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Original article

Productivity loss due to absenteeism and presenteeism by different instruments in patients with RA and subjects without RA

Louise M. A. Braakman-Jansen[1], Erik Taal[1], Ina H. Kuper[2] and Mart A. F. J. van de Laar[1,2]

Abstract

Objectives. To explore the impact of at-work productivity loss on the total productivity cost by different instruments in patients recently diagnosed with RA and controls without RA.

Methods. Cross-sectional data were collected from outpatients with RA between December 2007 and February 2008. The control group was formed by subjects without RA matched on age and gender. Absenteeism and presenteeism were estimated by the Quantity and Quality (QQ) Questionnaire, Work Productivity and Activity Impairment Questionnaire General Health V2.0 (WPAI-GH) and Health and Labor Questionnaire (HLQ) questionnaires. Differences between groups were tested by Mann–Whitney U-test. Costs were valued by the human capital approach.

Results. Data were available from 62 patients with a paid job and 61 controls. QQ- and WPAI-GH scores of presenteeism were moderately correlated ($r = 0.61$) while the HLQ presenteeism score correlated poorly with the other instruments ($r = 0.34$). The contribution of presenteeism on total productivity costs was estimated at ~70% in the RA group. The mean costs per person per week due to presenteeism varied between €79 and €318 per week in the RA group, dependent on the instrument used. The costs due to presenteeism were about two to four times higher in the RA group compared with the control group.

Conclusion. This study indicates that the impact of presenteeism on the total productivity costs in patients with RA is high. However, work productivity in individuals without RA was not optimal either, which implies a risk of overestimation of cost when a normal score is not taken into account. Finally, different presenteeism instruments lead to different results.

Key words: work productivity, absenteeism, presenteeism, rheumatoid arthritis.

CLINICAL SCIENCE

Introduction

Rheumatic diseases are prevalent conditions associated with severe impairments and high societal costs, as it is a leading cause of work disability and lost work productivity [1]. Several authors [2–5] suggest that the cost of lost productivity may be several times greater than the direct medical costs.

The effect of diseases on productivity loss is usually reported as time off work due to disability or time missed from work due to health reasons (absenteeism). In recent years, there has been increasing attention given to the reduced productivity while at work (presenteeism). From a health economic perspective, the impact of presenteeism on the macro cost could be huge, and presenteeism may account for a larger proportion of losses than absenteeism [5]. According to Goetzel *et al*. [2], 35% of the total expenditure in the USA for arthritis was attributable to presenteeism.

However, caution is advised, as the exact measurement and valuation of productivity costs due to presenteeism is not yet standardized. Several studies have

[1]Arthritis Centre Twente, Faculty of Behavioural Sciences, Department of Psychology, Health and Technology, University of Twente and [2]Department of Rheumatology and Clinical Immunology, Medisch Spectrum Twente, Enschede, The Netherlands.

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Correspondence to: Louise M. A. Braakman-Jansen, Arthritis Centre Twente, Faculty of Behavioural Sciences, Department of Psychology, Health and Technology, University of Twente, PO Box 217, 7500 AE Enschede, The Netherlands. E-mail: l.m.a.braakman@utwente.nl

reviewed productivity loss instruments [1, 3, 6–10] and concluded that there is no gold standard for either absenteeism or presenteeism.

In the review of Prasad *et al*. [7], presenteeism was defined as 'health-related impairment in productivity while at work' or 'reduced productivity while at work', while in the review of Burton *et al*. [10], presenteeism was defined as 'time lost because of a diminished capacity while at work'. The review of Escorpizo *et al*. [1] revealed 16 measures that quantify presenteeism in several different terms: degree/percentage of impairment, frequency of impaired work, overall work performance, self *vs* others' performance, quality and quantity, efficiency/percentage being effective, effect on well-being, degree of agreement with work limitations, level of difficulty, number of difficulties, time missed due to delays in starting work and number of hours. Nine of the 16 scales could be used in economic costing analyses. These cost-applicable measures tended to quantify presenteeism as the amount of time having difficulty rather than a level or degree of difficulty. The typical study usually values reduced productivity by multiplying the estimated reduced hours equivalent by the hourly wage rate to get an estimate of the cost of impaired presenteeism and absenteeism [11].

However, the assumption that time loss is the equivalent of productivity loss has a limited value. From a managerial view [11], the true economic productivity loss due to illness is dependent on the job type, team production, availability of perfect substitutes for absent or impaired workers and time-sensitivity of output. However, these job characteristics are not included within the current instruments. Furthermore, an important shortcoming of the current instruments is that no norm scores exist. When measuring reduced productivity at work, it is helpful to know the normal productivity at work of healthy individuals. Otherwise, there is a risk for overestimation of costs due to presenteeism in patients with arthritis. Once the normal presenteeism score in individuals without RA is known, the score in patients can be corrected. Therefore the main objective of this study is to explore the impact of presenteeism on productivity loss by different instruments and to estimate the costs due to productivity loss at work in patients with RA and controls without RA.

Methods

Population and design

Cross-sectional data were collected from outpatients with RA who participated in the remission induction cohort of the Dutch Rheumatoid Arthritis Monitoring (DREAM) collaboration. Since January 2006, consecutive patients with the diagnosis of RA according to the 1987 revised ACR criteria [12] and complaints <3 months in four hospitals in The Netherlands are included in this cohort. A step-up medication protocol was used in the treatment in order to reach remission.

From November 2007 to February 2008, members of the remission induction cohort who visited their rheumatologist in one of the four outpatient clinics were asked to participate in this study. Persons with difficulty comprehending the Dutch language and persons <18 years of age were excluded.

The control group was formed by subjects without RA matched on age and sex. The control group was selected by asking participating patients to recruit two acquaintances without RA of the same sex and about the same age as the patient. Acquaintances willing to participate received an envelope from the patient including the questionnaire and a cover letter. Patients and controls were requested to return the completed questionnaires within 2 weeks. Participation was voluntary and without payment. Informed consent was obtained. According to the Dutch Medical Research Involving Human Subjects Act (WMO), the study did not need approval of the ethical review board; only (non-intervention) studies with a high burden for patients have to be reviewed. Patients underwent no intervention or treatment and the psychological integrity of the patients was not encroached.

Work productivity outcome measures

As there is no gold standard to measure productivity loss as yet, we applied different measures of work productivity: Productivity and Disease Questionnaire (PRODISQ); Work Productivity and Activity Impairment Questionnaire General Health V2.0 (WPAI-GH); and Health and Labor Questionnaire (HLQ).

PRODISQ

The following modules of the PRODISQ [13] were used: (i) profession, working situation and income; (ii) absence from work during the last 3 months; (iii) compensating mechanisms in case of absence for paid work; and (iv) reduced productivity at work (presenteeism). Absence from work is measured by asking the number of working days the person was absent from work over the last 3 months.

Absenteeism costs were calculated by using the human capital approach. The number of hours missed over the last 3 months was calculated by multiplying the number of missed days by the number of hours work per day. Absenteeism costs were calculated by multiplying the number of missed workdays in the last 3 months by (mean number of hours work per day $\times$ average Dutch wage rate per day). The average Dutch wage rate per hour was based on the calculation of Oostenbrink *et al*. [14] and converted to 2008 by the general price index rate and was estimated at €37.69. Subsequently these costs were translated to costs per week by dividing the outcome by 13 weeks.

Presenteeism was measured within PRODISQ by the Quantity and Quality Questionnaire (QQ) [15]. The QQ measures the quantity (Q1) and quality of the work (Q2) performed on the last working day, which is reported on an 11-point numerical rating scale with 0 representing nothing and very poor quality and 10 representing normal quantity and normal quality. Furthermore, respondents could fill in whether problems were due to RA, other health problems or due to technical problems.

Only the problems due to RA or other health problems were included in the analyses.

The percentage productivity loss while at work is calculated by the formula $100\% - (Q1 \times Q2)$. The QQ score was extrapolated to costs per week by the formula [(QQ-score/100%) × number of hours work per week] × €37.69. Total costs were calculated by adding absenteeism and presenteeism costs.

Within PRODISQ, questions on work autonomy and skill discretion were measured by five items that assess whether the respondent is learning new things and whether the respondent has autonomy in executing tasks and solving problems (e.g. Can you plan your work by yourself? Do you learn new things at your work?). A four-point scale was used ranging from 1 (never) to 4 (always). The total sum score was calculated and averaged on a scale from 1 (poor skill discretion) to 4 (good skill discretion). The internal consistency was acceptable (Cronbach's $\alpha = 0.74$).

WPAI-GH

The WPAI-GH [16] outcomes are expressed as impairment percentages, with higher numbers indicating greater impairment and less productivity, i.e. worse outcomes. The WPAIGH contains the following six questions with a recall period of the last week: Q1 = currently employed; Q2 = hours missed due to health problems; Q3 = hours missed due to other reasons; Q4 = hours actually worked; Q5 = degree health affected productivity while working; and Q6 = degree health affected regular activities.

Absenteeism is defined as the percentage of time absent from work due to health of the last week and is calculated by the formula $Q2/(Q2 + Q4) \times 100\%$. Absenteeism costs were calculated by multiplying this percentage score × €37.69. Presenteeism is measured by the degree health problems affected work productivity of the last 7 days on a rating scale ranging from 0 to 10, with 0 indicating that health problems had no effect on my work and 10 indicating that health problems completely prevented me from working. The outcome is expressed as a percentage score representing the impairment due to health reasons while working, with higher numbers indicating greater impairment and less productivity, and was calculated by the formula (Q5/10) ×100%. The costs of productivity loss due to presenteeism were calculated by the formula (WPAI-GH presenteeism score/100%) × number of hours actually worked per week) × €37.69. Total costs were calculated by adding absenteeism and presenteeism costs.

HLQ

The HLQ measures presenteeism by first asking the respondents whether their health had affected their work during the last 2 weeks. If the answer was positive, they were asked how many extra hours individuals would have to work to catch up on tasks they were unable to complete in normal working hours due to health problems in the last 2 weeks [17]. A score of zero was given to respondents who indicated that their health had not affected their work during the last 2 weeks. The costs of productivity loss due to presenteeism per week were calculated by the formula [(HLQ presenteeism score × €37.69)/2].

Other measures

Demographic characteristics (age, gender, educational level and marital status) were assessed with a general checklist. The comparison group was asked to confirm not having RA and to report whether they had one or more chronic diseases. For the RA group, disease characteristics were assessed: duration of signs and symptoms of RA in years, functional disability by the HAQ Disability Index (HAQ-DI) [18] and DAS-28. The DAS-28 is a measure of disease activity developed for RA that combines the number of swollen and tender joints using 28-joint counts, the ESR and patient's general health on a visual analogue scale (VAS) in a single index score [19].

To assess comorbidity, patients were asked whether they were treated for one or more other chronic disease(s) besides RA by a general practitioner (GP) or specialist during the past year. The control group was asked to confirm not having RA and to report whether they had one or more chronic diseases for which they were treated by a GP or specialist during the past year. The list of conditions was primarily based on the International Classification of Diseases [20]. Eighteen conditions were listed explicitly to be checked where applicable. Respondents could also check other conditions. Comorbidity was assessed by summing the number of chronic diseases the respondent had reported.

Statistical analyses

Descriptive statistics are presented for all demographic and disease characteristics. Differences between groups were analysed by Mann–Whitney U-test or χ^2 where appropriate. Spearman's correlation coefficients were calculated between presenteeism instruments to determine the convergence of these scales. Differences in productivity scores between the RA and control group were tested by Mann–Whitney U-tests. Finally, the impact of presenteeism on total productivity costs was calculated as a percentage score and was shown for all measures.

Cost differences between the RA and control group were calculated separately for the absenteeism and presenteeism costs as calculated by the different instruments; mean differences in costs between groups and 95% confidence intervals (CIs) were calculated using double-sided bootstrapping.

Results

A total of 237 persons [64% female; mean (S.D.) age 57 (14) years] with early RA were invited to participate in the study: 94 of them declined to participate and 143 agreed to participate, of which 72 (44%) persons had a paid job. Completed questionnaires were available for 62 patients with a paid job [mean (S.D.) age 47 (10) years; 55% female].

TABLE 1 Demographic and disease characteristics of the RA and control group

Characteristic	RA ($n = 62$)	Control ($n = 61$)	P
Female, %	55	65	0.304
Age, mean (S.D.), years	47 (10)	45 (11)	0.479
Educational level, *n* (%)			0.731
Low (elementary school)	19 (31)	15 (25)	
Medium (high school)	28 (45)	34 (55)	
High (university)	15 (24)	12 (20)	
Marital status, *n* (%)			0.297
Single	5 (8)	7 (12)	
Married / living together	54 (87)	49 (80)	
Widow(er) / divorced	3 (5)	5 (8)	
Monthly salary, mean (S.D.), €	1296 (535)	1603 (844)	0.097
Occupation, %			0.837
Manufacturing	8	7	
Building	11	10	
Health and well-being	24	31	
Public sector (police force, civil service)	7	2	
Education	5	6	
Services (banking, retail, food service, etc.)	19	21	
other	26	23	
Work autonomy and skill discretion, mean (S.D.)	2.2 (0.5)	2.3 (0.6)	0.640
Work status			
Number of hours work per week, mean (S.D.)	29.5 (11.4)	28.2 (11.9)	0.605
Number of days work per week, mean (S.D.)	4.2 (1.3)	4.2 (1.2)	0.858
Comorbidity	0.5 (0–5)	0 (0–4)	0.548
Number of chronic diseases besides RA, median (range)			
Duration of signs and symptoms, years, %			
$\leqslant 1$	15		
1–5	75		
$\geqslant 5$	10		
Functional status (HAQ), mean (S.D.)	1.5 (0.5)		
Disease activity (DAS-28), mean (S.D.)	2.7 (1.2)		

Mann–Whitney U-test or χ^2 where appropriate.

Completed questionnaires were returned by 61 subjects without RA who had a paid job [mean (S.D.) age 45 (11) years; 65% female]. Demographic characteristics as well as the total number of working hours per week were not significantly different between groups (Table 1). No significant differences between groups were found in either occupation type and in work autonomy and skill discretion. Furthermore, the number of chronic diseases besides RA was equal between groups. The RA patients had a mean (S.D.) HAQ score of 1.5 (0.5) and the mean (S.D.) DAS-28 was 2.7 (1.2).

Absenteeism

In Table 2, productivity loss in both groups is shown. In terms of absenteeism, significantly more ($P < 0.001$) RA patients (50%) had missed time from work due to health reasons over the last 3 months compared with the control group (25%) as measured by PRODISQ. The median number of days missed from work due to health reasons in the last 3 months was significantly higher ($P < 0.001$) in the RA group [0.5 days, interquartile range (IQR) 0–15 days] compared with the controls (0 days, IQR 0–0 days) according to the PRODISQ. These differences in absenteeism scores between groups were confirmed by the WPAI-GH scores that had a recall period of 1 week (Table 2).

Presenteeism

QQ and WPAI-GH scores of presenteeism were moderately correlated ($r = 0.61$) while the HLQ presenteeism score was poorly correlated with the QQ ($r = 0.34$) as well as with the WPAI-GH ($r = 0.48$). As is shown in Table 2, the majority of RA patients (60–79%) experienced reduced productivity at work that was significantly higher compared with the number of persons in the comparison group (23–41%), depending on the presenteeism instrument used. Also, the median percentage of productivity loss at work on the last working day (QQ) was higher ($P < 0.01$) in the RA group (20%, IQR 0–47%) compared with the controls (0%, IQR 0–30%). Both the Q1 and Q2 scores were significantly higher in the control group compared with the RA group.

When estimated by the WPAI-GH, the median impairment in work productivity at work due to health problems

Table 2 Productivity loss according to PRODISQ, WPAI-GH and HLQ for the RA and control group

Instrument	RA ($n = 62$)	Control ($n = 61$)	P
Absenteeism			
PRODISQ			
Being absent from work due to health last 3 months, *n* (%)	31 (50)	15 (25)	**
Number of days missed due to health last 3 months, median (IQR)	0.5 (0–15)	0 (0–0)	***
WPAI-GH			
Being absent from work due to health last week: *n* (%)	28 (45)	16 (26)	**
Percentage time missed due to health last week, median (IQR)	0 (0–50)	0 (0–0)	***
Presenteeism			
QQ			
Having reduced work productivity at work last working day, *n* (%)	37 (60)	25 (41)	*
Q1 of the work, median (IQR)	9 (7–10)	10 (8–10)	**
Q2 of the work, median (IQR)	10 (8–10)	10 (9–10)	*
Percentage of productivity loss last working day, median (IQR)	20 (0–47)	0 (0–30)	**
WPAI-GH			
Having reduced work productivity at work last week, *n* (%)	49 (79)	25 (41)	***
Percentage of impairment while working due to health last week, median (IQR)	20 (0–50)	0 (0–0)	***
HLQ			
Having reduced work productivity at work last 2 weeks, *n* (%)	42 (67)	14 (23)	***
Number of hours needed to catch up work due to health problems last 2 weeks, median (IQR)	0 (0–2)	0 (0–0)	**

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. Mann–Whitney U-test or χ^2 where appropriate.

Table 3 Mean costs per person per week due to productivity loss in the RA and control group

Costs	RA	Percentage of total costs	Control	Percentage of total costs	Difference (95% CI)[a]
PRODISQ					
Absenteeism	120 (0–1351)	29	9 (0–200)	5	110 (39, 202)
Presenteeism (QQ)	299 (0–1447)	71	154 (0–1371)	95	152 (4, 314)
Total costs	419 (0–2437)	100	163 (0–1372)	100	263 (69, 467)
WPAI-GH					
Absenteeism	116 (0–530)	27	6 (0–93)	8	105 (52, 164)
Presenteeism	318 (0–1508)	73	72 (0–1357)	92	200 (68, 326)
Total costs	381 (0–2024)	100	78 (0–1357)	100	245 (100, 410
HLQ					
Presenteeism	79 (0–1224)	NA	11 (0–377)	NA	57 (1, 133)

Values are calculated by the human capital method and indicated by the mean (range) costs (€) per week. [a]Double-sided bootstrapping (1000 replications). NA: not applicable.

in the last week was 20% (IQR 0–50%) in the patient group *vs* 0% (IQR 0–0%) in the control group ($P < 0.001$). Also, the HLQ showed similar significant differences between groups.

Costs

The impact of productivity loss on mean costs per person is illustrated in Table 3. The mean total cost due to absenteeism in the RA group was estimated at €120 per patient per week while costs due to presenteeism were estimated at €299 per person per week according to the PRODISQ measurement. This would imply that 71% of the total productivity costs are due to presenteeism in the group of patients with RA. These results were comparable when using the WPAI-GH instrument: mean total costs due to absenteeism in the RA group were estimated at €116 per patient per week, while costs due to presenteeism were estimated at €318 per person per week, which represents 73% of the total productivity costs.

The bootstrapped mean difference in costs per week due to absenteeism were almost equal when measured by PRODISQ (€110; 95% CI €39, €202) and the WPAIGH (€105; 95% CI €52, 164), while the bootstrapped mean cost differences between groups due to

presenteeism were €152 (95% CI €4, €314) for the QQ and €200 (95% CI €68, €326) for the WPAIGH. The HLQ generated a lower estimate of mean incremental costs (mean €57; 95% CI €1, €133). It can be concluded that the cost due to presenteeism are about two times higher in the RA group compared with the control group (QQ score €299 *vs* €154), whereas the ratio was about 4.5 : 1 for the WPAIGH questionnaire (€318 for the RAs *vs* €72) and even higher for the HLQ (€79 for the RAs *vs* €11).

Discussion

This cross-sectional study shows that absence from work as well as reduced productivity at work due to health problems was reported significantly more frequently in patients with RA compared with healthy controls. Furthermore, it can be concluded that the contribution of presenteeism on the total productivity costs in patients with RA is ~70%, which is high as well. However, the normal productivity at work in a group of individuals without RA matched on age and gender was not optimal either, which implies a risk for overestimation of costs due to presenteeism in the RA group between 23 and 50% depending on the instrument used.

The fact that the different measures for presenteeism were only moderately correlated is in line with other studies [15]. Recently, the lack of convergence between instruments was demonstrated by Beaton *et al*. [21], who compared different productivity at work instruments [Work Activity Limitations Scale (WALS), Stanford Presenteeism Scale (6-items) (SPS-6), Endicott Work Productivity Scale (EWPS), Work Instability Scale (Rheumatoid Arthritis Version) (WIS-RA), Work Limitations Questionnaire (WLQ) index] and concluded that these moderate correlations could be a reflection of the diversity of the instruments' core concepts. The lack of convergence with the HLQ can also be explained by the fact that it explicitly asks the respondents to estimate the number of hours they would need to catch up on tasks. This question is dependent on the job type, as it is not relevant for all job types, and therefore the HLQ might underestimate production losses. As Brouwer *et al*. [15] stated: 'for example, redistribution of work over colleagues ensures that the collective workload is finished on time because colleagues make up for lost work during regular hours and some types of work cannot be made up for, for instance in a production line'. In addition, the HLQ measures absolute numbers and does not adjust for the hours worked, while the WPAI-GH is a relative (%) score.

Differences between presenteeism instruments can also be explained because of the large variation in recall period. The risk for recall bias could be higher when the recall period is longer (during the last 2 weeks could also include a day of absence), while the consequences of extrapolation over longer periods than the recall period may be even more doubtful because it is not known how stable presenteeism is. This is in line with Brooks *et al*. [22], who recently discussed issues surrounding the concept of presenteeism as well as the translation of productivity losses into economic outcomes. They concluded that many aspects of presenteeism should be discussed with caution. It is not clear whether all instruments measure the same entity, recall periods vary between instruments (resulting in recall bias when the period is too long) and extrapolations to annual estimates may magnify errors in measurement.

For that reason, it should be noted that the estimation of costs assessed by the QQ might be biased and overestimate the real costs, as (i) data were extrapolated from last working day to costs per week, and (ii) the costs estimated by the QQ were not corrected for number of days absent during the last week.

It is important to state that time loss has a limited value from both a managerial view as well as from the patient perspective. From a managerial view [11], the true economic productivity loss due to illness is dependent on the job type and team production, availability of perfect substitutes for absent or impaired workers and time-sensitivity of output. However, these job characteristics are not included within the current instruments. Moreover, the choice an employee has when feeling ill (stay home or going to work while ill) will most likely be dependent on the job type, organization type and health insurance situation of this individual. Internationally, the social security system also plays an important role. Also, from a patient perspective, productivity loss [23] should be measured within a broader framework, as it is dependent on the job context, which is defined by (i) the individual's work status (working full- or part-time hours); (ii) job type (physical, psychological, output demands of the current job); and (iii) personal and environmental factors (leisure and care-giving responsibilities at home, which are important for the balance between paid and unpaid roles. Work output may be considered a success from an employer's perspective but not from a patient's perspective if it is at the cost of social or leisure activities).

As patients and controls have not been matched for profession, the results might be biased, as the work tasks might be different. However, no significant differences between groups were found in occupation type and level of work autonomy and skill discretion. Therefore, we think that this bias is limited. Besides the cross-sectional design, another limitation of this study is the fact that it represents subjective worker productivity. We would like to address that objective work productivity and subjective worker productivity are not the same. The existing instruments for presenteeism in fact capture (experienced) subjective worker productivity. In cost-effectiveness evaluation studies, this outcome can be translated to work productivity and subsequently economic output by assigning a monetary value of the time lost due to reduced productivity at work. Unfortunately, studies reporting the association of self-reported work productivity and objective productivity measures have not been published yet and therefore the validity of all presenteeism measures is doubtful. Validating

presenteeism poses significant challenges because of the nature of the data being collected [9]. For certain types of employment and occupation, such as call centers, employee activity logs are maintained. However, for most jobs there is no true account of productivity with which to assess an employee's performance.

Also, the concept normal productivity that is used in this study can be interpreted in several ways leading to different results. Lerner and Lee [24] found that respondents had different responses to questions about productivity depending on whether the person was comparing his or her current productivity with his or her own usual productivity or to co-worker productivity. The personal average yielded more productivity loss than interpersonal averages. Therefore, the productivity at work score of the individuals without RA as found in the present study does not necessarily represent the standard of normal productivity, as the meaning of productivity at work will differ among individuals. Nevertheless, the questions of the instruments used in the present study explicitly asked the respondents to compare the work productivity with their own normal productivity standard. Brouwer *et al*. [15] reported in 1999 that illness at work (presenteeism) in healthy subjects is quite common. They collected data for employees of a Dutch trade firm and reported that on an average day, >7% of the respondents indicated experiencing health problems while at work. It is noteworthy that in the current study it was found that 23–41% of the persons from the control group experienced reduced productivity at work due to health reasons, which is much higher. Differences might be explained by the higher mean age of our population, the number of chronic diseases within the control group and the cross-sectional design.

This is the first study on productivity loss in patients with RA compared with controls without RA. The data show that lost productivity due to presenteeism is higher in the RA group compared with the controls. However, work productivity in healthy individuals was not optimal either, which implies a risk for overestimation in the RA group of between 23 and 50% depending on the instrument used when a normal score is not taken into account. The findings of the study are subject to limitations, as the measurement instruments for presenteeism we used are not validated yet.

Rheumatology key messages

- High impact of presenteeism on total productivity costs in patients with RA.
- Risk for overestimation of costs, as work productivity in healthy individuals was not optimal either.
- Presenteeism instruments QQ and WPAI-GH are moderately correlated.

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