.
17. van Lankveld W, Naring G, van't Pad Bosch P, van de Putte L. Behavioral coping and physical functioning: the effect of adjusting the level of activity on observed dexterity. J Rheumatol 1999;26:1058-64.
18. van Lankveld W, van't Pad Bosch P, van de Putte L, Naring G, van der Staak C. Disease-specific stressors in rheumatoid arthritis: coping and well-being. Br J Rheumatol 1994;33:1067-73.

19. Halfens R. Een gezondheidsspecifieke beheersingsorientatieschaal -Validiteit en betrouwbaarheid van de MHLC. T Soc Gezondheidsz 1988;66:399-403.

20. Wallston KA, Wallston BS, DeVellis R. Development of the Multidimensional Health Locus of Control (MHLC) Scales. Health Educ Monogr 1978;6:160-70.

21. van Dam-Baggen R, Kraaimaat FW. De Inventarisatielijst Sociale Betrokkenheid (ISB): een zelfbeoordelingslijst om sociale steun te meten. Gedragstherapie 1992;25:27-46.

22. Aaronson NK, Muller M, Cohen PD, et al. Translation, validation, and norming of the Dutch language version of the SF-36 Health Survey in community and chronic disease populations. J Clin Epidemiol 1998;51:1055-68.

23. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;30:473-83.

24. Picavet HS, Hoeymans N. Health related quality of life in multiple musculoskeletal diseases: SF-36 and EQ-5D in the DMC3 study. Ann Rheum Dis 2004;63:723-9.

25. Lapsley HM, March LM, Tribe KL, Cross MJ, Courtenay BG, Brooks PM. Living with rheumatoid arthritis: expenditures, health status, and social impact on patients. Ann Rheum Dis 2002;61:818-21.

26. Chorus AM, Miedema HS, Boonen A, van der Linden S. Quality of life and work in patients with rheumatoid arthritis and ankylosing spondylitis of working age. Ann Rheum Dis 2003;62:1178-84.

27. Engel GL. The need for a new medical model: a challenge for biomedicine. Science 1977;196:129-36.

28. Covic T, Adamson B, Spencer D, Howe G. A biopsychosocial model of pain and depression in rheumatoid arthritis: a 12-month longitudinal study. Rheumatology Oxford 2003;42:1287-94.

29. Evers AW, Kraaimaat FW, van Lankveld W, Jongen PJ, Jacobs JW, Bijlsma JW. Beyond unfavorable thinking: the illness cognition questionnaire for chronic diseases. J Consult Clin Psychol 2001;69:1026-36.

30. Crisson JE, Keefe FJ. The relationship of locus of control to pain coping strategies and psychological distress in chronic pain patients. Pain 1988;35:147-54.

Chapter 4

Work and sick leave among patients with early inflammatory joint conditions

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Geuskens GA, Hazes JMW, Barendregt PJ, Burdorf A. Work and sick leave among patients with early inflammatory joint conditions. Arthritis Rheum 2008;59(10):1458-66

Abstract

Objective. To study the occurrence of sick leave and to identify work characteristics related to sick leave in patients with early inflammatory joint conditions.

Methods. Patients with inflammatory joint conditions present for <12 months were included in this cross-sectional study. Approximately 85% of patients satisfying the criteria participated. Data collection included demographics, clinical characteristics, pain, physical functioning and mental health (Short Form 36), fatigue, and behavioural coping (Coping of Rheumatic Stressors questionnaire). Work characteristics included physical load, psychosocial load, job control, and support at work. Outcome was defined as sick leave for >2 weeks during the past 6 months. Multiple logistic regression analysis was conducted.

Results. Sick leave was reported by 54 (26%) of 210 employed patients, with 75% of the sick leave periods attributed to joint conditions. Of these 210 patients, 23% were classified as having rheumatoid arthritis (RA), 35% as having non-RA arthritis, and 42% as having inflammatory joint conditions without synovitis. Pain, poor physical functioning, and passive behavioural coping were related to increased sick leave, whereas diagnostic group was not. Low job control, i.e., low control over planning and pacing of activities within the job, was associated with increased sick leave (odds ratio (OR) 2.74), whereas being a supervisor (OR 0.21) and clerical work (OR 0.45) were related to reduced sick leave.

Conclusion. Substantial sick leave in the past 6 months was reported by 26% of patients with early inflammatory joint conditions. Pain, functional limitations, and fewer opportunities to determine one’s work activities were associated with the occurrence of sick leave.

Introduction

In patients with rheumatoid arthritis (RA), work participation is frequently affected early in the course of disease. Reviews have shown that approximately one-third of RA patients in European cohort studies quit employment during the first 2-3 years of disease, and that 23-31% of the patients received (partial) disability payments after 2 years[1,2]. The increase in work-relevant disability has been found to be highest during the first years of RA[3-5]. Compared with the general population, the prevalence of paid employment is estimated to be 4-28% lower in patients with longstanding RA, whereas the prevalence of (partial) disability pensions is 11-52% higher[1]. Because only a small proportion of patients that lost employment succeeded in regaining a paid job, the prevention of work loss from the earliest phase of inflammatory joint conditions onward seems crucial[6].

In the identification of factors related to work-relevant disability in RA patients, poor physical functioning has been described consistently as a strong determinant of increased work-relevant disability[2,7]. Higher levels of pain may also play a role[7]. In 2001, Chorus et al[8] showed that among RA patients, those passively coping with pain and limitations were more likely to be unemployed. Furthermore, demographic factors, e.g., older age and lower education level, are strong determinants of increased work-relevant disability[2,7]. Well-known work characteristics of increased work-relevant disability are blue-collar work and high physically demanding work[2,7]. Other work factors, such as part-time work, not supervising others, not being self-employed, low job autonomy or lack of control over work pace and activities, and lack of support at work have also been associated with increased work-relevant disability[8-12]. Some of these demographic and work characteristics, e.g., education and physically demanding work, have not only been described for RA patients, but also for patients with ankylosing spondylitis[13]. Finally, the clinical factors of longer disease duration, higher joint count, and higher erythrocyte sedimentation rate (ESR) may also influence work-relevant disability[2,7].

Until now, most studies on work participation among patients with a rheumatic disease have focused on employment status, especially on work-relevant disability. Sick leave usually precedes work-relevant disability[14-16]. However, insight into sick leave among workers with rheumatic diseases is limited. First, few studies have addressed sick leave, and to our knowledge, until now no study has examined the influence of disease-related, individual, and work factors on the occurrence of sick leave. Studies on sick leave due to musculoskeletal conditions have shown that sick leave was increased among workers with high physical workload, high psychosocial workload, or low social support at work[17,18]. Another study reported that demographic characteristics were more important than work-related factors in the occurrence of sick leave[19]. Second, sick leave has rarely been studied in the early phase of inflammatory joint conditions, when diagnosis is not yet known and patients seek care. Insight into which factors influence sick leave in this early phase of conditions is important to support work participation from the earliest moment onward. Work characteristics are especially of interest because they may be amendable to change as part of early tertiary intervention.

In order to gain insight into the performance at work of patients seeking medical care in an early phase of disease, the aim of this cross-sectional study was to examine the occurrence of sick leave and to identify work characteristics related to sick leave in patients with early inflammatory joint conditions.

Methods

Study population

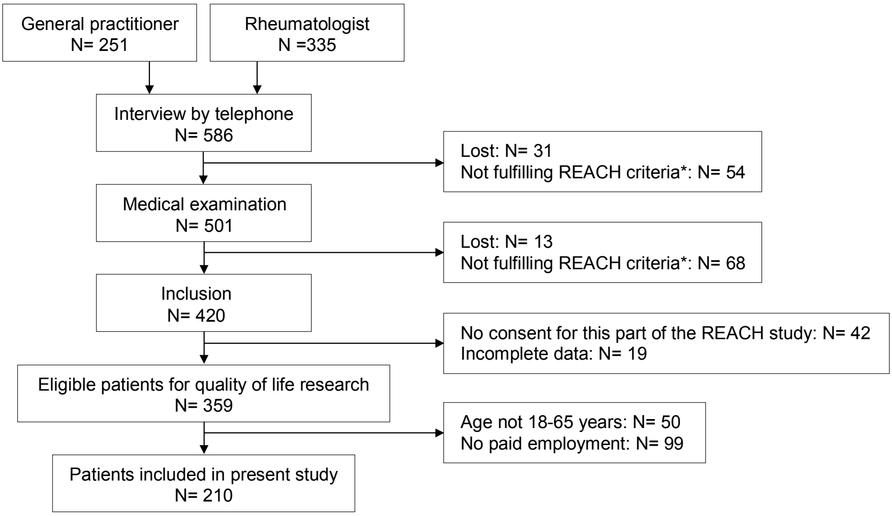
This cross-sectional study shows the first baseline assessments of the Rotterdam Early Arthritis CoHort (REACH), an ongoing inception cohort study with 4 years of follow-up. REACH aims to study the etiopathogenesis, diagnostic strategies, and outcome of patients with inflammatory joint conditions for <12 months. In total, 82 general practitioners, 12 rheumatologists, and 4 rheumatologist trainees (1 university hospital, 2 general hospitals) in the greater area of Rotterdam have invited patients to participate in REACH from July 2004 onward. For general practitioners, short educational courses on the importance of early treatment of RA and early referral were organized. Physicians that agreed to participate in REACH received written information and verbal instructions on the general aims of the study and on how to send patients for inclusion in the study. Data collection includes a large array of detailed medical examination and questionnaires. When patients enter the study, they can choose to provide only limited medical data and/or self-reported questionnaires. For the present study, data were available for patients who were sent by general practitioners or rheumatologists for inclusion in the study up to July 2006. This time period was chosen to ensure follow-up studies would include the same study population.

General practitioners selected patients with arthritis in ≥ 1 joint or patients experiencing conditions in ≥ 2 joints without synovitis. The general practitioners determined that conditions existed for <12 months and were not due to trauma/mechanical problems. In addition, patients had to be age >16 years. During an interview by telephone and a subsequent medical examination by a rheumatologist, the inclusion criteria were verified. Patients were included if 1) joint conditions existed for <12 months with no requirement of a minimum duration; 2) they had arthritis in ≥ 1 joint or complaints in ≥ 2 joints in combination with at least 2 of the following criteria ascertained during medical examination by a rheumatologist: morning stiffness for >1 hour, bilateral compression pain in the metacarpophalangeal or metatarsophalangeal joints, symmetric presentation, positive family history, non-fitting shoes, non-fitting rings, pins and needles in fingers, or unexplained fatigue for <1 year; and 3) conditions were predominantly present in the morning and at night, and improved with movement. Patients were excluded if 1) conditions were due to trauma/mechanical problems, 2) they were age <16 years, 3) no written communication was possible in Dutch, or 4) a prior diagnosis of RA, ankylosing spondylitis, Sjögren's syndrome, systemic lupus erythematosus, or juvenile arthritis had been made by a rheumatologist before inclusion in this study.

For patients directly visiting rheumatologists, a similar verification procedure was applied. For all patients enrolled through general practitioners or rheumatologists, a rheumatologist set the diagnosis.

At the end of July 2006, 586 patients were notified by general practitioners (n= 251) and rheumatologists (n= 335) (Figure 1). In total, 166 patients did not fulfil inclusion criteria during the interview by telephone (n= 54) or during the medical examination (n= 68), or were lost before actual inclusion (n= 44). Patients lost before actual inclusion were significantly more often men compared with participants (39% versus 27%), but no differences in age existed. After inclusion, 61 (15%) of 420 patients were excluded from the current study due to incomplete data collection (5%, n= 19) or as a result of the patient's choice at onset of the study to provide only limited medical data and/or questionnaires (10%, n= 42). Age and sex of these patients were not significantly different from the study population. Therefore, 359 patients were eligible. For the present study,

Figure 1. Inclusion of employed patients with early inflammatory joint conditions



*: Patients were included in REACH if 1) joint complaints existed for less than 12 months, and 2) arthritis in at least one joint or complaints in at least 2 joints in combination with other factors indicating inflammatory complaints was ascertained (see text).

only patients age 18-65 years in paid employment were selected. In total, 210 (58%) of 359 patients were included. This study was approved by the ethics committees of the 3 participating hospitals. All patients gave written informed consent.

Measurements

For the variables potentially related to sick leave, we selected variables that were previously related to work-relevant disability in patients with (rheumatoid) arthritis[2,7], and variables known to be related to sick leave in occupational populations with musculoskeletal conditions[17-19]. Patients completed self-administered questionnaires on demographics, health, behavioural coping, and work characteristics. Clinical characteristics were obtained by medical examination.

Demographic characteristics

Patients were asked about age, sex, and ethnicity. Ethnicity was defined by the country of birth of the mother if both parents were born abroad or by the country of birth of the parent that was born abroad[20]. Two categories were made: Dutch citizens (no parent born abroad) and non-Dutch citizens (at least 1 parent born abroad)[20]. Education was categorized, according to the highest level attained, into low (≤9 years: primary school, lower and intermediate secondary schooling, or lower vocational training), intermediate (10-14 years: higher secondary schooling or intermediate vocational training), and high (≥15 years: higher vocational training or university).

Clinical characteristics

Patients with inflammatory joint conditions were classified into 3 mutually exclusive diagnostic groups based on the diagnosis made by a rheumatologist: 1) definite or probable RA, 2) specified or nonspecified monarthritis, oligoarthritis, or polyarthritis (non-RA), and 3) inflammatory joint conditions without apparent synovitis. Swollen joint count (44 joints) was assessed and categorized into no synovitis, 1- 2 swollen joints, or ≥ 3 swollen joints. Because diagnostic groups and swollen joint count were strongly related (r= 0.64), only diagnostic group was included in the statistical analysis. ESR (mm/hour) was measured and classified as low, intermediate, or high on the basis of tertile scores. The duration of inflammatory conditions was defined as the period between symptom onset and medical examination. Based on the median number of weeks since symptom onset, disease duration was classified as short or long. A broad range of comorbidities was ascertained, including lung disease, cardiovascular diseases, diabetes mellitus, cancer, gastrointestinal diseases, kidney diseases, diseases of the gall bladder and liver, diseases of the thyroid gland, neurologic diseases, and psychiatric disease. If 1 or more comorbidities existed, patients were classified as having a condition (yes/no).

Self-reported health and behavioural coping

Self-reported pain and functioning were measured by 2 subscales of the Short Form 36 health survey (SF-36), bodily pain (2 items) and physical functioning (10 items), respectively[21,22]. Sum scores of these scales range from 0-100, where a higher score indicates better health. On the basis of tertile scores, bodily pain was classified into high, intermediate, and low, and physical functioning was classified into poor, moderate, and good. Similarly, mental health was ascertained by the mental health subscale of the SF-36 (5 items).

General fatigue during the past week was measured by a visual analogue scale ranging from 0 (no fatigue at all) to 100 (very high fatigue), where higher scores indicate more fatigue. Fatigue was classified as low or high based on the median value of the study population.

Behavioural coping was assessed by 2 scales of the Coping of Rheumatic Stressors questionnaire. The scale "decreasing activity to cope with pain" was measured by 8 items on a 4-point scale (seldom or never, sometimes, often, very often), and similarly, the scale "pacing to cope with limitations" was measured by 10 items. Sum scores were computed, which ranged from 8-32 and 10-40, respectively. A higher sum score indicates more frequent use of the coping strategy. Both scales have good internal consistency and high test–retest reliability[23-25]. Because both scales were highly correlated (r= 0.82), only "decreasing activities to cope with pain" was included in the statistical analysis, as it was considered to be the most relevant in patients with early joint conditions[24,26].

Work characteristics

Jobs were classified as blue collar or white collar based on job title, and full-time employment was defined as working ≥36 hours per week. Patients were asked whether they were a supervisor (yes/no) and whether they were self-employed (yes/no) [27]. Physical load was assessed by questions derived from the Dutch Musculoskeletal Questionnaire on manual material handling (lifting 5 kg and/or lifting 25 kg), strenuous arm positions (working with hands above shoulder level and/or repetitive arm movements), hand-arm vibration, clerical work (prolonged sedentary work and computer work), and precision tasks[27,28]. Answers were on a 4-point scale, with the ratings seldom or never, now and then, often, and always. The answers often and always were classified as high exposure [28]. Due to the low prevalence of hand-arm vibration (6%) and precision tasks (5%), these characteristics were not included in the regression analysis. Physical exertion was measured by a numeric rating scale from 0 (no effort at all) to 10 (very high effort). A score of ≥ 6 was classified as high physical exertion[29]. Associations among the physical workload factors were low to moderate (Spearman's r range 0.05-0.42).

Questions on the psychosocial load of the job were derived from the Karasek model, in which patients are supposedly at risk for psychological strain when experiencing high job demand and low job control[30]. Job demands were measured by 11 items (e.g., working fast, excessive work) on a 4-point scale (never, now and then, often, always) with a

Cronbach's alpha of 0.86. Similarly, job control was measured by 6 items on skill discretion (e.g., task variety, learning new things) and by 11 items on the authority to make decisions (e.g., autonomy in executing tasks and solving problems, influence on planning) with a Cronbach's alpha of 0.92. A sum score for both dimensions was calculated and job demands and job control were defined as low or high based on the median score.

Support from colleagues was measured by a numeric rating scale ranging from 0 (no support) to 10 (high support). Support from the manager was similarly ascertained[19]. On the basis of the median score, support from colleagues and the manager was classified as low or high.

Sick leave

In The Netherlands, sick leave is defined as not being able to work in full time duty, including both complete absence from work and work activities on restricted duty due to health problems. The latter is a small proportion of all workers on sick leave. In almost all situations, the collective labour agreements require full salary payment during the first 12 months and approximately 70% salary payment during the second 12 months. In this study, sick leave was measured by questions on the frequency and duration of sickness absence due to general causes in the past 6 months. For the duration of sick leave, patients reported on a 4-point scale whether they experienced no sick leave, 1-7 days, 8-14 days, or >2 weeks of sick leave. These questions have shown high specificity (91%), high sensitivity (79%), and moderate agreement with registry data (kappa 0.50 and 0.54, respectively). The questions were most accurate for patients with a sickness absence of >14 days[31]. Therefore, the outcome variable of this study was defined as reporting >2 weeks of sick leave in the past 6 months.

Statistical analysis

Logistic regression analysis was used to study the association of demographic, disease-related, and work factors with sick leave. First, univariate logistic regression was performed to investigate the association between the independent factors and sick leave. The measure of association was expressed by the odds ratio (OR) and 95% confidence interval. Characteristics with a P value <0.20 were selected for further investigation. Second, logistic regression analysis was performed with backward selection within 3 blocks of interrelated variables, i.e., 1) demographic variables, 2) clinical variables, self-reported health, and coping, and 3) work variables. Characteristics with a P value <0.20 were selected for further investigation. This second step was included in the analysis to identify those variables among interrelated variables that had the strongest association with sick leave, and therefore to reduce the number of variables studied in the final model. Third, the final multivariate logistic regression model with sick leave as the dependent variable was constructed by backward selection. Age and sex were included by default. Furthermore, independent variables with a P value <0.05 and variables of borderline significance with an important influence on other independent variables (>10%) were retained in the final model. Statistical analyses were performed with SPSS software, version 11.0 for Windows (SPSS, Chicago, IL).

Table 1. Characteristics of employed patients with early inflammatory joint conditions (n= 210)

Characteristics	**RA**	**Non-RA arthritis**	**Inflammatory joint conditions without synovitis**
	(n= 48)	(n= 74)	(n= 88)
Demographic factors			
Age, yrs, mean (SD)	46 (11)	44 (10)	44 (10)
Women, %	77%	58%	81%
Non-Dutch origin, %	23%	23%	19%
Education, %			
Low	48%	43%	38%
Intermediate	33%	41%	31%
High	19%	16%	31%
Clinical factors			
Disease duration, wks, median (IQR)	16 (19)	15 (17)	19 (19)
Swollen joint count, 44 joints, median (IQR)	3.0 (7.0)	2.0 (2.3)	0 (0)
ESR, mm/hour, median (IQR)	21 (27)	17 (30)	8 (9)
Comorbidity, %	35%	37%	41%
Self-reported health (0-100)			
Bodily pain, mean (SD)	40 (20)	43 (21)	49 (18)
Physical functioning, mean (SD)	57 (24)	60 (26)	69 (22)
Mental health, mean (SD)	73 (18)	71 (16)	71 (17)
Fatigue, median (IQR)	43 (46)	58 (42)	56 (39)
Behavioural coping			
Decreasing activity to cope with pain (8-32), mean (SD)	15.1 (4.8)	15.8 (4.7)	14.0 (4.3)
Pacing to cope with limitations (10-40), mean (SD)	21.3 (6.9)	21.4 (6.0)	18.7 (6.2)
Work factors			
General features			
Blue-collar job, %	54%	50%	49%
Supervisor, %	17%	15%	21%
Self-employed, %	15%	15%	9%
Part-time employment (<36 hrs/wk), %	63%	49%	57%
Physical load			
Frequent manual handling of materials, %	23%	26%	18%
Frequent strenuous arm movements, %	62%	64%	49%
Frequent hand-arm vibration, %	8%	11%	1%
Prolonged clerical work, %	32%	38%	38%
Frequent precision tasks, %	6%	10%	1%
Physical exertion (0-10), median (IQR)	6.0 (5.0)	6.0 (5.0)	6.0 (5.0)
Psychosocial load, median (IQR)			
Job demands (0-33)	12 (5.0)	13 (6.0)	13 (6.0)
Job control (0-51)	32 (17)	31 (14)	31 (14)
Support (0-10), median (IQR)			
From colleagues	7.0 (2.8)	7.0 (3.0)	7.0 (2.0)
From managers	7.0 (7.0)	7.0 (3.0)	7.0 (3.0)
Sick leave			
Sick leave > 2 weeks, %	35%	27%	19%

RA: rheumatoid arthritis; IQR: interquartile range; ESR: erythrocyte sedimentation rate.

Results

Table 1 shows the characteristics of 210 employed patients with early inflammatory joint conditions. Approximately 23% (n= 48) of the study population was diagnosed as having RA, 35% (n= 74) as having (non-RA) arthritis, and 42% (n= 88) as having inflammatory joint conditions without synovitis. Among those with non-RA arthritis, 27 (36%) of 74 patients had monarthritis, 39 (53%) patients had polyarthritis, and 8 (11%) patients had oligoarthritis. Patients classified as having inflammatory joint conditions without synovitis were diagnosed with arthralgia/myalgia (n= 33), inflammatory joint conditions without synovitis without further specification (n= 30), osteoarthritis (n= 16), or others (n= 9). Diagnostic group and swollen joint count were significantly associated (Spearman's r= 0.64). At least 1 comorbidity was present in 38% of patients, most often cardiovascular (n= 35) or respiratory disease (n= 16).

In total, 134 (64%) patients reported ≥1 period of sick leave in the past 6 months. Sick leave for 1-7 days was reported by 58 (28%) patients, 22 (10%) patients reported 8-14 days of sick leave, and 54 (26%) patients reported >2 weeks of sick leave. Among the 54 patients with >2 weeks of sick leave, 75% attributed their sick leave to their joint conditions, and another 15% reported their joint conditions as a contributing factor.

Table 2 shows that in univariate logistic regression, patients with RA more often experienced sick leave compared with patients with inflammatory joint conditions without synovitis (OR 2.29). Increased pain, reduced physical functioning, reduced mental health, and more fatigue were associated with increased sick leave. Lower educated patients more often reported sick leave than higher educated patients. Blue-collar work (OR 2.78) and low job control (OR 3.32) increased the likelihood of sick leave, whereas being a supervisor (OR 0.21) and prolonged clerical work (OR 0.46) were associated with less sick leave. The following characteristics had little or no influence on sick leave in the univariate analysis: ethnicity, disease duration, part-time employment, job demands, and support from the manager (Table 2). Additionally, swollen joint count was not associated with sick leave (data not shown).

Diagnostic group, ESR, self-reported health, and coping were all associated with sick leave, but also had substantial interrelationships. When adjusted for each other, bodily pain and physical functioning were associated with the occurrence of sick leave, whereas diagnostic group, ESR, mental health, and fatigue were not.

Table 3 shows that in the final multivariate logistic regression analysis, higher pain intensity (OR 4.11), poor physical functioning (OR 3.76), and passive coping by decreasing activity to cope with pain were associated with an increased likelihood of sick leave. A 1 SD increase in passive coping with pain was related to 1.77 times higher odds of sick leave. Low job control was associated with increased sick leave (OR 2.74), whereas being a supervisor (OR 0.21) and clerical work (OR 0.45, *P*= 0.08) were related to reduced

Table 2. Associations between demographic, disease, and work characteristics and sick leave in patients with early inflammatory joint conditions in a univariate logistic regression analysis

Independent characteristics	**Sick leave**	
	OR	95%CI
Demography		
Age, yrs	1.02	0.99-1.05
Sex, male vs female	1.56	0.80-3.03
Ethnicity, non-Dutch vs Dutch origin	1.06	0.50-2.23
Education		
High	1.00	
Intermediate	6.47*	1.82-23.1
Low	7.37*	2.11-25.7
Clinical		
Diagnostic group		
Inflammatory joint conditions, no synovitis	1.00	
Non-RA arthritis	1.58	0.75-3.30
RA	2.29*	1.04-5.07
ESR, mm/hr		
Low (1-7)	1.00	
Intermediate (8-20)	0.92	0.38-2.22
High (>20)	2.17†	0.98-4.81
Disease duration, long vs short (median 15 wks)	1.01	0.98-1.03
Comorbidity, yes vs no	2.00*	1.07-3.76
Self-reported health		
Bodily pain		
Low (≥52)	1.00	
Moderate (39-51)	4.41*	1.40-14.0
High (≤38)	16.5*	5.39-50.4
Physical functioning		
Good (≥76)	1.00	
Moderate (54-75)	1.54	0.60-3.98
Poor (≤53)	7.78*	3.35-18.1
Mental health		
Good (≥81)	1.00	
Moderate (65-80)	1.80	0.71-4.53
Poor (≤64)	4.84*	2.01-11.7
High fatigue (≥61)	1.88*	1.00-3.56
Behavioural coping		
Decreasing activity to cope with pain (8-32)	1.22*	1.13-1.32
Pacing to cope with limitations (10-40)	1.13*	1.07-1.19
Work		
Blue collar work	2.78*	1.44-5.37
Supervisor	0.21*	0.06-0.71
Self-employed	0.48†	0.16-1.47
Part-time employment (<36 hrs/wk)	1.40	0.74-2.63
Frequent manual handling of materials	1.98†	0.98-4.00
Frequent strenuous arm movements	1.86†	0.96-3.58
Prolonged clerical work	0.46*	0.23-0.92
High physical exertion (≥6.0)	1.55†	0.83-2.88
High job demands (≥13)	1.20	0.65-2.24
Low job control (≤30)	3.32*	1.72-6.41
High support from colleagues (≥7.0)	0.53†	0.28-1.01
High support from manager (≥6.0)	1.49	0.80-2.80

OR: odds ratio; 95% CI: 95% confidence interval; RA: rheumatoid arthritis; ESR: erythrocyte sedimentation rate; *: p ≤ 0.05; †: p ≤ 0.20.

sick leave. Education level was not associated with the occurrence of sick leave when other factors were taken into account. The number of comorbidities was not associated with sick leave (data not shown). In this multivariate analysis, blue-collar work was not included due to its relationship with education level and physical workload.

Table 3. The influence of demographic, disease, and work characteristics on sick leave in patients with early inflammatory joint conditions in multivariate logistic regression analysis

Independent characteristics	**Sick leave**	
	OR	95% CI
Age, yrs	1.02	0.99-1.06
Sex, male vs female	2.71*	1.10-6.70
Comorbidity, yes vs no	2.57*	1.08-6.08
Bodily pain		
Low (≥52)	1.00	
Moderate (39-51)	2.96	0.85-10.3
High (≤38)	4.11*	1.10-15.4
Physical functioning		
Good (≥76)	1.00	
Moderate (54-75)	1.58	0.51-4.88
Poor (≤53)	3.76*	1.24-11.4
Decreasing activity to cope with pain (8-32)	1.13*	1.02-1.25
Supervisor	0.21*	0.05-0.88
Clerical work	0.45†	0.18-1.11
Low job control (≤30)	2.74*	1.16-6.94

OR: odds ratio; 95% CI: 95% confidence interval; *: $p \leq 0.05$; †: $p = 0.08$.

When interaction terms for the work characteristics and the level of pain, functioning, and diagnostic group were added to the model, no significant interaction effects were found. Therefore, the observed associations between the work characteristics and sick leave did not differ significantly among patients with different levels of pain or functioning, or among diagnostic groups.

Discussion

One (26%) of 4 patients seeking medical care with early inflammatory joint conditions already experienced substantial sick leave, i.e., >2 weeks during the past 6 months. Self-reported pain, poor physical functioning, and passive behavioural coping were related to an increased occurrence of sick leave, whereas diagnostic group was not. Low job control increased the likelihood of sick leave, and being a supervisor and clerical work were associated with reduced sick leave.

In this study, 26% of patients with early inflammatory joint conditions reported >2 weeks of sick leave in the past 6 months. Similarly, in a longer period of 12 months, Zirkzee et al[15] described sick leave for >2 weeks in 41% of patients with early arthritis.

Sick leave was also more frequently observed among workers with arthritis and related joint disorders than in a comparison group in the US[32]. To our knowledge, this is the first study examining the factors associated with sick leave in an early phase of inflammatory joint conditions. Previous studies have shown that pain, functioning, behavioural coping, and work characteristics play an important role in work-relevant disability after progression of the disease[2,7,8]. The present study indicates that these factors are already related to the performance at work in patients with early inflammatory joint conditions, and therefore offer opportunities for early intervention. Our findings also suggest that, at least in an early phase of inflammatory joint conditions, the associations between work characteristics and sick leave do not differ across diagnostic groups.

Pain and physical functioning, which have been described to be notably affected in patients with early inflammatory joint conditions[33], were strongly associated with sick leave. Remarkably, diagnostic group had little influence on sick leave when other factors, notably pain and functioning, were taken into account. The diagnostic group reflects the underlying disease, whereas self-reported pain and functioning may reflect both the underlying disease and the patients' experience of the symptoms, which is influenced by demographic and psychosocial factors[33]. The importance of self-reported pain and functioning in relation to sick leave was further supported by the observation that ESR and swollen joint count were not associated with sick leave (data not shown).

Low job control, i.e., low control over the organization and planning of activities in the job, was related to increased sick leave. This was in agreement with previous studies showing the influence of control over the pace and the activities of work[9] and work autonomy[12] on work-relevant disability. In a focus group, patients with RA stated that the opportunity to plan work activities and the freedom to spread the work out were, among others, factors that a patient with RA needs to continue working[34]. Similarly, interviews with RA patients showed that important adaptations made to keep working included control over what work was done on a given day and control over work hours[35]. Patients with longstanding disease have described that flexible work arrangements are a helpful strategy to continue working, because flexibility allows workers to consider their arthritis when planning their tasks and work day. This improves both the patient's well-being and their performance at work[36]. The relationship between job control and work participation also reflects a general mechanism, because low job control has been related to the persistence of arm, neck, and shoulder conditions[37] and to higher sickness absence in the general work force[38]. Therefore, it is not known whether our finding reflects a mechanism in the general work force or whether job control is especially important in patients with inflammatory joint conditions. Clerical work was of borderline significance for reduced sick leave. Clerical work was not associated with job control, but was inversely related to measures reflecting physical workload. Because earlier studies showed that high physical workload is a marker of work-relevant disability[7], our findings are in agreement with the literature. Work characteristics are known to be a reflection of education level, which was also found in our study; i.e., 55% of the low educated patients reported low job control, whereas only 21% of the high educated patients reported low job control. We found that education level was no longer related to sick leave if work characteristics were taken into account. This suggests that work factors brought about the differences in sick leave among patients with different education levels.

In this cross-sectional study, the baseline data of an ongoing inception cohort study (REACH) were used. Because the prevalence of inflammatory joint conditions in the general population is unknown, little insight exists into potential selection processes during the referral of patients by physicians to this inception cohort study. However, selection bias probably did not influence our findings to a great extent, because it is unlikely that physicians selected patients on the basis of work characteristics. Furthermore, due to the response of 85% after inclusion, we are confident that a response bias has not influenced the results of this study to a large extent. Sick leave was measured by self-reported questions because registry data were not available. This is a drawback, but the self-assessment of sick leave has shown moderate agreement between questionnaire and registry data and was most accurate for sickness absence for >2 weeks in the past 6 months[31]. Finally, due to the cross-sectional design of this study, no inferences on causal relationships can be made. Cause and effect are especially difficult to discern for the characteristics decreasing activity to cope with pain and job control.

This study showed that an important proportion of patients seeking care with early inflammatory joint conditions have already experienced sick leave. Pain and physical limitations, which are targeted during medical treatment, were strongly related to the occurrence of sick leave. Our findings suggest that work characteristics already relate to early signs of loss of performance at work, as characterized by sick leave. Job control, and to a lesser extent clerical work, might be amendable to change. Therefore, they might offer opportunities for early adaptations of the job to support work participation from disease onset onward, in addition to medical treatment[17].

In conclusion, 26% of patients seeking care with early inflammatory joint conditions reported substantial sick leave in the past 6 months. Pain, functional limitations, and fewer opportunities to determine one's work activities were associated with the occurrence of sick leave.

References

1. Geuskens GA, Burdorf A, Hazes JM. Consequences of rheumatoid arthritis for performance of social roles- a literature review. J Rheumatol 2007;34:1248-60.
2. Verstappen SM, Bijlsma JW, Verkleij H, Buskens E, Blaauw, AA, ter Borg EJ, et al, on behalf of the Utrecht Rheumatoid Arthritis Cohort Study Group. Overview of work disability in rheumatoid arthritis patients as observed in cross-sectional and longitudinal surveys. Arthritis Rheum 2004;51:488-97.
3. Barrett EM, Scott DG, Wiles NJ, Symmons DP. The impact of rheumatoid arthritis on employment status in the early years of disease: a UK community-based study. Rheumatology (Oxford) 2000;39:1403-9.
4. Jantti J, Aho K, Kaarela K, Kautiainen H. Work disability in an inception cohort of patients with seropositive rheumatoid arthritis: a 20 year study. Rheumatology (Oxford) 1999;38: 1138-41.
5. Sokka T, Kautiainen H, Mottonen T, Hannonen P. Work disability in rheumatoid arthritis 10 years after the diagnosis. J Rheumatol 1999;26:1681-5.
6. Straaton KV, Maisiak R, Wrigley JM, White MB, Johnson P, Fine PR. Barriers to return to work among persons unemployed due to arthritis and musculoskeletal disorders. Arthritis Rheum 1996;39:101-9.
7. Sokka T, Pincus T. Markers for work disability in rheumatoid arthritis. J Rheumatol 2001;28:1718-22.
8. Chorus AM, Miedema HS, Wevers CW, van der Linden S. Work factors and behavioural coping in relation to withdrawal from the labour force in patients with rheumatoid arthritis. Ann Rheum Dis 2001;60:1025-32.
9. Yelin E, Meenan R, Nevitt M, Epstein W. Work disability in rheumatoid arthritis: effects of disease, social, and work factors. Ann Intern Med 1980;93:551-6.
10. Lacaille D, Sheps S, Spinelli JJ, Chalmers A, Esdaile JM. Identification of modifiable work-related factors that influence the risk of work disability in rheumatoid arthritis. Arthritis Rheum 2004;51:843-52.
11. Reisine S, McQuillan J, Fifield J. Predictors of work disability in rheumatoid arthritis patients: a five-year followup. Arthritis Rheum 1995;38:1630-7.
12. Reisine ST, Grady KE, Goodenow C, Fifield J. Work disability among women with rheumatoid arthritis: the relative importance of disease, social, work, and family factors. Arthritis Rheum 1989;32:538-43.
13. Boonen A, de Vet H, van der Heijde D, van der Linden S. Work status and its determinants among patients with ankylosing spondylitis: a systematic literature review. J Rheumatol 2001;28:1056-62.
14. De Buck PD, de Bock GH, van Dijk F, van den Hout WB, Vandenbroucke JP, Vliet Vlieland TP. Sick leave as a predictor of job loss in patients with chronic arthritis. Int Arch Occup Environ Health 2006;80:160-70.
15. Zirkzee EJ, Sneep AC, de Buck PD, Allaart CF, Peeters AJ, Ronday HK, et al. Sick leave and work disability in patients with early arthritis. Clin Rheumatol 2008;27:11-9.
16. Reisine S, Fifield J, Walsh SJ, Feinn R. Factors associated with continued employment among patients with rheumatoid arthritis: a survival model. J Rheumatol 2001;28:2400-8.
17. Hoogendoorn WE, Bongers PM, de Vet HC, Ariens GA, van Mechelen W, Bouter LM. High physical work load and low job satisfaction increase the risk of sickness absence due to low back pain: results of a prospective cohort study. Occup Environ Med 2002;59:323-8.
18. IJzelenberg W, Burdorf A. Risk factors for musculoskeletal symptoms and ensuing health care use and sick leave. Spine 2005;30:1550-6.

19. IJzelenberg W, Molenaar D, Burdorf A. Different risk factors for musculoskeletal complaints and musculoskeletal sickness absence. Scand J Work Environ Health 2004;30:56-63.

20. Keij I. Numbers of foreigners according to various definitions. Maandstat Bevolking 2000;48:14-7. In Dutch.

21. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;30:473-83.

22. Aaronson NK, Muller M, Cohen PD, Essink-Bot ML, Fekkes M, Sanderman R, et al. Translation, validation, and norming of the Dutch language version of the SF-36 health survey in community and chronic disease populations. J Clin Epidemiol 1998;51:1055-68.

23. Van Lankveld W, Naring G, van der Staak C, van 't Pad Bosch P, van de Putte L. Development of the CORS: coping with rheumatic stressors. Gedrag Gezond 1993;21:40-8. In Dutch.

24. Van Lankveld W, Naring G, van 't Pad Bosch P, van de Putte L. Behavioral coping and physical functioning: the effect of adjusting the level of activity on observed dexterity. J Rheumatol 1999;26:1058-64.

25. Van Lankveld W, van 't Pad Bosch P, van de Putte L, Naring G, van der Staak C. Disease-specific stressors in rheumatoid arthritis: coping and well-being. Br J Rheumatol 1994;33: 1067-73.

26. Van Lankveld W, Naring G, van 't Pad Bosch P, van de Putte L. The negative effect of decreasing the level of activity in coping with pain in rheumatoid arthritis: an increase in psychological distress and disease impact. J Behav Med 2000;23:377-91.

27. Hildebrandt VH, Bongers PM, van Dijk FJ, Kemper HC, Dul J. Dutch Musculoskeletal Questionnaire: description and basic qualities. Ergonomics 2001;44:1038-55.

28. Elders LA, Burdorf A. Interrelations of risk factors and low back pain in scaffolders. Occup Environ Med 2001;58:597-603.

29. Borg G. Psychophysical scaling with applications in physical work and the perception of exertion. Scand J Work Environ Health 1990;16 Suppl 1:55-8.

30. Karasek R, Baker D, Marxer F, Ahlbom A, Theorell T. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. Am J Public Health 1981; 71:694-705.

31. Burdorf A, Post W, Bruggeling T. Reliability of a questionnaire on sickness absence with specific attention to absence due to back pain and respiratory complaints. Occup Environ Med 1996;53:58-62.

32. Muchmore L, Lynch WD, Gardner HH, Williamson T, Burke T. Prevalence of arthritis and associated joint disorders in an employed population and the associated healthcare, sick leave, disability, and workers' compensation benefits cost and productivity loss of employers. J Occup Environ Med 2003; 45:369-78.

33. Geuskens GA, Burdorf A, Evers AW, Hazes JM. Clear associations between demographic and psychosocial factors and health-related quality of life in patients with early inflammatory joint complaints. J Rheumatol 2008;35:1754-61.

34. Detaille SI, Haafkens JA, van Dijk FJ. What employees with rheumatoid arthritis, diabetes mellitus and hearing loss need to cope at work. Scand J Work Environ Health 2003;29:134-42.

35. Mancuso CA, Paget SA, Charlson ME. Adaptations made by rheumatoid arthritis patients to continue working: a pilot study of workplace challenges and successful adaptations. Arthritis Care Res 2000;13:89-99.

36. Lacaille D, White MA, Backman CL, Gignac MA. Problems faced at work due to inflammatory arthritis: new insights gained from understanding patients' perspective. Arthritis Rheum 2007;57:1269-79.

37. Karels CH, Bierma-Zeinstra SM, Burdorf A, Verhagen AP, Nauta AP, Koes BW. Social and psychological factors influenced the course of arm, neck and shoulder complaints. J Clin Epidemiol 2007;60:839-48.

38. Gimeno D, Benavides FG, Amick BC 3rd, Benach J, Martinez JM. Psychosocial factors and work related sickness absence among permanent and non-permanent employees. J Epidemiol Community Health 2004;58:870-6.

Chapter 5

Predictors of sick leave and reduced productivity at work among persons with early inflammatory joint conditions

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Geuskens GA, Hazes JM, Barendregt PJ, Burdorf A. Predictors of sick leave and reduced productivity at work among persons with early inflammatory joint conditions. Scand J Work Environ Health 2008;34(6):420–429

Abstract

Objective. To identify predictors of sick leave and reduced productivity at work in persons with early inflammatory joint conditions.

Methods. In a prospective cohort study of 210 workers with inflammatory joint conditions present for less than 12 months, data were collected by medical examination and questionnaires at baseline and after 6 and 12 months. Outcomes were sick leave and reduced productivity at work. Generalized estimation equations (6-months time-lag model) were used to study predictors.

Results. Sick leave was predicted by high levels of pain (OR 3.2), poor physical functioning (OR 4.4), and frequent manual materials handling (OR 2.0), whereas supervisors had a lower likelihood of sick leave (OR 0.2). Predictors of reduced productivity at work were intermediate levels of pain (OR 3.1), poor physical functioning (OR 2.8), poor mental health (OR 2.1), and low support from colleagues (OR 2.2), whereas workers classified as non-RA arthritis were less likely to report reduced productivity than workers with inflammatory joint complaints without clinical synovitis (OR 0.4).

Conclusion. In workers with early inflammatory joint conditions, self-reported pain and physical functioning affected performance at work, together with manual materials handling and lack of support from colleagues. Early treatment should target pain and physical functioning, and job interventions should aim at reducing physical workload and increasing co-worker support.

Introduction

Working life expectancy among persons with arthritis or rheumatism is about 4.2 years lower in men and 3.1 years in women[1]. For rheumatoid arthritis (RA), ankylosing spondylitis and psoriatic arthritis, employment ratios ranged from 0.78 to 0.94 compared to the general population[2]. Among persons with longstanding RA, the prevalence of (partial) work disability pensions is 11% to 52% higher than in the general working population[3]. The long-term effects of clinical characteristics, physical function, and physically demanding work on work disability have been well documented, especially in RA patients[4,5]. However, the performance at work, i.e. sick leave and productivity at work, among employees with rheumatic diseases is increasingly gaining attention[6-8].

Sick leave and a reduced productivity at work reflect a reduced capacity to meet the demands of the job. Sick leave is more frequently observed among workers with chronic arthritis or related joint disorders[9-12]. Among employees with musculoskeletal conditions risk factors for sick leave include pain intensity, reduced function, demographic factors, high physically demanding work, high job strain, and low support at work[13-18]. In addition to sick leave, Li et al (2006)[19] found that 49% of the workers with longstanding arthritis reported a reduced productivity at work. In accordance, Burton et al (2006)[20] described that workers with chronic arthritis that received treatment had a reduced productivity at work of 2.5% due to arthritis. They were 1.5 times more likely to report a reduced productivity in physical activities than workers without arthritis[20].

Sick leave may precede work-relevant disability in rheumatic diseases[21,22]. Besides, a reduced performance at work importantly contributes to the indirect costs[6,19]. However, until now, no prospective study has addressed the relative contribution of clinical, individual and work characteristics to sick leave and reduced productivity at work among persons with recent inflammatory joint conditions. Especially in an early phase of inflammatory joint conditions, knowledge of these predictors is of interest, since work and disease characteristics may be amendable to change as a part of early tertiary intervention. Hence, the aim of this study was to identify predictors of sick leave and a reduced productivity at work among workers with early inflammatory joint conditions.

Methods

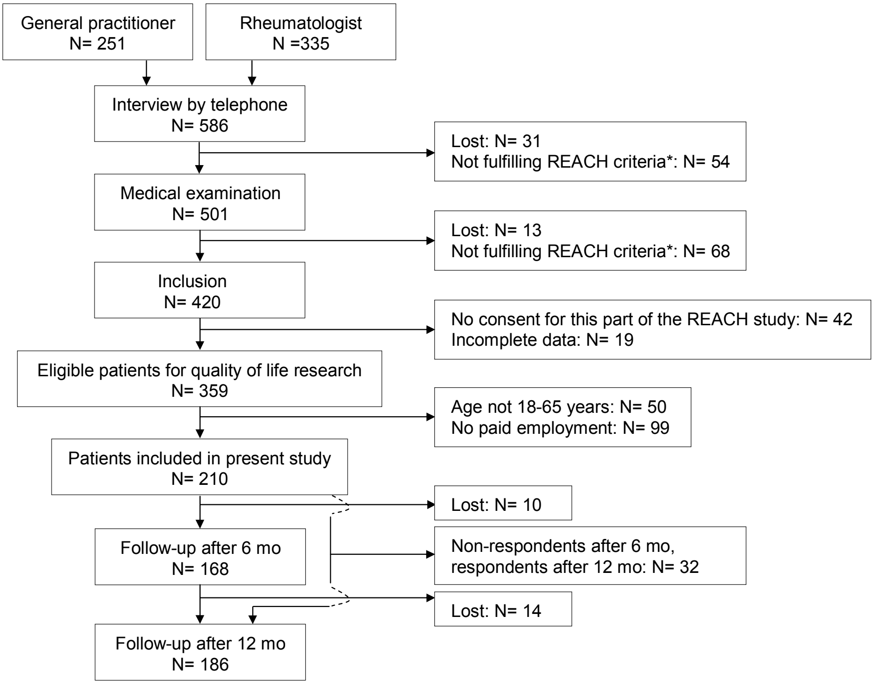
Study population

The current study presents the one-year follow-up data of the Rotterdam Early Arthritis CoHort (REACH). REACH is an ongoing inception cohort study with 4 years of follow-up. REACH aims to study the etiopathogenesis, diagnostic strategies and outcome of patients with inflammatory joint conditions for less than 12 months. In total, 82 general practitioners, 12 rheumatologists and 4 rheumatologist trainees (1 university hospital, 2 general hospitals) in the greater area of Rotterdam have invited patients to participate in REACH from July 2004 onwards. Data collection includes a large array of detailed medical examination and questionnaires. When patients enter the study, they can choose to provide only limited medical data and/or self-reported questionnaires. For the current study, patients who were sent by general practitioners or rheumatologists for inclusion in the study up to July 2006 were studied. This date was chosen to ensure 1-year follow-up data of these patients were available for analysis.

General practitioners selected patients with clinical synovitis in at least one joint or patients experiencing complaints in at least two joints without synovitis. The general practitioners ascertained that complaints existed for less than 12 months and were not due to trauma/mechanical problems. During an interview by telephone and subsequent medical examination by a rheumatologist, the inclusion criteria were verified. Patients were included if 1) joint complaints existed for less than 12 months with no requirement of a minimum duration, and, 2) clinical synovitis in at least one joint or complaints in at least two joints in combination with at least two of the following criteria ascertained during medical examination by a rheumatologist: morning stiffness longer than one hour, bilateral compression pain in the metacarpophalangeal joints or metatarsophalangeal joints, symmetrical presentation, positive family history, no longer fitting own shoes, no longer fitting own rings, pins and needles in fingers, or unexplained fatigue for less than 1 year, and, 3) complaints were predominantly present in the morning and at night, and improved with movement. Patients were excluded if 1) complaints were due to trauma/ mechanical problems, 2) age was under 16 years old, 3) no written communication was possible in Dutch, or 3) a prior diagnosis of rheumatoid arthritis, ankylosing spondylitis, Sjögren's syndrome, systemic lupus erythematosus or juvenile arthritis had been made by a rheumatologist before inclusion in this study. For patients directly visiting rheumatologists, a similar verification procedure was applied. For all patients, enrolled through general practitioners or rheumatologists, a rheumatologist set the diagnosis.

Figure 1 presents that 586 patients were notified at the end of July 2006. In total, 122 patients did not fulfil inclusion criteria. Before actual inclusion, 44 patients were lost. These patients were significantly more often male compared to participants (39% versus 27% male), but no differences in age existed. After inclusion, 61 out of 420 patients (15%) were excluded from the current study due to incomplete data collection (5%) or the patient's choice at entrance of the study to provide only limited medical data and/or self-reported questionnaires (10%). Age and sex of these patients was not significantly different. Since only patients aged 18 to 65 years old in paid employment were selected for the current study, 210 patients were included. This study was approved by the ethics committees of the three participating hospitals. All patients gave written informed consent.

Figure 1. Inclusion and follow-up of employed patients with early inflammatory joint conditions



*: Patients were included in REACH if 1) joint complaints existed for less than 12 months, and 2) arthritis in at least one joint or complaints in at least 2 joints in combination with other factors indicating inflammatory complaints was ascertained (see text).

Measurements

At baseline and after 6 and 12 months of follow-up, patients completed self-administered questionnaires and clinical characteristics were obtained by medical examination.

Demographic and work characteristics

Age, sex, and ethnicity were asked. Ethnicity was categorized into a Dutch origin (no parent born abroad) or a non-Dutch origin (at least one parent born abroad)[23]. Education was categorized according to the highest level attained into low (≤ 9 years: primary school, lower and intermediate secondary schooling or lower vocational training), intermediate (10-14 years: higher secondary schooling or intermediate vocational training), and high (≥15 years: higher vocational training or university).

Work characteristics were assessed at baseline, and if patients changed jobs during the follow-up period. Full-time employment was defined as working at least 36 hours per week. Patients were asked whether they were a supervisor, self-employed, and whether they worked in shifts. The duration of employment for the same employer was dichotomized on the basis of the median number of years[24]. Physical load was assessed by questions derived from the Dutch Musculoskeletal Questionnaire on manual materials handling (lifting 5 kg and/or lifting 25 kg), strenuous arm positions (working with hands above shoulder level and/or repetitive arm movements), and clerical work (prolonged sedentary work and computer work)[24,25]. Answers were on a 4-point scale with ratings "seldom or never", "now and then", "often" and "always". The answers "often" and "always" were classified as high exposure[25]. Physical exertion was asked at each measurement by a numeric rating scale from 0 ("no effort at all") to 10 ("very high effort"). A score of 6 and over was classified as high physical exertion[26].

Questions on the psychosocial load of the job were derived from the Karasek model[27]. In this model, subjects are supposedly at risk for psychological strain when experiencing high job demands and low job control. Job demands were measured by 11 items (e.g. working fast, excessive work). Job control was measured by 6 items on skill discretion (e.g. task variety, learning new things) and by 11 items on the authority to make decisions (e.g. autonomy in executing tasks and solving problems, influence on planning). For both dimensions, the sum score was dichotomized based on the median score.

Support from colleagues was measured by a numeric rating scale ranging from 0 (no support) to 10 (high support). Support from the supervisor was similarly ascertained[28]. On the basis of the median score, support from colleagues and the supervisor was classified as low or high. Attitude towards paid employment was assessed by three statements with answers on a 3-point scale with ratings "agree", "neutral", "do not agree" ("I would do a lot to have a paid job", "I always want to earn my own money with a paid job", "paid employment is important for my self confidence"). Patients' attitude was classified as high motivation if they agreed with all three statements, and otherwise as low motivation.

At all measurements, currently present adaptations of the job due to the joint complaints were asked. Workers specified adaptations in working tasks, times and in work environment by means of open-ended questions. Job adaptations were not included as predicting variables in the statistical analysis.

Clinical characteristics and self-reported health

Clinical characteristics were obtained at each measurement. Patients were classified into three mutually exclusive diagnostic groups based on the diagnosis made by a rheumatologist: 1) definite or probable rheumatoid arthritis (RA), 2) specified or non-specified mono- or oligo/poly arthritis, non-RA, and 3) inflammatory joint complaints without clinical synovitis. In the latter group, patients with artralgia/myalgia, osteoarthritis, or inflammatory complaints without further specification were included. Swollen joint count (44 joints) was categorized into no clinical synovitis, 1-2 swollen joints, and 3 or more swollen joints. Erythrocyte sedimentation rate (ESR) was classified into low (≤20 mm/hr) or high (>20 mm/hr). Since 89% of the patients with inflammatory joint complaints without clinical synovitis were classified in the low ESR group at baseline, they were also classified in this group if data were not available during follow-up. The duration of inflammatory complaints was defined as the period between symptom onset and medical examination, and was dichotomized based on the median number of weeks. The use of disease modifying anti-rheumatic drugs (DMARD) was ascertained. Comorbidity was assessed, and classified in no comorbid condition or at least one comorbid condition, since no large groups with the same comorbid condition could be differentiated.

At each measurement, self-reported health was asked. Pain, physical functioning, and mental health were measured by three subscales of the Short Form-36 Health Survey (SF-36), respectively bodily pain (2 items), physical functioning (10 items), and mental health (5 items)[29,30]. Sum scores of the subscales may range from 0 to 100 with higher scores indicating better health. Functional ability was assessed by the Health Assessment Questionnaire (HAQ) (20 items)[31]. The HAQ ranges from 0 to 3 with higher scores indicating more disability. The subscales of the SF-36 and the HAQ were analyzed in tertiles. General fatigue during the past week was measured by a visual analogue scale ranging from 0 (no fatigue at all) to 100 (very high fatigue). Fatigue was classified as low or high based on the median score.

Behavioural coping was assessed at baseline by the scale 'decreasing activity to cope with pain' of the Coping of Rheumatic Stressors (CORS) questionnaire. This scale consists of 8 items on a four-point scale. The sum score may range from 8 to 32, with higher scores indicating more frequent use of the coping strategy[32,33]. Behavioural coping was analyzed in tertiles.

Sick leave and productivity at work

In the Netherlands sick leave is legally defined as being not able to work in fulltime duty, including both complete absence from work and work activities on restricted duty due to health problems. The latter is a small proportion of all workers on sick leave. In almost all situations the collective labour agreements require payment of full salary during the first 12 months and approximately 70% of salary during the second 12 months. In this study, sick leave was measured at baseline, after 6 months, and after 12 months of follow-up by questions on the frequency and duration of sickness absence due to general causes in the past six months. For the duration of sick leave, patients reported on a 4-point scale whether they experienced no sick leave, 1 to 7 days, 8 to 14 days, or more than two weeks of sick leave. These questions have shown high specificity (91%) and high sensitivity (79%), and moderate agreement with registry data (kappa respectively 0.50 and 0.54). The questions were most accurate for subjects with sickness absence of over 14 days[34]. Hence, sick leave was defined as reporting more than two weeks of sick leave in the past six months.

Productivity at work was assessed at 6 and 12 months of follow-up by two questions derived from the Quantity and Quality instrument (QQ). The self-report questions addressed the quantity and the quality of the work performed during the last working day compared to a normal workday. Answers were on a numerical rating scale with 0 representing respectively "nothing" and "very poor quality" and 10 representing "normal quantity" and "normal quality"[35,36]. Since the two questions for quantity and quality of the work were highly correlated (spearman r= 0.73), only the question on the quantity of the work was used in the analysis. The quantity of work was categorized in reduced productivity (score <10) and normal productivity (score=10).

Statistical analysis

Predictors of sick leave and a reduced productivity at work were studied in separate models by means of logistic regression analysis with Generalized Estimating Equations (GEE), suitable for the analysis of repeated measurements data. A 6-months time-lag model was chosen, implying that the measurement of a risk factor was related to the outcome measured six months later. In the analysis individuals with one 6-month follow-up period have two measurements and workers with two 6-months periods of follow-up have 3 measurements. In the model, demographic and work characteristics were considered to be time independent, except if patients changed to another job and for physical exertion. Clinical characteristics and self-reported health were considered to be time dependent, except for disease duration and behavioural coping, which were measured only at baseline. The odds ratio (OR) was used as the measure of association, and indicated the impact of a risk factor on sick leave and reduced productivity in the next 6 months.

The following procedure was used to identify predictors of sick leave and reduced productivity at work. First, all independent factors were analyzed in a univariate logistic GEE model. Factors with a p-value below 0.20 were selected for further investigation. Second, a multivariate GEE model with demographic and work factors as independent factors was constructed by forward selection. Variables with a p-value of 0.05 or less were selected, and age and sex were included in the model by default. Similarly, a multivariate GEE model with clinical factors and self-reported health as independent factors was made by forward selection, and variables with a p-value of 0.05 or less were selected. Third, the two multivariate models were combined to study the impact of demographic, work, clinical and self-reported health variables on sick leave and reduced productivity at work during a period of 6 months. Independent variables with a p-value of 0.05 or less were retained, as well as variables of borderline significance that caused a change by 10 percent or more in the coefficient of another significant variable in the model. Statistical analyses were performed with the statistical package STATA (8.0 SE).

Results

At baseline, 210 workers seeking care with early inflammatory joint conditions participated in this study. Data of 168 persons were available after 6 months, and after 12 months 186 persons participated (Figure 1). In total 24 (11%) persons were lost to follow-up. They were significantly younger compared to participants (39 (11) versus 45 (10) yrs), not classified as RA at baseline, and more frequently classified as inflammatory joint complaints without clinical synovitis (63%). No differences were found for sex, and for sick leave, pain and physical functioning at baseline.

Tables 1 and 2 describe the characteristics of the study population. At baseline, median disease duration was 15 (2-27) weeks. During follow-up, swollen joint count and ESR levels decreased compared to baseline. In addition, pain decreased and physical functioning improved in all diagnostic groups (Table 2). After 6 months, 94% of the RA patients, 33% of the patients with arthritis, non-RA, and 9% of the patients classified as inflammatory joint complaints without clinical synovitis received treatment with DMARDs.

After 12 months, 11 persons had quitted employment and two of them attributed work loss to their joint condition (Table 3). Sick leave for more than two weeks in the past 6 months was reported by 26% of the workers at baseline, and by respectively 27% and 17% after 6 and 12 months. Recurrence of sick leave was found in 66% of those with sick leave at baseline and in 32% of those with sick leave at the 6-month visit. Recurrence of a reduced productivity was found in 65% of the workers with a reduced productivity at

Table 1. Demographic and work characteristics of workers with early inflammatory joint conditions

Characteristics	**Baseline** (n=210)
Demographic characteristics	
Age, yrs, mean (SD)	45 (11)
Female, %	72%
Education, %	
High	23%
Intermediate	35%
Low	42%
Work characteristics	
Hours of work, mean (SD)	31 (13)
Supervisor, %	18%
Prolonged clerical work, %	36%
Frequent manual handling of materials, %	22%
Physical exertion (0-10), median (IQR)	6 (3-8)
Job demands (0-33), median (IQR)	13 (10-16)
Job control (0-51), median (IQR)	31 (24-38)
Support from colleagues (0-10), median (IQR)	7 (6-8)
Support from supervisor (0-10), median (IQR)	7 (5-8)

IQR: Interquartile range

Table 2. Clinical characteristics and self reported health in patients with early inflammatory joint conditions during a 1-year follow-up period

Characteristics	**Baseline** (n=210)	**6 months follow-up** (n= 168)	**12 months follow-up** (n= 186)
Clinical factors			
Disease duration at inclusion, wks, median (IQR)	15 (7-27)	.	.
Diagnostic group, %			
Rheumatoid arthritis	23%	32%	32%
Arthritis but not rheumatoid arthritis	35%	29%	34%
Inflammatory joint complaints without clinical synovitis	42%	39%	34%
Swollen joints, 44 joints			
No swollen joints	42%	80%	92%
1-2 swollen joints	29%	16%	2%
>2 swollen joints	29%	4%	6%
High erythrocyte sedimentation rate (>20mm/hr), %	34%	15%	11%
Medical treatment with DMARD, %	0%	43%	41%
Comorbidity, % yes	38%	42%	45%
Self-reported health			
Bodily pain (SF-36)(0-100), mean (SD)[a]	45 (20)	63 (22)	64 (22)
Physical functioning (SF-36) (0-100), mean (SD)[a]	63 (24)	72 (22)	75 (20)
Mental health (SF-36) (0-100), mean (SD)[a]	72 (17)	74 (19)	76 (19)
Health Assessment Questionnaire (HAQ)(0-3), median (IQR)[b]	0.50 (0.13-0.88)	0.25 (0-0.63)	0.25 (0-0.63)
Fatigue (0-100), median (IQR)[c]	60 (32-73)	52 (26-72)	49 (20-67)
Decreasing activity to cope with pain (8-32), mean (SD)	15 (5)	.	.

[a]: Higher scores indicate better health, [b]: higher scores indicate more functional disability, [c]: higher scores indicate more fatigue, IQR: Interquartile range

the 6-month visit. Sick leave and reduced productivity were strongly related, with 72% of the workers reporting sick leave also reporting reduced productivity. At least one job adaptation due to joint complaints was described by 39% of the persons after 12 months. Adaptations in working tasks were often combined with changes in working times or environment. Workers with job adaptations more frequently had a reduced productivity compared to those without adaptations (68% versus 36%). They also reported more sick leave (33% versus 17%).

Table 4 presents that in univariate GEE analyses, low education and high physical load predicted sick leave, whereas being a supervisor reduced the likelihood of sick leave. High disease activity and worse self-reported health predicted sick leave, but diagnostic group and comorbidity had no impact. In the multivariate GEE analysis, sick leave was predicted by frequent manual handling of materials (OR 2.0 (95% CI 1.0-4.0)), high bodily pain (OR 3.2 (95% CI 1.3-7.5)), and poor physical functioning (OR 4.4 (95% CI 1.9-10)), whereas supervisors were less likely to report sick leave (OR 0.2 (95% CI 0.1-0.7)) (Table 4). Educational level, clinical factors, and reducing activities to cope with pain had no influence on sick leave when pain and function were taken into account. The impact of poor mental health on sick leave was borderline significant (OR 2.3 (95% CI 0.9-5.8)). The HAQ was not included in the multivariate model, since it was strongly associated with physical functioning as assessed by the SF-36 (spearman r= 0.64).

Table 3. Performance at work and job adaptations among workers with early inflammatory joint conditions during a 1-year follow-up period

Work outcome n (%)	**Baseline** (n=210)	**After 6 month** (n=168)	**After 12 months** (n=186)
Quitted employment	.	6	11
Employed	210	162	175
Sick leave more than 2 weeks in past 6 months	54 (26%)	44 (27%)	29 (17%)
Reduced productivity on last working day	.	80 (49%)	71 (41%)
Work adaptation	49 (23%)	50 (31%)	43 (25%)
Tasks	32 (15%)	37 (23%)	29 (17%)
- Reduction in physically demanding tasks	20	21	16
- Partial change in working tasks or job change	9	8	7
- Other adaptations	3	8	6
Time	22 (10%)	22 (14%)	15 (9%)
- Reduction in hours	14	10	9
- Change in distribution of hours	3	8	6
- Other adaptations	5	4	0
Environment	11 (5%)	12 (7%)	15 (8%)
- Desks, chairs, computer	9	7	12
- Other adaptations	2	5	3

The impact of demographic and work characteristics on productivity in univariate GEE analysis resembled the pattern found in sick leave, although the relations were less strong and not significant for most factors (Table 4). The presence of swollen joints, diagnostic group and poor self-reported health influenced productivity. In the multivariate GEE analysis, a reduced productivity at work was predicted by low support from colleagues (OR 2.2 (95% CI 1.3-3.9)), intermediate levels of pain (OR 3.1 (95% CI 1.6-6.0)), moderate or poor physical functioning (OR 2.1 (95% CI 1.1-4.3), 2.8 (95% CI 1.2-6.5)), and poor mental health (OR 2.1 (95% CI 1.0-4.3)), whereas productivity loss was less likely among workers classified as arthritis, non-RA, compared to those with inflammatory joint complaints without clinical synovitis (OR 0.4 (95% CI 0.2-0.9)) and those with RA (OR 0.3 (95% CI 0.1-0.6)). In about half of the workers classified as non-RA arthritis at baseline, clinical synovitis was transient after 6 months, as defined by no treatment with DMARDs and no swollen joints. Furthermore, these workers reported a 5.9- point better score for bodily pain after 6 months than both other diagnostic groups (p=0.10), and a 9.6-point better score after 12 months (p=0.00). The recurrence of reduced productivity was also lower (45% versus 73%).

When the work factors being a supervisor and frequent handling of materials were added to the multivariate model of productivity, findings were in agreement with the impact of these factors on sick leave, though non-significant (OR 0.60 (95% CI 0.29-1.23) and OR 1.42 (95% CI 0.66-3.02)). Furthermore, the impact of the risk factors on sick leave and reduced productivity at work was not different between the first and second 6-month period. The observed relations between the work characteristics and outcomes did not differ among workers with different levels of pain, physical functioning and

Table 4. Predictors of sick leave and a reduced productivity at work among workers with early inflammatory joint conditions in GEE analyses

	Sick leave				**Reduced productivity at work**			
	Univariate		Multivariate (n= 307[a])		Univariate		Multivariate (n= 303[b])	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Demographic and work characteristics								
Age, yrs	1.02	(0.99-1.04)	1.01	(0.99-1.04)	1.01	(0.99-1.04)	1.00	(0.97-1.03)
Sex, male vs female	0.94	(0.50-1.80)	1.00	(0.49-2.04)	0.80	(0.45-1.41)	0.95	(0.50-1.79)
Ethnicity, non-Dutch vs Dutch origin	1.78†	(0.91-3.48)	.		1.90*	(1.04-3.45)	.	
Education								
High	1.00		.		1.00		.	
Intermediate	1.69	(0.71-3.98)	.		1.52	(0.78-2.98)	.	
Low	2.80*	(1.25-6.29)	.		1.62	(0.84-3.15)	.	
Supervisor	0.23*	(0.08-0.63)	0.24*	(0.08-0.70)	0.79	(0.40-1.57)	.	
Prolonged clerical work	0.65	(0.35-1.19)	.		0.67	(0.40-1.13)	.	
Frequent manual handling of material	1.98*	(1.10-3.56)	1.96†	(0.97-3.98)	1.48	(0.79-2.76)	.	
High physical exertion (>6.0)	2.32*	(1.28-4.22)	.		1.38	(0.84-2.28)	.	
High job demands (≥13)	1.32	(0.74-2.33)	.		0.97	(0.59-1.61)	.	
Low job control (≤30)	1.70†	(0.96-3.04)	.		1.17	(0.71-1.91)	.	
Low support from colleagues (≥ 7.0)	1.69†	(0.94-3.04)	.		1.64†	(0.99-2.72)	2.21*	(1.27-3.86)
Low support from the supervisor (≥ 7.0)	0.83	(0.48-1.44)	.		0.86	(0.51-1.45)	.	
High motivation to be in paid employment	0.64	(0.36-1.13)	.		1.32	(0.80-2.20)	.	
Clinical characteristics and self-reported health								
Diagnosis								
Inflammatory joint complaints, no synovitis	1.00		.		1.00		1.00	
Arthritis, not rheumatoid arthritis	1.20	(0.63-2.28)	.		0.59†	(0.32-1.09)	0.44*	(0.22-0.90)
Rheumatoid arthritis	1.17	(0.59-2.35)	.		1.65	(0.90-3.03)	1.61	(0.80-3.25)
Swollen joints								
No swollen joints	1.00		.		1.00		.	
1-2 swollen joints	1.59	(0.84-3.00)	.		1.98*	(1.14-3.42)	.	
>2 swollen joints	2.55*	(1.38-4.70)	.		1.55†	(0.92-2.61)	.	
High erythrocyte sedimentation rate (>20mm/hr)	3.04*	(1.68-5.52)	.		1.12	(0.63-1.97)	.	
Disease duration at inclusion, long vs short	0.62†	(0.35-1.09)	.		0.68	(0.41-1.13)	.	
Comorbidity, yes vs no	1.48	(0.85-2.58)	.		1.25	(0.77-2.03)		
Bodily pain								
Low (≥ 52)	1.00		1.00		1.00		1.00	
Intermediate (39-51)	1.57	(0.77-3.18)	1.27	(0.58-2.78)	3.21*	(1.89-5.46)	3.11*	(1.61-6.02)
High (≤ 38)	7.96*	(4.02-15.8)	3.17*	(1.34-7.49)	2.61*	(1.47-4.63)	1.91	(0.83-4.39)
Physical functioning								
Good (≥ 76)	1.00		1.00		1.00		1.00	
Moderate (54-75)	1.23	(0.57-2.64)	1.22	(0.56-2.66)	2.24*	(1.20-4.19)	2.14*	(1.06-4.30)
Poor (≤ 53)	7.81*	(3.90-15.7)	4.38*	(1.88-10.2)	3.93*	(2.07-7.47)	2.84*	(1.24-6.50)
Health assessment questionnaire (HAQ)								
Good (≤0.12)	1.00		.		1.00		.	
Moderate (0.13-0.63)	0.85	(0.39-1.86)	.		1.96*	(1.11-3.45)	.	
Poor (≥ 0.64)	2.91*	(1.52-5.57)	.		4.17*	(2.25-7.75)	.	
Mental health								
Good (≥ 81)	1.00		.		1.00		1.00	
Moderate (65-80)	2.05†	(0.91-4.64)	.		1.26	(0.73-2.17)	0.82	(0.44-1.54)
Poor (≤ 64)	4.93*	(2.29-10.6)	.		2.60*	(1.46-4.64)	2.11*	(1.04-4.26)
Fatigue (≥ 61)	1.72*	(1.06-2.78)	.		1.65†	(0.99-2.73)	.	
Decreasing activity to cope with pain (8-32)								
Low	1.00		.		1.00		.	
Intermediate	2.49*	(1.06-5.87)	.		1.36	(0.72-2.59)	.	
High	4.13*	(1.91-8.96)	.		2.44*	(1.30-4.57)	.	

*: p<0.05, †: 0.05<p<0.10, [a]: 162 persons completed the first 6-month period, 145 persons completed the second 6-month period, with 142 persons with complete data for both periods. [b]: 160 persons completed the first 6-month period, 143 persons completed the second 6-month period with 139 persons with complete data for both 6-month periods.

mental health, or between diagnostic groups when interaction terms were added to the models.

Discussion

Among workers seeking care with early inflammatory joint conditions, sick leave was predicted by high levels of pain, poor physical functioning, and frequent manual handling of materials, whereas supervisors had a lower likelihood to report sick leave. Predictors of a reduced productivity at work were increased levels of pain, intermediate or poor physical functioning, poor mental health, and low support from colleagues, whereas workers classified as arthritis, non-RA, were less likely to report a reduced productivity.

Some methodological aspects may have influenced our findings. Since the prevalence of inflammatory joint conditions in the general population is unknown, little insight exists in potential selection processes during referral of patients by physicians to this inception cohort study. It is unlikely that physicians selected patients on the basis of work characteristics. If selection bias occurred, it could be hypothesized that physicians were more likely to notify patients for REACH if they reported serious complaints. Additional analysis showed that entering the study via either general practitioners or rheumatologists did not influence the performance at work. During the follow-up period, 24 patients were lost. Although these patients were younger and classified with less serious disease from a medical point of view, no differences existed for gender, pain, physical functioning, and sick leave at baseline. Therefore, loss to follow-up was not strongly influenced by the risk factors pain and function.

In this prospective cohort study of workers with early inflammatory joint conditions, clinical characteristics and self-reported health improved over time, and sick leave decreased. Two factors could explain the decrease in sick leave. First, medical treatment probably influenced pain, physical functioning, and the performance at work. Secondly, the decrease in sick leave may be due to regression to the mean, since patients were only included in this study when they sought care, which may be prompted by sick leave. As a consequence, it could be expected that sick leave was higher at baseline than during follow-up.

Self-reported pain and poor physical functioning already had an adverse effect on the performance at work in the early phase of inflammatory joint conditions, whereas the clinical factors swollen joint count and erythocyte sedimentation rate, as parameters of inflammation, had no influence. Pain and reduced physical functioning are important consequences of musculoskeletal conditions[37], and they often result in sick leave[13-15,18] or productivity loss[38] in other musculoskeletal disorders. Therefore, this study adds to our knowledge that pain and physical functioning determine the performance at work already in an early phase of this musculoskeletal condition too, and that they are more important than the inflammatory parameters. Our findings were in agreement with the results from a cross-sectional study in the same worker population. At baseline, when persons entered the study, high levels of pain (OR 4.1, 95%CI 1.1-15.4) and poor physical functioning (OR 3.8, 95%CI 1.2-11.4) were also strongly associated with sick leave in the past six months[39]. No other clinical factor, except diagnostic group, was of predictive value. Workers with arthritis, non-RA, had a lower likelihood to report a reduced productivity at work, relative to workers with RA and workers with inflammatory joint conditions without clinical synovitis. In this patient group, clinical synovitis was transient (self-limiting) in a substantial proportion of the patients, as one would expect[40]. The transient nature of the complaints was illustrated by the fact that these patients did not receive treatment with DMARDs and also had no swollen joints after 6 months. Moreover, self-reported pain was lower in this diagnostic group during follow-up. Given the transient nature of complaints, it is very likely that most of these workers had no complaints when filling out the questionnaire on productivity loss at work.

Apart from the experience of pain and decreased physical functioning, the job characteristics manual material handling, being a supervisor and support from colleagues predicted the performance at work. It may be hypothesized that pain and functional limitations will become especially troublesome in jobs with strenuous working conditions. Frequent manual materials handling will increase mechanical loading of the joints, which in turn may result in exacerbation of joint complaints[41]. Likewise, supervisors will have more control over the planning and organization of their activities at work and, thus, may avoid strenuous working conditions during flares up of their complaints[42]. The positive effects of support from colleagues could also reflect increased possibilities for workers with complaints to adjust their working load when needed. This could be illustrated by a qualitative study, in which a substantial proportion of the persons with longstanding RA reported that their colleagues helped with physical aspects of the job, such as lifting, reaching and typing[43]. It is of interest to gain more insight into the mechanisms of workers with inflammatory joint complaints to tailor their working conditions to their temporary pain and functional limitations. Workers with early inflammatory joint conditions frequently described adaptations of the job. An additional analysis showed that, among workers without any adaptation at baseline, the likelihood of adaptations was increased in those with poor physical functioning (OR 7.2, 95% CI 2.9-18) and decreased in those with prolonged clerical work (OR 0.2, 95% CI 0.1-0.4). In a recent study, a higher proportion of the workers with early arthritis reported job adaptations than in our study, i.e. respectively 29% versus 23% at baseline and 42% versus 25% after 12 months[44]. This could be due to worse physical functioning. Since little is known on the influence of early adaptations on the relation between job characteristics and the performance at work, we recommend future studies to address their influence.

The present study showed that physicians may support the performance at work of persons with early inflammatory joint conditions by targeting pain and physical functioning, in addition to disease activity. Besides medical treatment, patient education programs may improve function and pain, though more insight is needed in their impact in different musculoskeletal diseases and their timing[45,46]. Early job related interventions reducing physical workload and increasing control over the organization and planning of activities may avoid negative consequences of inflammatory joint complaints on the performance at work.

In workers with early inflammatory joint conditions, self-reported pain and physical functioning affected performance at work, together with manual materials handling and lack of support from colleagues. Early treatment should target pain and physical functioning, and job interventions should aim at reducing physical workload and increasing co-worker support.

References

1. Lacaille D, Hogg RS. The effect of arthritis on working life expectancy. J Rheumatol 2001;28(10):2315-9.
2. Mau W, Listing J, Huscher D, Zeidler H, Zink A. Employment across chronic inflammatory rheumatic diseases and comparison with the general population. J Rheumatol 2005;32(4):721-8.
3. Geuskens GA, Burdorf A, Hazes JM. Consequences of rheumatoid arthritis for performance of social roles- a literature review. J Rheumatol 2007;34(6):1248-60.
4. Sokka T, Pincus T. Markers for work disability in rheumatoid arthritis. J Rheumatol 2001;28(7):1718-22.
5. Verstappen SM, Bijlsma JW, Verkleij H, Buskens E, Blaauw AA, ter Borg EJ, Jacobs JW. Overview of work disability in rheumatoid arthritis patients as observed in cross-sectional and longitudinal surveys. Arthritis Rheum 2004;51(3):488-97.
6. Burdorf A. Economic evaluation in occupational health--its goals, challenges, and opportunities [editorial]. Scand J Work Environ Health 2007;33(3):161-4.
7. Escorpizo R, Bombardier C, Boonen A, Hazes JM, Lacaille D, Strand V, Beaton D. Worker productivity outcome measures in arthritis. J Rheumatol 2007;34(6):1372-80.
8. Uegaki K, de Bruijne MC, Anema JR, van der Beek AJ, van Tulder MW, van Mechelen W. Consensus-based findings and recommendations for estimating the costs of health-related productivity loss from a company's perspective. Scand J Work Environ Health 2007;33(2):122-30.
9. Dadoniene J, Stropuviene S, Venalis A, Boonen A. High work disability rate among rheumatoid arthritis patients in Lithuania. Arthritis Rheum 2004;51(3):433-9.
10. Kleinman NL, Brook RA, Patel PA, Melkonian AK, Brizee TJ, Smeeding JE, Joseph-Ridge N. The impact of gout on work absence and productivity. Value Health 2007;10(4):231-7.
11. Muchmore L, Lynch WD, Gardner HH, Williamson T, Burke T. Prevalence of arthritis and associated joint disorders in an employed population and the associated healthcare, sick leave, disability, and workers' compensation benefits cost and productivity loss of employers. J Occup Environ Med 2003;45(4):369-78.
12. Kessler RC, Maclean JR, Petukhova M, Sarawate CA, Short L, Li TT, Stang PE. The effects of rheumatoid arthritis on labor force participation, work performance, and healthcare costs in two workplace samples. J Occup Environ Med 2008;50(1):88-98.
13. Bergstrom G, Bodin L, Bertilsson H, Jensen IB. Risk factors for new episodes of sick leave due to neck or back pain in a working population. A prospective study with an 18-month and a three-year follow-up. Occup Environ Med 2007;64(4):279-87.
14. Coste J, Delecoeuillerie G, Cohen de Lara A, Le Parc JM, Paolaggi JB. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. Bmj 1994;308(6928):577-80.
15. Elders LA, Heinrich J, Burdorf A. Risk factors for sickness absence because of low back pain among scaffolders: a 3-year follow-up study. Spine 2003;28(12):1340-6.
16. Hoogendoorn WE, Bongers PM, de Vet HC, Ariens GA, van Mechelen W, Bouter LM. High physical work load and low job satisfaction increase the risk of sickness absence due to low back pain: results of a prospective cohort study. Occup Environ Med 2002;59(5):323-8.
17. IJzelenberg W, Burdorf A. Risk factors for musculoskeletal symptoms and ensuing health care use and sick leave. Spine 2005;30(13):1550-6.

18. Kuijpers T, van der Windt DA, van der Heijden GJ, Twisk JW, Vergouwe Y, Bouter LM. A prediction rule for shoulder pain related sick leave: a prospective cohort study. BMC Musculoskelet Disord 2006;7:97.

19. Li X, Gignac MA, Anis AH. The indirect costs of arthritis resulting from unemployment, reduced performance, and occupational changes while at work. Med Care 2006;44(4):304-10.

20. Burton WN, Chen CY, Schultz AB, Conti DJ, Pransky G, Edington DW. Worker productivity loss associated with arthritis. Dis Manag 2006;9(3):131-43.

21. de Buck PD, de Bock GH, van Dijk F, van den Hout WB, Vandenbroucke JP, Vliet Vlieland TP. Sick leave as a predictor of job loss in patients with chronic arthritis. Int Arch Occup Environ Health 2006;80(2):160-70.

22. Reisine S, Fifield J, Walsh SJ, Feinn R. Factors associated with continued employment among patients with rheumatoid arthritis: a survival model. J Rheumatol 2001;28(11):2400-8.

23. Keij I. Numbers of foreigners according to various definitions. Maandstatistiek van de bevolking 2000;48(5):14-7.

24. Hildebrandt VH, Bongers PM, van Dijk FJ, Kemper HC, Dul J. Dutch Musculoskeletal Questionnaire: description and basic qualities. Ergonomics 2001;44(12):1038-55.

25. Elders LA, Burdorf A. Interrelations of risk factors and low back pain in scaffolders. Occup Environ Med 2001;58(9):597-603.

26. Borg G. Psychophysical scaling with applications in physical work and the perception of exertion. Scand J Work Environ Health 1990;16 Suppl 1:55-8.

27. Karasek R, Baker D, Marxer F, Ahlbom A, Theorell T. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. Am J Public Health 1981;71(7):694-705.

28. IJzelenberg W, Molenaar D, Burdorf A. Different risk factors for musculoskeletal complaints and musculoskeletal sickness absence. Scand J Work Environ Health 2004;30(1):56-63.

29. Ware JE, Jr., Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;30(6):473-83.

30. Aaronson NK, Muller M, Cohen PD, Essink-Bot ML, Fekkes M, Sanderman R, Sprangers MA, te Velde A, Verrips E. Translation, validation, and norming of the Dutch language version of the SF-36 Health Survey in community and chronic disease populations. J Clin Epidemiol 1998;51(11):1055-68.

31. Fries JF, Spitz P, Kraines RG, Holman HR. Measurement of patient outcomes in arthritis. Arthritis Rheum 1980(23):137-45.

32. van Lankveld W, van't Pad Bosch P, van de Putte L, Naring G, van der Staak C. Disease-specific stressors in rheumatoid arthritis: coping and well-being. Br J Rheumatol 1994;33(11):1067-73.

33. van Lankveld W, Naring G, van der Staak C, van 't Pad Bosch P, van de Putte L. De ontwikkeling van de CORS. Coping met reuma stressoren. Gedrag en Gezondheid 1993;21:40-8 [in Dutch].

34. Burdorf A, Post W, Bruggeling T. Reliability of a questionnaire on sickness absence with specific attention to absence due to back pain and respiratory complaints. Occup Environ Med 1996;53(1):58-62.

35. Brouwer WB, Koopmanschap MA, Rutten FF. Productivity losses without absence: measurement validation and empirical evidence. Health Policy 1999;48(1):13-27.

36. Meerding WJ, W IJ, Koopmanschap MA, Severens JL, Burdorf A. Health problems lead to considerable productivity loss at work among workers with high physical load jobs. J Clin Epidemiol 2005;58(5):517-23.

37. Picavet HS, Hoeymans N. Health related quality of life in multiple musculoskeletal diseases: SF-36 and EQ-5D in the DMC3 study. Ann Rheum Dis 2004;63(6):723-9.

38. Bostrom M, Dellve L, Thomee S, Hagberg M. Risk factors for generally reduced productivity-a prospective cohort study of young adults with neck or upper-extremity musculoskeletal symptoms. Scand J Work Environ Health 2008;34(2):120-32.

39. Geuskens GA, Hazes JMW, Barendregt PCM, Burdorf A. Work and sick leave among patients with early inflammatory joint conditions. Arthritis Rheum 2008;59(10):1458-66.

40. Visser H, le Cessie S, Vos K, Breedveld FC, Hazes JM. How to diagnose rheumatoid arthritis early: a prediction model for persistent (erosive) arthritis. Arthritis Rheum 2002;46(2):357-65.

41. Allaire S, Wolfe F, Niu J, Baker N, Michaud K, LaValley M. Extent of occupational hand use among persons with rheumatoid arthritis. Arthritis Rheum 2006;55(2):294-9.

42. Lacaille D, White MA, Backman CL, Gignac MA. Problems faced at work due to inflammatory arthritis: new insights gained from understanding patients' perspective. Arthritis Rheum 2007;57(7):1269-79.

43. Mancuso CA, Paget SA, Charlson ME. Adaptations made by rheumatoid arthritis patients to continue working: a pilot study of workplace challenges and successful adaptations. Arthritis Care Res 2000;13(2):89-99.

44. Zirkzee EJ, Sneep AC, de Buck PD, Allaart CF, Peeters AJ, Ronday HK, Westedt ML, le Cessie S, Vliet Vlieland TP. Sick leave and work disability in patients with early arthritis. Clin Rheumatol 2007.

45. Li LC. If knowledge is power, why don't rheumatoid arthritis education programs show better outcomes? J Rheumatol 2007;34(8):1645-6.

46. Riemsma RP, Taal E, Kirwan JR, Rasker JJ. Systematic review of rheumatoid arthritis patient education. Arthritis Rheum 2004;51(6):1045-59.

Chapter 6

A high physical workload and high job demands hamper the good prognosis in physical functioning in persons with early inflammatory joint conditions

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Geuskens GA, Burdorf A, Barendregt PJ, Hazes JMW. A high physical workload and high job demands hamper the good prognosis in physical functioning in persons with early inflammatory joint conditions. *Submitted.*

Abstract

Objective. To determine the influence of job characteristics on the prognosis of patients with early inflammatory joint conditions.

Methods. In a prospective cohort study of 210 workers with inflammatory joint conditions present for less than 12 months, data were collected by questionnaires and medical examination at baseline and after 6 and 12 months. Outcomes were self-reported pain and physical functioning, and the presence of at least one swollen joint. Generalized estimation equations were used to study the influence of job characteristics on prognosis in pain and function, and logistic regression analysis to study prognosis in swollen joints.

Results. Pain and physical functioning strongly improved during the first 6-month period (respectively 40% and 14%), and improvement slowed down considerably in the second 6-month period. The proportion of workers with swollen joints strongly decreased from 58% via 20% to 7%. The good prognosis in pain and physical functioning in the first 6 months was hampered by persistent high levels of inflammation, older age, low perceived health control, and low social support. Job characteristics had no influence on the prognosis of pain and swollen joints, whereas workers with frequent manual material handling or high job demands improved approximately 50% less in physical functioning.

Conclusions. Job characteristics had no influence on the disease characteristics pain and swollen joints, but strongly affected the consequences of disease in physical functioning. Among patients with early inflammatory joint conditions who do not recover in functional abilities, adjustments in working conditions may be imperative.

Introduction

Working life expectancy of persons with arthritis or rheumatism is about 4.2 years lower in men and 3.1 years in women[1]. In persons with longstanding rheumatoid arthritis (RA), the prevalence of (partial) work-relevant disability is 11% to 52% higher than in reference populations[2,3]. Workers with chronic arthritis or related joint disorders more often experience sickness absence[4-7] and a reduced productivity while present at work[8,9].

According to the framework of the International Classification of Functioning, Disability and Health (ICF), the consequences of a disease may be influenced by environmental (e.g. work-related) and personal factors[10]. However, few studies have addressed the influence of working conditions on the prognosis of arthritis. In a cross-sectional study, Allaire et al. (2006)[11] found that extensive hand use in occupational activities was associated with higher pain intensity in the hand joints among workers with longstanding RA. In another cross-sectional study, workers with longstanding osteoarthritis and/or RA reported that work had interfered with managing their arthritis[12]. Outside the workplace, in randomized controlled trials, mechanical loading of the joints in dynamic exercise training did not increase pain, disease activity, or joint damage[13,14].

The relation between inflammatory joint conditions and work may be bi-directional. However, the impact of work factors on the prognosis of inflammatory joint conditions is largely unknown, since prospective studies among workers with recent onset of complaints are lacking. More insight in the effects of job characteristics could provide guidance on how to continue employment from disease onset onwards without deteriorating the prognosis. Therefore, the aim of this study was to determine the influence of job characteristics on the prognosis of patients with early inflammatory joint conditions.

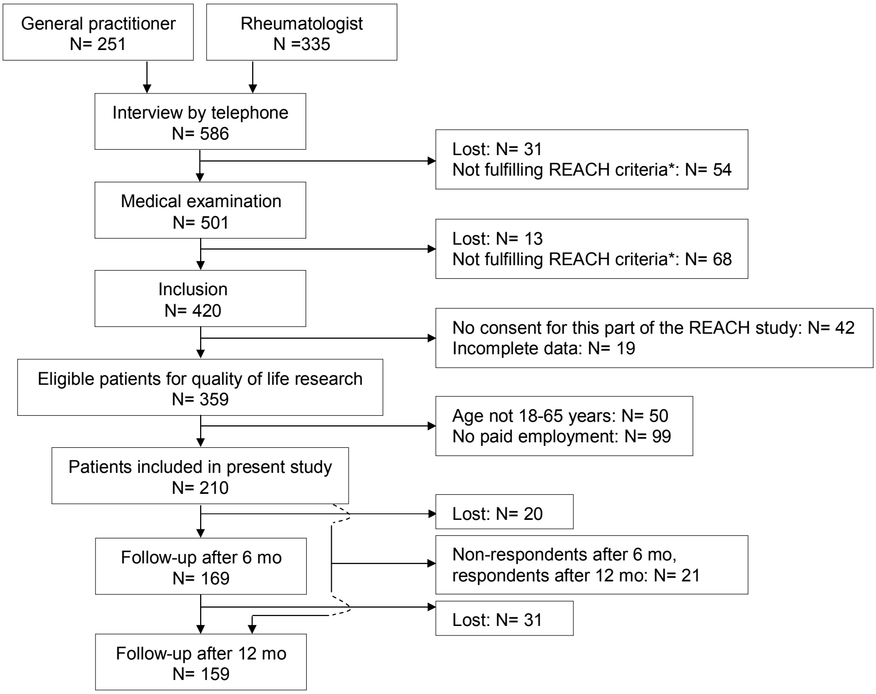
Methods

Study population

The current study presents the one-year follow-up data of the Rotterdam Early Arthritis CoHort (REACH). REACH is an ongoing inception cohort study with 4 years of follow-up. REACH aims to study the etiopathogenesis, diagnostic strategies and outcome of patients with inflammatory joint conditions for less than 12 months. In total, 82 general practitioners, 12 rheumatologists and 4 rheumatologist trainees (1 university hospital, 2 general hospitals) in the greater area of Rotterdam have invited patients to participate in REACH from July 2004 onwards. Data collection includes a large array of detailed medical examination and questionnaires. When patients entered the study, they could choose to provide only limited medical data and/or self-reported questionnaires. For the current study, patients who were sent by general practitioners or rheumatologists for inclusion in the study up to July 2006 were studied. This sample was chosen to ensure 1-year follow-up information of these patients were available for analysis.

General practitioners selected patients with clinical synovitis in at least one joint or patients experiencing complaints in at least two joints without synovitis. The general practitioners ascertained that onset of complaints had started in the past 12 months and complaints were not due to trauma/mechanical problems. During an interview by telephone and subsequent medical examination by a rheumatologist, the inclusion criteria were verified. Patients were included if (1) joint complaints existed for less than 12 months with no requirement of a minimum duration, and, (2) clinical synovitis in at least one joint or complaints in at least two joints in combination with at least two of the following criteria ascertained during medical examination by a rheumatologist: morning stiffness longer than one hour, bilateral compression pain in the metacarpophalangeal joints or metatarsophalangeal joints, symmetrical presentation, positive family history, non-fitting shoes, non-fitting rings, pins and needles in fingers, or unexplained fatigue

Figure 1. Inclusion and follow-up of employed persons with early inflammatory joint conditions



*: Persons were included in REACH if 1) clinical synovitis in at least one joint or complaints in at least 2 joints in combination with other factors indicating inflammatory complaints was ascertained, and 2) joint complaints existed for less than 12 months (see text).

for less than 1 year, and, (3) complaints were predominantly present in the morning and at night, and improved with movement. Patients were excluded if (1) complaints were due to trauma/mechanical problems, (2) age was under 16 years old, (3) no written communication was possible in Dutch, or (4) a prior diagnosis of rheumatoid arthritis, ankylosing spondylitis, Sjögren's syndrome, systemic lupus erythematosus or juvenile arthritis had been made by a rheumatologist before inclusion in this study. For patients directly visiting rheumatologists, a similar verification procedure was applied. For all patients, enrolled through general practitioners or rheumatologists, a rheumatologist set the diagnosis.

Figure 1 shows that 586 patients were notified at the end of July 2006. In total, 122 patients did not fulfill inclusion criteria. Before actual inclusion, 44 patients were lost. These patients were significantly more often male compared to participants (39% vs 27% male), but no differences in age existed. After inclusion, 61 out of 420 patients (15%) were excluded from the current study due to incomplete data collection (5%) or the patient's choice at entrance of the study to provide only limited medical data and/or self-reported questionnaires (10%). Age and sex of these patients was not significantly different. Since only patients aged 18 to 65 years old in paid employment were selected for the current study, 210 patients were included. This study was approved by the ethics committees of the three participating hospitals. All patients gave written informed consent.

Measurements

At baseline and after 6 and 12 months of follow-up, patients completed self-administered questionnaires and clinical characteristics were obtained by medical examination.

Demographic characteristics

Age, sex, and ethnicity were asked. Ethnicity was categorized into Dutch origin (no parent born abroad) or non-Dutch origin (at least one parent born abroad)[15]. Education was categorized according to the highest level attained into low (≤ 9 years: primary school, lower and intermediate secondary schooling or lower vocational training), intermediate (10-14 years: higher secondary schooling or intermediate vocational training), and high (≥15 years: higher vocational training or university).

Work characteristics

Work characteristics were assessed at baseline, and if patients changed jobs during the follow-up period. Full-time employment was defined as working at least 36 hours per week. Patients were asked whether they were supervisor, self-employed, and worked in shifts[16]. Physical load was assessed by questions derived from the Dutch Musculoskeletal Questionnaire on manual materials handling (lifting 5 kg and/or lifting 25 kg), and strenuous arm positions (working with hands above shoulder level and/or repetitive arm movements)[16,17]. Answers were on a 4-point scale with ratings "seldom or never", "now and then", "often" and "always". The answers "often" and "always" were classified as high exposure[17]. Physical exertion at work was measured by a numeric rating scale from 0 ("no effort at all") to 10 ("very high effort"). A score of 6 and over was classified as high physical exertion[18].

Questions on the psychosocial load of the job were derived from the Karasek model[19]. In this model, subjects are supposedly at risk for psychological strain when experiencing high job demands and low job control. Job demands were measured by 11 items (e.g. working fast, excessive work). Job control was measured by 6 items on skill discretion (e.g. task variety, learning new things) and by 11 items on the authority to make decisions (e.g. autonomy in executing tasks and solving problems, influence on planning). For both dimensions, the sum score was dichotomized based on the median score.

Support from colleagues was measured by a numeric rating scale ranging from 0 (no support) to 10 (high support). Support from the supervisor was similarly ascertained[20]. On the basis of the median score, support from colleagues and the supervisor was classified as low or high.

Clinical characteristics

Clinical characteristics were obtained at each measurement. Patients were classified into three mutually exclusive diagnostic groups based on the diagnosis made by a rheumatologist: 1) definite or probable rheumatoid arthritis (referred to as "RA" in text), 2) specified or non-specified mono- or oligo/poly arthritis, non-RA (referred to as "arthritis" in text), and 3) inflammatory joint complaints without clinical synovitis. The presence of swollen joints (44 joints) was categorized into no clinical synovitis, and one or more swollen joints. Since diagnostic group and the presence of swollen joints were strongly related (Spearman r=0.66), only the variable swollen joints was included in the analysis. Erythrocyte sedimentation rate (ESR) was classified into low (≤20 mm/hr) or high (>20 mm/hr). If ESR values were not available, they were imputed by means of a multivariate regression model based on a selection of significant factors. The duration of inflammatory complaints was defined as the period between symptom onset and medical examination, and was dichotomized based on the median number of weeks. The use of disease modifying anti-rheumatic drugs (DMARD) was ascertained. Among persons with one or more swollen joint at baseline or high ESR, respectively 60% and 65% received DMARD treatment during the first 6 months of follow-up. Comorbidity was assessed, and defined as the presence of at least one comorbid condition at first visit.

Bodily pain and physical functioning

At each measurement, health-related quality of life was measured by the Short Form-36 Health Survey (SF-36). The SF-36 is a generic 36-item questionnaire covering eight dimensions: physical functioning, physical role functioning, bodily pain, general health, vitality, social functioning, emotional role functioning, and mental health. Sum scores of the dimensions may range from 0 to 100 with higher scores indicating better health[21,22]. The subscales bodily pain (2 items) and physical functioning (10 items) were chosen as outcome measures in this study, since these dimensions are mainly impaired in patients with early arthritis and showed the strongest improvement over time, and were also normally distributed. Bodily pain and physical functioning were strongly associated (r=0.64).

Psychosocial characteristics

Perceived control over health outcomes was measured at baseline by the Multidimensional Health Locus of Control Questionnaire (MHLC). The MHLC assesses three different dimensions of perceived health control by means of three scales. The 'internal' scale reflects the believe that people are personally responsible for their own health, the 'physician' scale reflects that a physician is responsible for one's health, and the 'chance' scale reflects the believe that health depends on chance, luck or fate. Each scale contains 6 statements with answers on a 6-point scale (strongly disagree to strongly agree)[23,24]. The subscale scores range from 6 to 36 with a higher score indicating that a patient believes stronger in the particular health locus of control. In this study, correlations among the subscales were low (r=0.00-0.38). The scales were analyzed in tertiles.

Social support was assessed at baseline by a subscale of the Inventory for Social Support (ISB), which reflects the perceived availability of emotional and instrumental support[25,26]. The scale consists of five items with answers on a 4-point scale (almost never, sometimes, regularly, often) and the sum score ranges from 5 to 20 with higher scores indicating that more support is experienced. The sum score was categorized into low and high based on the median score.

Statistical analysis

The impact of individual, clinical and work-related factors on the prognosis in pain and physical functioning was studied in separate models by means of General Estimating Equations (GEE), suitable for the analysis of repeated measurements. In all models, demographic and psychosocial factors were considered to be time independent, whereas clinical factors were time dependent. Job characteristics were considered to be time independent, except if a person changed to another job. A simple correlation structure was chosen, assuming a uniform correlation for all possible pairs of variables within subjects (exchangeable or compound symmetry). Time and baseline score of the dependent variable were included in the models, and hence, the influence of independent variables on the change in pain and function over time was analyzed.

The impact of the independent variables on the prognosis of swollen joints was studied by means of a logistic regression model. Only persons with at least one swollen joint at baseline were included in this analysis, and thus, the impact of independent variables, assessed at baseline, on the recurrence of swollen joints was studied.

For all dependent variables, the following procedure was used. First, the influence of independent factors was analyzed in univariate regression analyses, and variables with a p-value below 0.20 were selected. Second, multivariate regression models within groups of interrelated variables (i.e. demographic, job-related, clinical, and psychosocial factors) were constructed by backward selection. Since change in ESR and change in swollen joints were strongly related, only the parameter of inflammation with most influence on the dependent variable of interest was selected. Third, final multivariate models were constructed by backward selection. Variables with a p-value of 0.05 or less, and variables of borderline significance with an important influence on other independent variables (>10% in regression coefficient) were retained. Age and sex were included by default. Fourth, we determined whether variables were excluded correctly by including them one by one in the final multivariate model and evaluated their influence on the overall fit of the model. Only the first six months of follow-up were presented, since most change in pain and physical functioning occurred during this period. In addition, only persons that remained employed were included in the analyses. Statistical analyses were performed with the statistical package STATA (8.0 SE).

Results

At baseline, 210 workers seeking care with early inflammatory joint conditions participated in this study. Mean age was 45 (11) years, and 72% was female. About 23% of the population was classified as RA (n=48), 35% (n=74) as arthritis, and 42% (n=88) as inflammatory joint complaints without clinical synovitis. Among those with arthritis (non-RA), 27 of the 74 persons had monoarthritis, 39 persons had polyarthritis, and 8 persons had oligoarthritis. Persons with inflammatory joint conditions without synovitis were classified as inflammatory joint conditions without synovitis without specification (n=63), osteoarthritis (n=16), and other specifiable diseases (n= 9). In total, 51 (24%) persons were lost to follow-up (Figure 1). They were significantly younger than participants (40 vs. 46 years). No differences were found for gender, pain, physical functioning, swollen joints, and diagnostic group at baseline. Besides, 6 (4%) persons had stopped working after 6 months, and 8 (5%) persons after 12 months.

Table 1. Clinical characteristics, self-reported health, and work status in persons with early inflammatory joint conditions during a 1-year follow-up period

Characteristics	**Baseline** (n=210)	**6 months follow-up** (n= 169)	**12 months follow-up** (n= 159)
Clinical characteristics			
Duration of complaints, wks, median (IQR)	15 (7-27)	.	.
One or more swollen joints, %	58%	20%	7%
High ESR (>20mm/hr), %	33%	17%	11%
DMARD treatment, %	0%	43%	43%
Self-reported health (SF-36) (0-100)[a]			
Physical functioning, mean (SD)	63 (24)	72 (22)	75 (20)
Role physical, median (IQR)	25 (0-75)	75 (0-100)	100 (25-100)
Bodily pain, mean (SD)	45 (20)	63 (22)	64 (22)
General health, mean (SD)	57 (18)	59 (20)	60 (20)
Vitality, mean (SD)	54 (19)	59 (20)	61 (21)
Social functioning, mean (SD)	72 (24)	78 (25)	80 (22)
Role emotional, median (IQR)	100 (42-100)	100 (67-100)	100 (67-100)
Mental health, mean (SD)	72 (17)	74 (19)	76 (19)
Work status			
Having paid employment, n	210	163	151
Quitted employment, n	.	6	8

ESR: Erythrocyte sedimentation rate, DMARD: disease modifying anti-rheumatic drugs, [a]: Higher scores indicate better health

Figure 2. Improvements in bodily pain and physical functioning (SF-36) of persons with early inflammatory joint conditions during a 1-year follow-up period, as presented by mean scores and standard errors of the mean

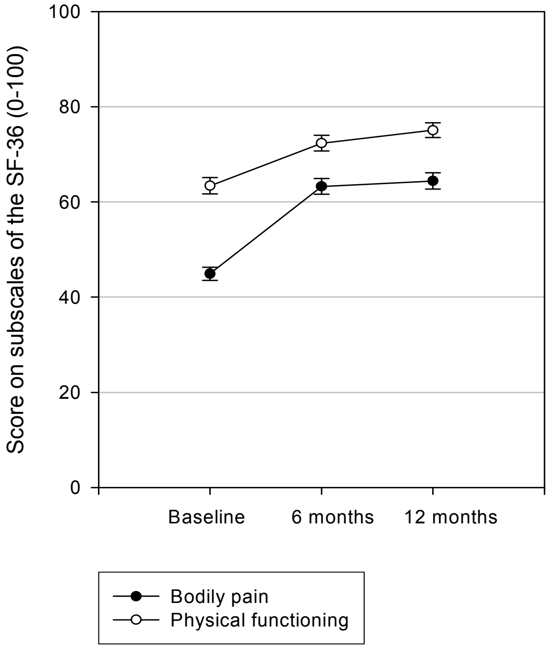


Table 1 and Figure 2 show that pain and physical functioning strongly improved during the first 6 months of follow-up, respectively 40% (18 points) and 14% (9 points). Improvements slowed down considerably in the second 6-month period, with pain improving only 1 point and physical functioning 3 points (not significant). The number of persons with swollen joints strongly decreased from 122 (58%) persons at study onset to 34 (20%) persons after 6 months, to 11 (7%) persons after 12 months.

Table 2 describes that both swollen joints and ESR strongly influenced the improvement in pain in the univariate analyses, whereas swollen joints stronger influenced prognosis in the multivariate analysis. Workers with recurrent swollen joints improved

Table 2. Determinants of prognosis in bodily pain and physical functioning (SF-36) during the first 6 months after seeking care in workers with early inflammatory joint conditions (n=163), as determined by Generalised Estimating Equations

		Bodily pain (0-100) Beta (95%CI)		**Physical functioning (0-100)** Beta (95%CI)	
	n	Univariate[a]	Multivariate[b]	Univariate[a]	Multivariate[b]
Time					
6 months since baseline	163	18.4* (15.0, 21.9)	37.3* (29.8, 44.8)	9.57* (6.54, 12.6)	32.4* (24.9, 39.8)
Demographic factors					
Age					
20-39 yrs	54	Ref	Ref	Ref	Ref
40-49 yrs	43	0.22 (-5.21, 5.64)	-0.37 (-6.13, 5.39)	-4.61 (-9.93, 0.72)	-3.79 (-8.79, 1.21)
50-65 yrs	66	-3.13 (-9.14, 2.89)	-0.43 (-5.55, 4.70)	-4.70 (-9.49, 0.09)	-6.15* (-10.7,-1.63)
Female gender	116	-6.00* (-11.1,-0.93)	-4.50 (-9.53, 0.52)	-3.44 (-7.96, 1.08)	-0.46 (-4.92, 4.00)
Job-related factors					
Frequent manual materials handling	35	0.26 (-5.46, 5.98)	.	-4.49 (-9.47, 0.50)	-4.84* (-9.61,-0.07)
High job demands (>12)	84	-0.14 (-4.76, 4.48)	.	-3.03 (-7.12, 1.07)	-5.03* (-8.94,-1.13)
Low job control (<31)	73	1.66 (-3.01, 6.33)	.	1.71 (-2.33, 5.75)	.
Clinical factors					
Swollen joints					
≥1 at baseline, 0 after 6mo	60	Ref	Ref	Ref	.
≥1 at baseline, ≥1 after 6mo	27	-7.22* (-13.8,-0.61)	-5.19[†] (-11.6, 1.18)	2.90 (-3.13, 8.93)	.
0 at baseline, 0 after 6 mo	66	-9.99* (-15.1,-4.92)	-8.02* (-12.9,-3.09)	-8.09* (-12.6,-3.53)	.
0 at baseline, ≥1 after 6mo	4	-28.8* (-43.5,-14.2)	-23.9* (-37.8,-9.91)	-20.2* (-33.3,-7.00)	.
ESR					
High at baseline, low after 6 mo	30	Ref	.	Ref	Ref
High at baseline, high after 6 mo	21	-4.68 (-13.0, 3.60)	.	-7.55* (-14.7,-0.40)	-4.95[§] (-11.9, 2.05)
Low at baseline, low after 6 mo	105	-10.1* (-16.2,-4.02)	.	-14.5* (-19.8,-9.16)	-14.8* (-20.1,-9.54)
Low at baseline, high after 6 mo	7	-13.1* (-25.3,-0.92)	.	-23.9* (-34.5,-13.3)	-18.3* (-28.8,-7.74)
Long duration of complaints (>15 wks)	86	-6.41* (-11.1,-1.71)	-6.10* (-10.6,-1.57)	-2.10 (-6.22, 2.02)	.
Psychosocial factors					
Internal perceived health control					
High (≥23)	55	Ref	Ref	Ref	Ref
Intermediate (19-22)	56	4.42 (-1.03, 9.86)	6.36* (1.17, 11.5)	4.74 (-0.11, 9.59)	4.93* (0.37, 9.49)
Low (≤18)	48	-8.65* (-14.3,-2.98)	-7.66*(-13.2,-2.12)	-7.18* (-12.2,-2.14)	-7.89* (-12.8,-3.00)
Physician perceived health control					
High (≥21)	48	Ref	Ref	Ref	Ref
Intermediate (18-20)	50	-12.4* (-18.3,-6.54)	-9.88* (-15.5,-4.24)	-9.98* (-15.2,-4.75)	-8.46* (-13.3,-3.60)
Low (≤17)	61	-6.19* (-11.8,-0.59)	-2.94 (-8.38, 2.50)	-7.09 (-12.1,-2.05)	-2.76 (-7.61, 2.10)
Low perceived support (≤16)	75	-3.88 (-8.53, 0.77)	-4.57* (-8.94,-0.20)	-3.29 (-7.44, 0.87)	.

[a]: Adjusted for baseline score of pain/physical functioning and time since inclusion, [b]: Adjusted for baseline score of pain/physical functioning, ESR= Erythocyte sedimentation rate, Ref: reference group, *: p≤ 0.05, [†]: p=0.11, [§]: p=0.17

28% (5.2 points) less in pain than workers with swollen joints at baseline but no swollen joints after 6 months (p=0.11). Low perceived health control and low social support also strongly hampered prognosis in pain, whereas job-related factors had no influence.

Prognosis in physical functioning was not only influenced by clinical and psychosocial variables in the univariate analyses, but also by manual materials handling (Table 2). In the multivariate analysis, workers with high ESR at baseline improved more during the 6-month period than those with low ESR at baseline. However, physical functioning improved 52% (5.0 points) less among workers with persistent high ESR than in those with an ESR decrease from high to low (p=0.17). Job-related factors influenced the consequences of disease in physical functioning, with persons with frequent manual materials handling at work (4.8 points) or high job demands (5.0 points) improving approximately 50% less. Older age groups had less improvement in physical functioning, and workers aged 50 to 65 years with frequent manual materials handling or high job demands showed no improvement at all. Besides, a low perceived health control hampered a good prognosis.

Table 3 shows that the recurrence of swollen joints after 6 months was not influenced by any of the clinical, individual and job-related factors assessed at baseline. About 60% of the persons with one or more swollen joint at baseline had received DMARD treatment during the first 6 months of follow-up, and two-third of these patients had no swollen joints after 6 months.

Table 3. Determinants of recurrence of swollen joints 6 months after seeking care in a subgroup of workers with early inflammatory joint conditions (n=89), as determined by logistic regression analysis

Independent variables assessed at baseline		**Swollen joints**			
		Univariate		Multivariate	
	n	OR	(95% CI)	OR	(95% CI)
Demographic factors					
Age					
20-39 yrs (ref)	28	1.00		1.00	
40-49 yrs	24	0.79	(0.21-2.91)	0.81	(0.22-3.01)
50-65 yrs	37	2.05	(0.70-6.01)	1.95	(0.65-5.78)
Female gender	60	0.60	(0.23-1.53)	0.69	(0.26-1.83)
Job-related factors					
Frequent manual materials handling	19	1.46	(0.50-4.24)	.	
High job demands (>12)	41	1.73	(0.70-4.31)	.	
Low job control (<31)	38	1.11	(0.45-2.76)	.	
Clinical factors					
High ESR (>20mm/hr)	43	1.52	(0.61-3.77)	.	
Long duration of complaints (>15 wks)	40	1.49	(0.60-3.70)	.	

ESR: Erythocyte sedimentation rate

Discussion

The good prognosis in pain and physical functioning in the first 6 months of follow-up in workers with early inflammatory joint conditions was hampered by persistent high levels of inflammation, older age, low perceived health control, and low social support. Job characteristics had no influence on the prognosis of pain and swollen joints, whereas they strongly affected the consequences of disease in physical functioning. Workers with frequent manual materials handling or high job demands improved approximately 50% less in physical functioning.

Some methodological considerations should be taken into account. First, in this study the one-year follow-up data of an ongoing inception cohort study (REACH) were used. Since the prevalence of early inflammatory joint conditions in the general population is unknown, little insight exists in selection processes among patients that seek care, and in referral of patients by physicians to this inception cohort study. It is unlikely, however, that physicians selected patients on the basis of job characteristics. Moreover, additional analyses showed that entering the study directly via either general practitioners or rheumatologists did not influence prognosis. Second, during the follow-up period, data of 51 persons were not available. Although these persons were younger, no differences were found for pain, physical functioning, and the presence of swollen joints at baseline, or for any of the other variables influencing prognosis. Therefore, we think loss to follow-up did not affect the essence of our findings. Third, loss of employment did probably not influence our findings strongly, since only 6 persons stopped working during the first 6 months of follow-up, and they were excluded from the analyses. If long-term sick leave affected our findings, the influence of job characteristics on prognosis might have been underestimated due to reduced exposure to working conditions. Fourth, previous studies found that 23% to 29% of the workers with early inflammatory joint conditions reported adaptations in working tasks, times and/or environment[27,28], among others adaptations that reduce physically demanding activities at work[27]. As a consequence, the impact of physical workload on prognosis might have been underestimated in this study. However, the extent to which job adaptations changed exposure to strenuous working conditions within the same job could not be assessed within the current study. Finally, information bias due to self-report of work-related factors, pain, and physical functioning is unlikely, because work-related factors were assessed 6 months before the outcomes, and the change in the outcomes was studied.

In this prospective cohort study, pain, physical functioning, and the presence of swollen joints strongly improved over time. Three factors may underlie these improvements. First, 43% of the persons received DMARD treatment, and two-third of these workers had no swollen joints after 6 months. Second, persons were only included in this study when they sought care, which may be prompted by pain, reduced functioning and/or swollen joints. As a consequence, it could be expected that these measures were worse at baseline than during follow-up. Third, as described in previous early arthritis cohorts[29], about half of the workers classified as non-RA arthritis had self-limiting (i.e. transient) synovitis after 6 months. The transient nature of their synovitis was illustrated by the fact that these patients did not receive DMARD treatment and had no swollen joints. In the present study, the occurrence of erosions was not included as an outcome measure since less than 4% of all patients included in REACH had erosions at baseline and the follow-up period was relatively short to detect a meaningful number of new cases in the population.

The good prognosis in pain and physical functioning in the first 6 months of follow-up was hampered by recurrent swollen joints and high ESR levels, respectively. Both parameters reflect disease activity, and high disease activity has been related to pain and functional disability before[30-32]. In addition to clinical factors, workers with a low believe in their own control over their health improved less in both pain and physical functioning. Although longitudinal studies on the influence of perceived control over health in arthritis are scarce, previous prospective studies in persons with longstanding RA showed that helplessness feelings unfavourably influenced pain and functional disability[33,34].

The present study is, to our knowledge, the first prospective study examining the influence of work-related factors on the prognosis in swollen joints, pain and physical functioning of persons with early rheumatic conditions. Job-related factors did not influence the consequences of early inflammatory joint conditions in the ICF domain of body function and structure, i.e. pain and swollen joints. However, frequent manual materials handling at work and high job demands hampered the prognosis in the ICF domain of activities, with workers experiencing less improvement in physical functioning. It could be hypothesized that especially patients with a high physical workload and high job demands experience fatigue, and that fatigue might (partly) explain the reduced improvement in physical functioning. Because older persons with high physical workload and high job demands did not improve in physical functioning at all in the first 6 months after seeking care, they are at increased risk of a worse outcome. Previous studies showed that a high physical workload and poor physical functioning are strong determinants of sick leave and work-relevant disability in persons with rheumatic conditions[35-38]. The present study adds to this knowledge that in workers with physically demanding work, less improvement in physical functioning might contribute to their increased risk of adverse work-related outcomes, such as sick leave, change of job, or loss of paid employment.

In conclusion, job characteristics had no influence on the disease characteristics pain and swollen joints, but manual materials handling and high job demands negatively affected the consequences of disease in physical functioning. Among patients with early inflammatory joint conditions who do not recover in functional abilities, adjustments in working conditions may be imperative.

References

1. Lacaille D, Hogg RS. The effect of arthritis on working life expectancy. J Rheumatol 2001;28(10):2315-9.
2. Barrett EM, Scott DG, Wiles NJ, Symmons DP. The impact of rheumatoid arthritis on employment status in the early years of disease: a UK community-based study. Rheumatology (Oxford) 2000;39(12):1403-9.
3. Geuskens GA, Burdorf A, Hazes JM. Consequences of rheumatoid arthritis for performance of social roles- a literature review. J Rheumatol 2007;34(6):1248-60.
4. Dadoniene J, Stropuviene S, Venalis A, Boonen A. High work disability rate among rheumatoid arthritis patients in Lithuania. Arthritis Rheum 2004;51(3):433-9.
5. Kleinman NL, Brook RA, Patel PA, Melkonian AK, Brizee TJ, Smeeding JE, Joseph-Ridge N. The impact of gout on work absence and productivity. Value Health 2007;10(4):231-7.
6. Muchmore L, Lynch WD, Gardner HH, Williamson T, Burke T. Prevalence of arthritis and associated joint disorders in an employed population and the associated healthcare, sick leave, disability, and workers' compensation benefits cost and productivity loss of employers. J Occup Environ Med 2003;45(4):369-78.
7. Kessler RC, Maclean JR, Petukhova M, Sarawate CA, Short L, Li TT, Stang PE. The effects of rheumatoid arthritis on labor force participation, work performance, and healthcare costs in two workplace samples. J Occup Environ Med 2008;50(1):88-98.
8. Burton WN, Chen CY, Schultz AB, Conti DJ, Pransky G, Edington DW. Worker productivity loss associated with arthritis. Dis Manag 2006;9(3):131-43.
9. Li X, Gignac MA, Anis AH. The indirect costs of arthritis resulting from unemployment, reduced performance, and occupational changes while at work. Med Care 2006;44(4):304-10.
10. WHO. International Classification of Functioning, Disability and Health: ICF. Geneva: World Health Organization, 2001.
11. Allaire S, Wolfe F, Niu J, Baker N, Michaud K, LaValley M. Extent of occupational hand use among persons with rheumatoid arthritis. Arthritis Rheum 2006;55(2):294-9.
12. Gignac MA, Sutton D, Badley EM. Reexamining the arthritis-employment interface: perceptions of arthritis-work spillover among employed adults. Arthritis Rheum 2006;55(2):233-40.
13. de Jong Z, Munneke M, Zwinderman AH, Kroon HM, Jansen A, Ronday KH, van Schaardenburg D, Dijkmans BA, Van den Ende CH, Breedveld FC, Vliet Vlieland TP, Hazes JM. Is a long-term high-intensity exercise program effective and safe in patients with rheumatoid arthritis? Results of a randomized controlled trial. Arthritis Rheum 2003;48(9):2415-24.
14. Gaudin P, Leguen-Guegan S, Allenet B, Baillet A, Grange L, Juvin R. Is dynamic exercise beneficial in patients with rheumatoid arthritis? Joint Bone Spine 2008;75(1):11-7.
15. Keij I. Numbers of foreigners according to various definitions. Maandstatistiek van de bevolking 2000;48(5):14-7.
16. Hildebrandt VH, Bongers PM, van Dijk FJ, Kemper HC, Dul J. Dutch Musculoskeletal Questionnaire: description and basic qualities. Ergonomics 2001;44(12):1038-55.
17. Elders LA, Burdorf A. Interrelations of risk factors and low back pain in scaffolders. Occup Environ Med 2001;58(9):597-603.

18. Borg G. Psychophysical scaling with applications in physical work and the perception of exertion. Scand J Work Environ Health 1990;16 Suppl 1:55-8.

19. Karasek R, Baker D, Marxer F, Ahlbom A, Theorell T. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. Am J Public Health 1981;71(7):694-705.

20. IJzelenberg W, Molenaar D, Burdorf A. Different risk factors for musculoskeletal complaints and musculoskeletal sickness absence. Scand J Work Environ Health 2004;30(1):56-63.

21. Ware JE, Jr., Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;30(6):473-83.

22. Aaronson NK, Muller M, Cohen PD, Essink-Bot ML, Fekkes M, Sanderman R, Sprangers MA, te Velde A, Verrips E. Translation, validation, and norming of the Dutch language version of the SF-36 Health Survey in community and chronic disease populations. J Clin Epidemiol 1998;51(11):1055-68.

23. Halfens R. Een gezondheidsspecifieke beheersingsorientatieschaal- Validiteit en betrouwbaarheid van de MHLC. T Soc Gezondheidsz 1988;66:399-403.

24. Wallston KA, Wallston BS, DeVellis R. Development of the Multidimensional Health Locus of Control (MHLC) Scales. Health Educ Monogr 1978;6(2):160-70.

25. Evers AW, Kraaimaat FW, Geenen R, Jacobs JW, Bijlsma JW. Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. Behav Res Ther 2003;41(11):1295-310.

26. van Dam-Baggen R, Kraaimaat FW. De Inventarisatielijst Sociale Betrokkenheid (ISB): een zelfbeoordelingslijst om sociale steun te meten. Gedragstherapie 1992;25(1):27-46.

27. Geuskens GA, Hazes JMW, Barendregt PCM, Burdorf A. Work and sick leave among patients with early inflammatory joint conditions. Arthritis Rheum 2008;59(10):1458-66.

28. Zirkzee EJ, Sneep AC, de Buck PD, Allaart CF, Peeters AJ, Ronday HK, Westedt ML, le Cessie S, Vliet Vlieland TP. Sick leave and work disability in patients with early arthritis. Clin Rheumatol 2008;27(1):11-9.

29. Visser H, le Cessie S, Vos K, Breedveld FC, Hazes JM. How to diagnose rheumatoid arthritis early: a prediction model for persistent (erosive) arthritis. Arthritis Rheum 2002;46(2):357-65.

30. Hazes JM. Determinants of physical function in rheumatoid arthritis: association with the disease process. Rheumatology (Oxford) 2003;42 Suppl 2:ii17-21.

31. Kosinski M, Zhao SZ, Dedhiya S, Osterhaus JT, Ware JE, Jr. Determining minimally important changes in generic and disease-specific health-related quality of life questionnaires in clinical trials of rheumatoid arthritis. Arthritis Rheum 2000;43(7):1478-87.

32. Scott DL, Smith C, Kingsley G. Joint damage and disability in rheumatoid arthritis: an updated systematic review. Clin Exp Rheumatol 2003;21(5 Suppl 31):S20-7.

33. Covic T, Adamson B, Spencer D, Howe G. A biopsychosocial model of pain and depression in rheumatoid arthritis: a 12-month longitudinal study. Rheumatology (Oxford) 2003;42(11):1287-94.

34. Evers AW, Kraaimaat FW, van Lankveld W, Jongen PJ, Jacobs JW, Bijlsma JW. Beyond unfavorable thinking: the illness cognition questionnaire for chronic diseases. J Consult Clin Psychol 2001;69(6):1026-36.

35. Geuskens GA, Hazes JM, Barendregt PCM, Burdorf A. Predictors of sick leave and reduced productivity at work among persons with early inflammatory joint conditions. Scand J Work Environ Health 2008;34(6):420-29.

36. Sokka T, Pincus T. Markers for work disability in rheumatoid arthritis. J Rheumatol 2001;28(7):1718-22.

37. Verstappen SM, Bijlsma JW, Verkleij H, Buskens E, Blaauw AA, ter Borg EJ, Jacobs JW. Overview of work disability in rheumatoid arthritis patients as observed in cross-sectional and longitudinal surveys. Arthritis Rheum 2004;51(3):488-97.
38. Young A, Dixey J, Kulinskaya E, Cox N, Davies P, Devlin J, Emery P, Gough A, James D, Prouse P, Williams P, Winfield J. Which patients stop working because of rheumatoid arthritis? Results of five years' follow up in 732 patients from the Early RA Study (ERAS). Ann Rheum Dis 2002;61(4):335-40.

Chapter 7

General Discussion

1. Introduction

Workers with rheumatic diseases are at increased risk for a reduced performance at work[1-3] and work-relevant disability[4,5]. However, little is known on the performance at work in the early phase of inflammatory joint conditions. Besides, the relation between inflammatory joint conditions and work may be bi-directional[6], but the influence of working conditions on the prognosis of arthritis has rarely been studied. Therefore, the primary objectives of this thesis were:

1. To describe the influence of early inflammatory joint conditions, individual factors, and work-related factors on health and performance at work.
2. To determine the influence of work-related factors on the prognosis of early inflammatory joint conditions.

This chapter presents the main findings in the light of the objectives of this thesis, discusses methodological issues, and presents recommendations for clinical practice and future research.

2. Main findings

Objective 1. To describe the influence of early inflammatory joint conditions, individual factors, and work-related factors on health and performance at work.

A literature review on the consequences of rheumatoid arthritis (RA) showed that RA influenced the likelihood of having a paid job, and that restrictions in employment occurred already early in the course of RA. Two years after the diagnosis, disability benefits had increased up to 30% in some European cohorts (Chapter 2).

To gain more insight into perceived health in the early phase of inflammatory joint conditions, a cross-sectional study was performed within the Rotterdam Early Arthritis CoHort (REACH). Patients experienced a significant reduction in health-related quality of life (HRQOL), with notably pain, reduced physical functioning, and reduced role functioning due to physical problems. Clinical characteristics together only explained 4% to 9% of the variance in HRQOL dimensions, whereas demographic and psychosocial characteristics explained an additional 21% to 29% of HRQOL. Passive behavioural coping with pain strongly affected HRQOL (Chapter 3).

A second cross-sectional study presented that one out of four (26%) persons in paid employment had already experienced more than two weeks of sick leave in the past 6 months. Pain, poor physical functioning, and passive behavioural coping were associated with sick leave, whereas diagnosis or other clinical characteristics were not. Low job control was associated with a higher occurrence of sick leave, whereas being a supervisor and performing clerical work were related to a lower occurrence of sick leave (Chapter 4). The findings of this study were supported in the longitudinal study with 12 months of follow-up which found that sick leave for more than two weeks in a six month period was predicted by high levels of pain (OR 3.2), poor function (OR 4.4), and frequent manual materials handling (OR 2.0), whereas supervisors had a lower likelihood of sick leave (OR 0.2). Clinical characteristics as well as psychosocial factors did not contribute to the prediction of sick leave. A reduced productivity at work was predicted by intermediate levels of pain (OR 3.1), poor function (OR 2.8), poor mental health (OR 2.1), and low support from colleagues (OR 2.2), whereas workers classified as non-RA arthritis, in which arthritis was self-limiting in half of the persons (i.e. transient), were less likely to report a productivity loss (OR 0.4) (Chapter 5).

In conclusion, persons with early inflammatory joint conditions experienced notably pain and decreased physical functioning. Demographic and psychosocial characteristics were stronger associated with HRQOL than clinical characteristics reflecting the nature and severity of the underlying disease. Pain and physical functioning strongly influenced the performance at work. Moreover, pain and poor function seemed to be especially troublesome in jobs with high physical workload, low control over planning and organization of activities at work, and low support from colleagues.

Objective 2. To determine the influence of work-related factors on the prognosis of early inflammatory joint conditions.

The longitudinal study in Chapter 6 showed that workers with early inflammatory joint conditions had a good prognosis in swollen joints, pain, and physical functioning. Pain and function strongly improved during the first 6-month period, and improvement slowed down considerably in the second 6-month period. The proportion of workers with swollen joints decreased in a similar pattern from 58% via 20% to 7% after 12 months. Clinical and individual characteristics did not influence the recurrence of swollen joints after 6 months. Prognosis in pain and physical functioning was influenced by the level of inflammation (i.e. swollen joints and erythrocyte sedimentation rate), age, perceived health control, and social support. Job-related factors did not influence the prognosis of swollen joints and pain, whereas workers with frequent manual materials handling or high job demands improved about 50% less in physical functioning than those in less strenuous jobs (Chapter 6).

In conclusions, work-related factors did not influence the consequences of disease in the domain of Body Function and Structure of the International Classification of Functioning, Disability and Health (ICF)[7], i.e. pain and swollen joints. In contrast, job-related factors affected the improvement in the ICF domain of Activities, i.e. physical functioning.

Objective 1 and 2. The relation between work and health in early arthritis.

Pain and physical functioning strongly influenced sick leave and productivity loss at work (Chapter 5). When the relation between health and work was studied in the other direction, i.e. the influence of working conditions on prognosis, we found that a high physical workload and high job demands reduced the improvements in physical functioning (Chapter 6). Together, these finding suggests a causal pathway, in which work-related factors (partly) influence the performance at work via physical functioning.

In conclusion, pain and physical functioning influenced the performance at work, whereas working conditions influenced the prognosis in physical functioning.

3. Methodological issues

One of the strengths of the studies in this thesis is that all studies, except for the literature review, were performed in the same study population. This facilitates direct comparison across the studies, though small differences in the exact number of persons existed due to different outcome measures studied. However, for the interpretation of the findings, some methodological issues should be taken into account. Below, the internal and external validity of the studies described in Chapter 3 to 6 are discussed.

Internal validity

Internal validity refers to the extent to which results are valid for the study population itself; more specifically the extent to which the results might be distorted by systematic errors. In the following, selection bias and information bias will be discussed.

Selection bias

In Chapter 3 to 6, data of persons participating in an ongoing inception cohort study (REACH) were used. Selection bias may have occurred as a result of (1) care seeking of patients and selective referral of patients by physicians to this cohort study, (2) selective non-response, and (3) selective loss to follow-up.

Since the prevalence of early inflammatory joint conditions in the general population is unknown, little insight exists in selection processes among persons that seek care, and in referral of patients to REACH by physicians. We have no insight in the selection among patients. High levels of pain and poor physical functioning could very well prompt care seeking in an early phase of complaints. Therefore, in addition to clinical characteristics, demographic and psychosocial characteristics such as behavioural coping and perceived health control may have influenced which patients sought care (Chapter 3). This potential selection bias did probably not introduce systematic errors in our findings, but may limit the generalizability of our findings to those persons that visit primary care. Patients were included in REACH after notification by a physician, i.e. a general practitioner (GP) or a rheumatologist. No differences in HRQOL at baseline were found between persons that entered the study via GPs or rheumatologists (Chapter 3). Entering the study via GPs or rheumatologists could also not predict the performance at work (Chapter 5) or the prognosis in swollen joints, pain and function (Chapter 6). For both GPs and rheumatologists, selection on the basis of work characteristics seems unlikely. However, it is possible that physicians were more likely to notify patients for REACH if patients reported more serious complaints, or if physicians suspected a more severe underlying disease. Although the potential overrepresentation of these persons in our study population may have influenced the absolute levels of HRQOL and work limitations, it seems unlikely that this has strongly influenced the relative contribution of clinical, individual and work-related variables to health and performance at work.

Second, selective non-response to participation in REACH may have introduced bias. We do not know how many persons decided not to participate in REACH after their GP or rheumatologist presented them with information on the study. About 7.5% of the persons notified by GPs and rheumatologists were lost before actual inclusion in the study. After inclusion in REACH, 61 out of 420 patients (15%) were excluded from the present studies due to incomplete data (n=19) or as a result of the patient’s choice at entrance of the study to provide only limited medical data and/or questionnaires (n= 42). Insight in the characteristics of these patients is limited, but age and gender were not significantly different from the study population. Although the response of 85% after inclusion was considered to be satisfactory, selective non-response may have influenced our findings.

Third, the results of the longitudinal studies may have been biased by loss to follow-up. In both longitudinal studies, persons lost to follow-up after 12 months were younger (Chapter 5 & 6). In the study on predictors of the performance at work, they were also more frequently diagnosed with a less severe condition from a medical point of view (Chapter 5). It seems likely that especially those employed persons in whom complaints strongly improved, and/or treatment by a rheumatologist was no longer needed were less likely to participate in follow-up assessments. The fact that medical examinations were only possible in the hospital during regular working hours may also have hampered participation in this part of the data collection. However, no differences were found for pain, physical functioning, swollen joints, and sick leave at baseline between those participating and those lost to follow-up.

Information bias

Two important sources of information bias in our studies are (1) the self-report of all non-clinical risk factors and outcome measures, and (2) the occurrence of job adaptations due to joint complaints. Self-reports could have biased the results if there would have been systematic differences in answering of questions on risk factors by the outcome measure. For example, persons with poor physical functioning may have been more aware of their working conditions. As a consequence, they may have been more likely to report frequent manual materials handling, which could have resulted in differential misclassification and, hence, in a spurious association between manual materials handling and physical functioning. However, in the longitudinal studies, information bias at baseline will probably not have had a strong influence on the findings because prognostic factors were determined before the outcomes.

Job adaptations due to joint complaints may have introduced information bias. In the questionnaires, questions on working conditions referred to the usual exposure at work. However, job adaptations in working tasks, times and/or working environment were already described by 23% of the population at baseline, and new adaptations were described during follow-up. Regretfully, the extent in which job adaptations changed exposure to working conditions within the same job could not be assessed within the current studies. It could be hypothesized that due to job adaptations, which frequently involved a reduction in physical workload (Chapter 5), the impact of work-related factors on prognosis and the performance at work was underestimated.

External validity

The external validity refers to the generalizability of the study findings to persons outside of the study population, e.g. other workers with early inflammatory joint conditions.

In REACH, persons with a wide variety of different rheumatic diseases were included, and inclusion by physicians was based on joint complaints. As a consequence, it seems likely that the work-related factors were representative of workers with early inflammatory joint conditions that seek care in the general workforce, which supports the generalizability to other worker populations.

Work disability is known to be influenced by social benefit systems[8,9], but insight in the influence of social systems on the performance at work in persons with rheumatic diseases is limited. Boonen et al. (2002) showed that in patients with ankylosing spondilitis, episodes of sick leave occurred as frequent in The Netherlands as in Belgium and France. However, after adjustment for sociodemographic factors and disease activity, the total number of days on sick leave was higher in The Netherlands[8]. Differences in social systems may limit generalizability of the occurrence of sickness absence for more than two weeks to countries with eligibility criteria for sick leave compensation that differ from The Netherlands. Not withstanding these limitations, the risk factors we found for a reduced performance at work (Chapter 5) resembled risk factors of sick leave described in workers with other musculoskeletal diseases[10-15], and risk factors of work-relevant disability in RA patients after progression of the disease[16-19]. Some of these studies were performed in The Netherlands, whereas others were performed elsewhere. Hence, the generalizability of our findings on the relative contribution of clinical, individual and work-related factors to the performance at work to countries other than The Netherlands seems reasonable.

4. New insights

1. Self-reported pain and physical functioning play an important role in the performance at work among persons with early inflammatory joint conditions, whereas the influence of clinical characteristics seems limited.

Already in an early phase of inflammatory joint conditions, a substantial proportion of the workers experienced sick leave and productivity loss at work. Self-reported pain and function strongly influenced the performance at work (Chapter 4 & 5). Pain and functional limitations are important consequences of musculoskeletal disorders[20], and their impact on the performance at work has previously been described in other musculoskeletal diseases[10-12,15]. Besides, previous studies in RA patients found that pain and function predicted work-relevant disability after progression of the disease[17,18], and hence, the present studies add that pain and function already play an important role in an early phase of rheumatic diseases.

Persons included in REACH were diagnosed with a broad range of different rheumatic diseases, which varied in severity from a clinical point of view. Although clinical characteristics underlay pain and function, these factors only explained 9% of the variance in pain and function among persons at baseline, whereas demographic and psychosocial factors explained an additional 25% to 27% (Chapter 3). Clinical characteristics were not associated with sick leave at baseline (Chapter 4), and did not contribute to the prediction of sick leave during a 12-month follow-up period.

Since self-reported pain and function predicted the performance at work and the influence of clinical characteristics was limited, sickness absence and productivity loss at work did not differ between workers with RA and workers with inflammatory joint conditions without synovitis. Complaints were probably persistent in both groups, but the latter group of conditions is generally considered to be much less severe than RA, and adverse work-related consequences have less frequently been studied. However, these conditions (i.e. artralgias and/or myalgias with inflammatory characteristics, inflammatory joint complaints without specification, inflammatory osteoarthritis, etc.) may be more prevalent in the working population[3,21-23]. Therefore, the fact that these workers experienced substantial sick leave and productivity loss at work too is important in the light of public health and societal costs.

In conclusion, in the early phase of inflammatory joint conditions, pain and function strongly influenced the performance at work. This finding stresses the importance of pain control and prevention of functional limitations among all persons seeking care with early inflammatory joint conditions, irrespective of the severity of their underlying disease.

2. Work-related factors influence the performance at work in persons with early inflammatory joint conditions, and also may partly exert their influence by hampering prognosis in physical functioning.

Physically demanding work is a well-known risk factor of work-relevant disability in workers with RA[17,18]. In Chapter 6, it was presented that frequent manual materials handling at work and high job demands at study entrance predicted less improvement in physical functioning after 6 months. In another study, we found that poor physical functioning in turn strongly predicted sick leave and productivity loss at work (Chapter 5). Together, these findings suggest a causal pathway from job-related factors via function to a reduced performance at work. This pathway could partially explain why workers in physically demanding jobs are at increased risk of adverse work-related outcomes[17,18]. As a consequence, it seems important to evaluate physical workload in an early phase of rheumatic diseases, and to reduce physical workload by means of early job adaptations when needed.

In addition to physical workload, control over the planning and organization of activities at work influenced the performance at work (Chapter 4 and 5)[16,19]. Control over activities at work may be important to deal with the fluctuating nature of inflammatory joint conditions. A high control may allow avoiding strenuous working conditions during flares up of the complaints with temporarily increased pain and functional limitations[24]. Therefore, early job adaptations increasing a person's control over planning and pacing of activities at work may offer the flexibility needed to prevent adverse work-related outcomes[25,26].

5. Recommendations for clinical practice

1. To support the performance at work, physicians are strongly recommended to immediately provide treatment and interventions that reduce pain and improve physical functioning.

High levels of pain and poor physical functioning were important determinants of both sick leave and productivity loss at work in the early phase of inflammatory joint conditions. Their influence was independent of whether the underlying disease was considered to be serious (RA) or less serious from a medical point of view (inflammatory joint conditions without clinical synovitis) (Chapter 4 & 5). Therefore, it seems crucial for performance at work that physicians avoid wait and see strategies in all patients.

2. Physicians are advised to take psychosocial characteristics into account in the assessment of pain and function in persons with early inflammatory joint conditions.
HRQOL of persons with early inflammatory joint conditions was stronger associated with psychosocial characteristics than with clinical characteristics (Chapter 3). Psychosocial factors, i.e. perceived health control and social support, also strongly influenced prognosis in pain and physical functioning in the first 6 months after seeking care (Chapter 6). Therefore, physicians should take into account that, in addition to clinical characteristics, the valuation of health is strongly influenced by psychosocial factors in an early phase of disease.

3. Physicians are recommended to advise patients to adjust their physical workload if prognosis in function develops less well than expected.
Among workers with early inflammatory joint conditions, physical functioning strongly improved during the first six months after seeking care. However, these improvements were reduced in workers with high physical workload and high job demands (Chapter 6). Physical workload may be amendable to change as a part of work-related interventions, and hence, physicians could advise patients to reduce their physical workload if physical functioning improves less that expected. In the Dutch health care this implies that treating physicians should actively seek collaboration with occupational physicians.

6. Recommendations for future research

1. The influence of job-related characteristics on prognosis in persons with early inflammatory joint conditions should be corroborated.
Chapter 6 presented the first prospective study on the influence of job-related factors on the prognosis in persons with a rheumatic condition. It is important that future research replicates our findings in different and larger populations. It is advised to investigate whether the influence of job characteristics on the prognosis in function extends beyond the early phase of inflammatory joint conditions.

2. It is of interest to study the influence of early inflammatory joint conditions on specific patterns in sick leave and productivity loss at work.
In Chapter 4 and 5, it was shown that sick leave for more than two weeks in the past six months and productivity loss on the last working day frequently occurred in the early phase of inflammatory joint conditions. It is advised that future studies go beyond the

occurrence of these events, and identify and explain patterns, such as the moment in time sick leave or productivity loss at work occurs, the frequency of recurrence, and the length of each episode. Besides, the interrelation between patterns in sick leave and productivity loss at work, and their relation with future work loss should be addressed.

3. It is recommended to evaluate the effects of job adaptations in working tasks and hours and environment on work performance among persons with early inflammatory joint conditions.
At least one job adaptation in working tasks and hours or environment was described by 39% of the persons with early inflammatory joint conditions (Chapter 5). In future research, it is advised to study the positive and negative influence of these job adaptations on health and the performance at work, and their permanence. Also, future research should address the influence of job adaptations on the relation between work-related risk factors and the performance at work.

4. "Early adapters" that change job due to joint conditions should be studied.
A few workers described a change in profession due to inflammatory joint conditions within the first 12 months of follow-up (Chapter 5). Changing to less strenuous jobs has been described as a helpful strategy to remain in paid employment by RA patients with longstanding disease[26]. However, little is known on the job changes that "early adapters" make, on the barriers and facilitators, on the positive and negative consequences of these changes, and whether these persons could serve as a model for other workers. Since the first years of inflammatory joint conditions may be crucial for the maintenance of paid employment, long-term studies of those "early adapters" are needed.

5. In order to determine trends in health over time in persons with early inflammatory joint conditions, it is advised to measure health-related outcomes every 3 to 6 months.
In Chapter 6 it was shown that pain and physical functioning strongly improved during the first 6 months of follow-up, whereas the improvements slowed down considerably in the second 6-month period. The proportion of workers with swollen joints decreased in a similar pattern. Since changes in health do not seem to follow a linear course over time in persons with early inflammatory joint conditions, it is recommended to measure clinical characteristics and self-reported health every 3 to 6 months in studies on trends in health.

References

1. Burton WN, Chen CY, Schultz AB, Conti DJ, Pransky G, Edington DW. Worker productivity loss associated with arthritis. Dis Manag 2006;9(3):131-43.
2. Dadoniene J, Stropuviene S, Venalis A, Boonen A. High work disability rate among rheumatoid arthritis patients in Lithuania. Arthritis Rheum 2004;51(3):433-9.
3. Muchmore L, Lynch WD, Gardner HH, Williamson T, Burke T. Prevalence of arthritis and associated joint disorders in an employed population and the associated healthcare, sick leave, disability, and workers' compensation benefits cost and productivity loss of employers. J Occup Environ Med 2003;45(4):369-78.
4. Geuskens GA, Burdorf A, Hazes JM. Consequences of rheumatoid arthritis for performance of social roles- a literature review. J Rheumatol 2007;34(6):1248-60.
5. Lacaille D, Hogg RS. The effect of arthritis on working life expectancy. J Rheumatol 2001;28(10):2315-9.
6. Allaire S, Wolfe F, Niu J, Baker N, Michaud K, LaValley M. Extent of occupational hand use among persons with rheumatoid arthritis. Arthritis Rheum 2006;55(2):294-9.
7. WHO. International Classification of Functioning, Disability and Health: ICF. Geneva: World Health Organization, 2001.
8. Boonen A, van der Heijde D, Landewe R, Spoorenberg A, Schouten H, Rutten-van Molken M, Guillemin F, Dougados M, Mielants H, de Vlam K, van der Tempel H, van der Linden S. Work status and productivity costs due to ankylosing spondylitis: comparison of three European countries. Ann Rheum Dis 2002;61(5):429-37.
9. Chung CP, Sokka T, Arbogast PG, Pincus T. Work disability in early rheumatoid arthritis: higher rates but better clinical status in Finland compared with the US. Ann Rheum Dis 2006;65(12):1653-7.
10. Bergstrom G, Bodin L, Bertilsson H, Jensen IB. Risk factors for new episodes of sick leave due to neck or back pain in a working population. A prospective study with an 18-month and a three-year follow-up. Occup Environ Med 2007;64(4):279-87.
11. Coste J, Delecoeuillerie G, Cohen de Lara A, Le Parc JM, Paolaggi JB. Clinical course and prognostic factors in acute low back pain: an inception cohort study in primary care practice. Bmj 1994;308(6928):577-80.
12. Elders LA, Heinrich J, Burdorf A. Risk factors for sickness absence because of low back pain among scaffolders: a 3-year follow-up study. Spine 2003;28(12):1340-6.
13. Hoogendoorn WE, Bongers PM, de Vet HC, Ariens GA, van Mechelen W, Bouter LM. High physical work load and low job satisfaction increase the risk of sickness absence due to low back pain: results of a prospective cohort study. Occup Environ Med 2002;59(5):323-8.
14. IJzelenberg W, Burdorf A. Risk factors for musculoskeletal symptoms and ensuing health care use and sick leave. Spine 2005;30(13):1550-6.
15. Kuijpers T, van der Windt DA, van der Heijden GJ, Twisk JW, Vergouwe Y, Bouter LM. A prediction rule for shoulder pain related sick leave: a prospective cohort study. BMC Musculoskelet Disord 2006;7:97.
16. Reisine ST, Grady KE, Goodenow C, Fifield J. Work disability among women with rheumatoid arthritis. The relative importance of disease, social, work, and family factors. Arthritis Rheum 1989;32(5):538-43.
17. Sokka T, Pincus T. Markers for work disability in rheumatoid arthritis. J Rheumatol 2001;28(7):1718-22.

18. Verstappen SM, Bijlsma JW, Verkleij H, Buskens E, Blaauw AA, ter Borg EJ, Jacobs JW. Overview of work disability in rheumatoid arthritis patients as observed in cross-sectional and longitudinal surveys. Arthritis Rheum 2004;51(3):488-97.

19. Yelin E, Meenan R, Nevitt M, Epstein W. Work disability in rheumatoid arthritis: effects of disease, social, and work factors. Ann Intern Med 1980;93(4):551-6.

20. Picavet HS, Hoeymans N. Health related quality of life in multiple musculoskeletal diseases: SF-36 and EQ-5D in the DMC3 study. Ann Rheum Dis 2004;63(6):723-9.

21. Jacobsson L, Lindgarde F, Manthorpe R. The commonest rheumatic complaints of over six weeks' duration in a twelve-month period in a defined Swedish population. Prevalences and relationships. Scand J Rheumatol 1989;18(6):353-60.

22. Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, Gabriel S, Hirsch R, Hochberg MC, Hunder GG, Jordan JM, Katz JN, Kremers HM, Wolfe F, National Arthritis Data W. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. Arthritis Rheum 2008;58(1):26-35.

23. Silman AJ, Hochberg MC. Epidemiology of rheumatic diseases second edition. Oxford: Oxford University Press, 2001.

24. Detaille SI, Haafkens JA, van Dijk FJ. What employees with rheumatoid arthritis, diabetes mellitus and hearing loss need to cope at work. Scand J Work Environ Health 2003;29(2):134-42.

25. Lacaille D, White MA, Backman CL, Gignac MA. Problems faced at work due to inflammatory arthritis: new insights gained from understanding patients' perspective. Arthritis Rheum 2007;57(7):1269-79.

26. Mancuso CA, Paget SA, Charlson ME. Adaptations made by rheumatoid arthritis patients to continue working: a pilot study of workplace challenges and successful adaptations. Arthritis Care Res 2000;13(2):89-99.

Summary

Summary

This thesis aimed to contribute to the understanding of the relation between work and health in persons with early inflammatory joint conditions (**Chapter 1**). The primary objectives were (1) to describe the influence of early inflammatory joint conditions, individual factors, and work-related factors on health and performance at work, and (2) to determine the influence of work-related factors on the prognosis of early inflammatory joint conditions. The first objective was addressed in Chapter 2 to 5, and the second objective in Chapter 6.

Chapter 2 presents a literature review, which aimed to obtain quantitative estimates of restrictions in participation, i.e. the performance of social roles, in persons with rheumatoid arthritis (RA). Almost all studies included in the review examined paid employment or recreation and leisure as core elements of participation. RA patients had an increased risk of being without a paid job compared to well-adjusted reference groups (absolute difference 4% to 28%). Restrictions in employment occurred already early in the course of RA, and varied greatly among studies. Two years after diagnosis, disability benefits increased up to approximately 30% in some European cohorts. Most studies on recreation and leisure investigated socializing. RA patients experienced a decreased socializing compared to reference groups, but changes over time were minor. Our findings strongly supported that if consequences of RA are studied in the ICF domain of participation, work participation and socializing are among the first outcomes of choice.

In **Chapter 3,** the first of four studies performed within the Rotterdam Early Arthritis CoHort (REACH) was presented. This cross-sectional study aimed to gain insight in perceived health in an early phase of inflammatory joint conditions, and examined demographic and psychosocial characteristics associated with health-related quality of life (HRQoL). In total, 359 patients were included, of which 24% were classified as RA, 34% as arthritis (non-RA), and 42% as inflammatory joint conditions without clinical synovitis. Among all patients, the health dimensions physical functioning, role functioning due to physical problems, and bodily pain were most affected. Clinical characteristics explained 4%-9% of the variance in HRQoL dimensions, whereas the combined demographic and psychosocial factors explained an additional 21%-29% of HRQoL. HRQoL was negatively associated with younger age, lower education, non-Dutch origin, passive behavioural coping with pain, lower perceived health control, and low social support. It was concluded that among persons with early inflammatory joint conditions, HRQoL was stronger associated with individual characteristics than with clinical characteristics.

Chapter 4 described a cross-sectional study on the occurrence of sick leave and work characteristics related to sick leave. In total, 210 of the 359 persons with early inflammatory joint conditions had paid employment. Sick leave for more than 2 weeks in the past 6 months was reported by 54 (26%) of the 210 workers. Pain, poor physical functioning, and passive behavioural coping were associated with an increased occurrence of sick leave, but clinical characteristics were not associated. Low job control, i.e. low control over planning and pacing of activities at work, was associated with an increased occurrence of sick leave, whereas being a supervisor and performing clerical work were related to a reduced occurrence of sick leave. The findings of this cross-sectional study were supported in the prospective study with 12 months of follow-up described in **Chapter 5**. The aim of this longitudinal study was to identify predictors of sick leave and reduced productivity at work. Sick leave was predicted by high levels of pain, poor function, and frequent manual materials handling, whereas supervisors had a lower likelihood of sick leave. Predictors of reduced productivity at work were intermediate levels of pain, poor function, poor mental health, and low support from colleagues, whereas workers classified as arthritis (non-RA), in which arthritis was frequently transient (self-limiting), were less likely to report a reduced productivity at work. It was concluded that self-reported pain and function strongly influenced the performance at work in an early phase of inflammatory joint conditions. Pain and reduced function seemed especially troublesome in jobs involving frequent manual materials handling, low control over the planning and organization of activities at work, and low support from colleagues.

Chapter 6 examined the influence of job characteristics on the prognosis in swollen joints, pain, and physical functioning. Pain and physical functioning strongly improved during the first 6-months of follow-up (respectively 40% and 14%), and improvement slowed down considerably in the second 6-month period. The proportion of workers with swollen joints decreased in a similar pattern from 58% via 20% to 7% after 12 months. The good prognosis in pain and function was hampered by persistent high levels of inflammation, older age, low perceived health control, and low social support. Job characteristics had no influence on the prognosis in swollen joints and pain, whereas workers with frequent manual materials handling or high job demands improved approximately 50% less in physical functioning. It was concluded that job characteristics had no influence on swollen joints and pain (ICF domain Body function and structure), but strongly affected the consequences of disease in physical functioning (ICF domain Activities).

Chapter 7, the General Discussion, started with presenting the main findings in the light of the study objectives, followed by methodological limitations that should be acknowledged when interpreting the findings. New insights in the role of self-reported pain and physical functioning for the performance at work, and the influence of work-related characteristics, were described. Finally, recommendations for clinical practice and future research were presented.

Samenvatting

Samenvatting

In dit proefschrift onderzoeken wij de relatie tussen gezondheid en werk bij personen met vroege inflammatoire gewrichtsklachten (**Hoofdstuk 1**). De volgende doelstellingen staan centraal in dit proefschrift: (1) het beschrijven van de invloed van vroege inflammatoire gewrichtsklachten, individuele factoren, en werkgerelateerde factoren op gezondheid en functioneren op het werk, en (2) het bepalen van de invloed van werkgerelateerde factoren op de prognose van vroege inflammatoire gewrichtsklachten. De eerste doelstelling wordt onderzocht in Hoofdstuk 2 tot en met 5, en de tweede doelstelling in Hoofdstuk 6.

In **Hoofdstuk 2** wordt een literatuurstudie over participatie (functioneren in sociale rollen) van patiënten met reumatoïde artritis (RA) beschreven. Het doel was om een kwantitatieve schatting te geven van de beperkingen in participatie. Bijna alle studies die in dit literatuuronderzoek werden geïncludeerd beschreven participatie in betaald werk of in recreatie en vrije tijd. RA patiënten hadden vaker geen betaald werk dan vergelijkbare referentie groepen (absolute verschil 4% tot 28%). Beperkingen in arbeidsparticipatie ontstonden al in een vroege fase van de ziekte en varieerden sterk tussen de studies. In sommige Europese studies had bijna 30% van de RA patiënten 2 jaar na de diagnose een arbeidsongeschiktheidsuitkering. De meeste studies over participatie in recreatie en vrije tijd handelden over sociaal functioneren. RA patiënten rapporteerden minder goede scores voor sociaal functioneren dan referentie groepen, maar veranderingen in sociaal functioneren over de tijd waren klein. De resultaten van deze literatuurstudie geven aan dat arbeidsparticipatie en sociaal functioneren zeer belangrijke uitkomstmaten zijn wanneer de gevolgen van RA in het ICF domein participatie worden onderzocht.

Hoofdstuk 3 presenteert de eerste van vier studies die zijn uitgevoerd binnen het Rotterdam Early Arthritis CoHort (REACH). In deze eerste cross-sectionele studie stond de ervaren gezondheid van personen met vroege inflammatoire gewrichtsklachten centraal. Wij onderzochten welke demografische en psychosociale factoren geassocieerd waren met de kwaliteit van leven. In totaal zijn 359 personen in de studie geïncludeerd, waarvan 24% geclassificeerd werd als RA, 34% als artritis, geen RA, en 42% als inflammatoire gewrichtsklachten zonder klinische synovitis. De kwaliteit van leven was voornamelijk verminderd op het gebied van fysiek functioneren, rol functioneren door fysieke beperkingen en pijn. Klinische kenmerken verklaarden 4% tot 9% van de variantie in de verschillende dimensies van kwaliteit van leven, terwijl demografische en psychosociale factoren additioneel 21% tot 29% verklaarden. De kwaliteit van leven was negatief geassocieerd met lagere leeftijd, lager opleidingsniveau, niet-Nederlandse afkomst, passieve coping met pijn, minder ervaren controle over eigen gezondheid, en weinig sociale steun. De conclusie van deze studie luidde dat de kwaliteit van leven van personen met vroege inflammatoire gewrichtsklachten sterker samenhangt met individuele factoren dan met klinische kenmerken.

Hoofdstuk 4 beschrijft een cross-sectionele studie over het voorkomen van verzuim en de werkgerelateerde factoren die met verzuim zijn geassocieerd. Van de 359 personen met inflammatoire gewrichtsklachten hadden 210 personen betaald werk. In totaal rapporteerden 54 (26%) van deze 210 personen meer dan 2 weken verzuim in de afgelopen 6 maanden. Pijn, slecht fysiek functioneren en passieve coping waren geassocieerd met het melden van verzuim, maar klinische kenmerken niet. Weinig regelmogelijkheden op het werk, dat wil zeggen weinig controle over de planning en uitvoering van activiteiten op het werk, was geassocieerd met verzuim, terwijl leidinggevenden en personen met kantoorwerk juist minder verzuimden. De resultaten van deze cross-sectionele studie werden bevestigd in de prospectieve studie met 12 maanden follow-up, die is beschreven in **Hoofdstuk 5**. Het doel van deze prospectieve studie was het identificeren van voorspellers van verzuim en een verminderde productiviteit tijdens het werk. Voorspellers van verzuim waren veel pijn, slecht fysiek functioneren en regelmatig handmatig tillen tijdens het werk, terwijl leiding geven voorspellend was voor minder verzuim. Een verminderde productiviteit tijdens het werk werd voorspeld door een gemiddelde pijn score, slecht fysiek functioneren, een slechte mentale gezondheid, en weinig steun van collega's. Personen geclassificeerd als 'artritis, geen RA' hadden vaak een 'self-limiting' (voorbijgaande) artritis en ervaarden minder vaak een verminderde productiviteit. Op basis van deze resultaten concludeerden wij dat pijn en fysiek functioneren een grote invloed hadden op het functioneren op het werk van personen met vroege inflammatoire gewrichtsklachten. Pijn en slecht fysiek functioneren leken in het bijzonder beperkende factoren bij personen die regelmatig handmatig tilden, weinig controle hadden op de planning en organisatie van activiteiten op het werk en een weinig steun van collega's ervaarden.

In **Hoofdstuk 6** wordt de invloed van werkgerelateerde factoren op de prognose van gezwollen gewrichten, pijn, en het fysiek functioneren onderzocht. Pijn en fysiek functioneren verbeterden sterk tijdens de eerste 6 maanden follow-up (respectievelijk 40% en 14%). Deze verbetering nam aanzienlijk af tijdens de tweede periode van 6 maanden. Het percentage personen met een gezwollen gewricht nam in een vergelijkbaar patroon af van 58% bij aanvang van de studie tot 20% na 6 maanden tot 7% na 12 maanden. Een minder goede prognose van pijn en fysiek functioneren werd gevonden bij personen met blijvend hoge klinische ontstekingsparameters, een hogere leeftijd, minder ervaren controle over eigen gezondheid, en weinig sociale steun. Werkgerelateerde factoren hadden geen invloed op de prognose van gezwollen gewrichten en pijn, terwijl personen die regelmatig handmatig tilden of hoge taakeisen hadden ongeveer 50% minder verbeterden in fysiek functioneren. Op basis van deze resultaten werd geconcludeerd dat werkgerelateerde factoren geen invloed hadden op gezwollen gewrichten en pijn

(ICF domein functies en anatomische eigenschappen), maar de gevolgen van inflammatoire gewrichtsklachten op het gebied van fysiek functioneren sterk beïnvloedden (ICF domein activiteiten).

Hoofdstuk 7, de algemene discussie, begint met het presenteren van de belangrijkste bevindingen in het licht van de onderzoeksvragen, gevolgd door methodologische beperkingen die van belang zijn bij de interpretatie van de bevindingen. Nieuwe inzichten in de rol van pijn en fysiek functioneren voor het functioneren op het werk en de invloed van werkgerelateerde factoren worden beschreven. Hoofdstuk 7 eindigt met aanbevelingen voor de klinische praktijk en toekomstig onderzoek.

Dankwoord

Dankwoord

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Goedele

About the author

Curriculum vitae

Goedele An Geuskens was born on March 31st 1980, in Leuven, Belgium. She grew up in Rotterdam, The Netherlands, where she obtained her secondary school education at the Erasmiaans Gymnasium Rotterdam. Thereafter, she started studying at the Faculty of Human Movement Sciences of the VU University Amsterdam. In 2003 she completed a Master of Science in Human Movement Sciences with a major in 'Human movement in the context of health care'. In April 2004 she was employed as a PhD-student at the Department of Rheumatology and the Department of Public Health of the Erasmus MC in Rotterdam, where she carried out the research presented in this thesis. During this period, she obtained a Master of Science in Epidemiology at the Netherlands Institute for Health Sciences (Nihes). Goedele is currently employed as a researcher by TNO Quality of Life|Work and Employment in Hoofddorp.

Goedele An Geuskens werd geboren op 31 maart 1980 in Leuven, Belgie. Ze groeide op in Rotterdam, waar zij in 1998 eindexamen deed aan het Erasmiaans Gymnasium Rotterdam. Daarna startte zij met de studie Bewegingswetenschappen aan de Vrije Universiteit Amsterdam. In 2003 behaalde zij haar doctoraal Bewegingswetenschappen, met als afstudeerrichting 'Bewegen in de context van gezondheidszorg'. Vanaf april 2004 was zij als promovendus verbonden aan de afdeling Reumatologie en de afdeling Maatschappelijke Gezondheidszorg van het Erasmus MC in Rotterdam, en voerde het promotieonderzoek uit dat resulteerde in dit proefschrift. Tijdens dit onderzoek behaalde zij haar Master of Science in Epidemiologie aan het Netherlands Institute for Health Sciences (Nihes). Sinds mei 2008 is Goedele werkzaam als onderzoeker bij TNO Kwaliteit van Leven|Arbeid te Hoofddorp.

Publications

- Geuskens GA, Hazes JM, Barendregt PJ, Burdorf A. Predictors of sick leave and reduced productivity at work among persons with early inflammatory joint conditions. Scand J Work Environ Health 2008;34(6):420-9.

- Geuskens GA, Hazes JM, Barendregt PJ, Burdorf A. Work and sick leave among patients with early inflammatory joint conditions. Arthritis Rheum 2008;59(10):1458-66.

- Geuskens GA, Burdorf A, Evers AW, Hazes JM. Clear associations between demographic and psychosocial factors and health-related quality of life in patients with early inflammatory joint complaints. J Rheumatol 2008;35(9):1754-61.

- Geuskens GA, Burdorf A, Hazes JM. Consequences of rheumatoid arthritis for performance of social roles- a literature review. J Rheumatol 2007;34(6):1248-60.

- Hazes JM, Geuskens GA, Burdorf A. Work limitations in the outcome assessment of rheumatoid arthritis (editorial). J Rheumatol 2005; 32(6):980-2.

ERASMUS UNIVERSITEIT ROTTERDAM

PhD Portfolio Summary

Summary of PhD training and teaching activities

Name PhD student: Goedele An Geuskens **Erasmus MC Department:** Rheumatology (50%), Public Health (50%) **Research School:** Netherlands institute for health Sciences (Nihes)	**PhD period:** April 2004-March 2008 **Promotor:** J.M.W. Hazes, MD, PhD **Supervisor:** A. Burdorf, PhD

1. PhD training	
	Year
General academic skills& Research skills Master of Science in Epidemiology, Netherlands institute for health Sciences (Nihes), Rotterdam, The Netherlands	2004-2007
Presentations	
National conferences	
Najaarsdagen Nederlandse Vereniging Reumatologie, Veldhoven: poster presentation	2005
Najaarsdagen Nederlandse Vereniging Reumatologie, Veldhoven: oral presentation	2006
International conferences	
EULAR Congress (Vienna, Austria): poster presentation	2005
EULAR Congress (Barcelona, Spain): oral presentation	2007
ACR/ARHP annual scientific meeting (Boston, USA): poster presentations	2007
EULAR Congress (Paris, France): oral presentation	2008

2. Teaching activities
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