Prevalence and predictors of reduced work productivity in patients with psoriatic arthritis

M. Kennedy, A. Papneja, A. Thavaneswaran, V. Chandran, D.D. Gladman

University of Toronto, Psoriatic Arthritis Program, Centre for Prognosis Studies in the Rheumatic Diseases, Toronto Western Hospital, Toronto, Ontario, Canada.

Abstract

Objectives

Psoriatic arthritis (PsA) is a unique inflammatory musculoskeletal disorder associated with psoriasis. Although high rates of absenteeism have been associated with PsA, less is known about the impact of the disease on the productivity of patients who remain at work. The aim of this study was to identify factors associated with reduced work productivity, as measured by the Work Limitations Questionnaire (WLQ), among patients with PsA.

Methods

Patients attending a single Psoriatic Arthritis Clinic were recruited for participation. Employed participants (including homemakers) first completed a Questionnaire for the Assessment of Work-Related Factors (QAWRF). Eligible participants then completed the WLQ. WLQ scores were used as the dependent variable in linear and logistic regression analyses. Independent variables assessed in this study include work characteristics, demographic factors, and clinical measures.

Results

One hundred and eighty-six eligible patients (60.9% males) returned their assessment forms for analysis. The mean reduction in work productivity due to illness was 4.3%. In univariate linear regression analysis, work productivity was significantly associated with sex, education status, Psoriasis Area and Severity Index (PASI), AJC, ESR, Functional Co-morbidity Index (FCI), and support at work; associations with gender, ESR, FCI, and medications were also significant in a reduced multivariate model.

Conclusions

Work productivity was associated with demographic, clinical, and work-related factors in PsA. These variables may be useful in identifying patients who require more aggressive intervention, including the use of effective drugs to control disease activity and advocacy for a more supportive work environment.

Key words

psoriatic arthritis, presenteeism, quality of life, employment, disease activity, work.

*Matthew Kennedy, BSc, Medical Student **
*Anjali Papneja, BSc, Medical Student **
Arane Thavaneswaran, MMath
Biostatistician,
Vinod Chandran, MBBS, MD, DM, PhD
Dafna D. Gladman, MD, FRCPC

**These authors are to be considered co-first authors as they contributed equally to the work and manuscript.*

Please address correspondence and reprint requests to:
Prof. Dafna D. Gladman,
Toronto Western Hospital,
399 Bathurst Street,
1E-410B Toronto,
Ontario M5T 2S8, Canada.
E-mail: dafna.gladman@utoronto.ca

Received on July 2, 2013; accepted in revised form on November 20, 2013.

Funding: The psoriatic arthritis program is supported by a grant from the Krembil Foundation.
M. Kennedy was supported by a Canadian Rheumatology Association Abbott Summer Scholarship.
V. Chandran was supported by a Canadian Institutes of Health Research NET grant;

Competing interests: none declared.

Introduction

Psoriatic arthritis (PsA) is a distinct inflammatory musculoskeletal disease associated with skin and nail psoriasis (1). Typical features in addition to psoriasis peripheral arthritis, axial involvement enthesitis and dactylitis (1). Estimates vary widely, with the incidence and prevalence of PsA ranging from approximately 3 to 23 per 100 000 and 0.5 to 4 per 1000, respectively in Western countries (2).

A number of studies have demonstrated that patients with PsA have significantly compromised physical health and quality of life (3-10). Given its impact on patient health and wellbeing, it is not surprising that PsA can negatively affect work productivity as well. High rates of unemployment and sick leave among patients with PsA have been reported (11-15). The estimated indirect costs associated with PsA related absences from work in these studies were substantial, ranging from an average of 2,904 euros/patient/year in Hungary to 7,919 euros/patient/year in Germany (14, 15). Comparable estimates are not available for North American populations at this time, but based on the indirect costs associated with other forms of arthritis are expected to be high (16). Although absenteeism is an important contributor to work productivity losses, presenteeism, or reduced performance at work due to illness, also results in substantial reductions in productivity (17). For example, in a recent Canadian study of employed patients with inflammatory and/or degenerative arthritis, productivity losses associated with presenteeism were the largest contributor to indirect costs, accounting for 41% of the average annual indirect cost per patient of $11,553 (CAD) (16). Although reduced work productivity has been reported among patients with treatment resistant PsA, independent predictors of reduced productivity in PsA have not yet been identified (18).

A number of questionnaires have been developed to measure presenteeism (19). The Work Limitations Questionnaire (WLQ) is a generic tool with demonstrated validity and reliability for use in studies of PsA as well as other types of arthritis (20-23). This instrument has demonstrated content validity, item and scale reliability, and criterion validity by comparing with other instruments. It was also validated against objectively measured work productivity in 919 employees of a large New England Firm that monitors work productivity of employees electronically. In the ACCLAIM trial of adalimumab for PsA significant improvement from baseline was achieved at 12 weeks in three of four WLQ subscales (18).

Given the importance of presenteeism to individual patients as well as to society as a whole, the aim of the present study was to identify demographic, clinical, and work-related factors that are associated with the development of work restrictions, as measured by the WLQ, in patients with PsA. Higher WLQ productivity scores were expected to correlate with measures of disease activity and severity, as well as work-related factors.

Methods

Study participants

Patients attending the University of Toronto Psoriatic Arthritis Clinic between June 2011 and July 2012 were studied. All cohort members have a rheumatologist-confirmed diagnosis of PsA with 99% fulfilling CASPAR criteria (24). Patients who agreed to participate in the study were asked about their current employment situation; those who had been employed or worked as a homemaker at any point during the two weeks prior to their visit were eligible to complete questionnaires related to their work. Participation was completely voluntary and subjects received no compensation for their time. This study was approved by the University Health Network Research Ethics Board.

Primary outcome measure

Patients completed the 25-item self-administered WLQ as well as the WLQ 2-Question Time Loss Module; the latter asks patients to quantify the number of full and partial workdays missed during the past two weeks due to health concerns. The questions of the 25-item WLQ are grouped into four subscales that address time, physical, mental-interpersonal, and output de-

mands, respectively (20). Scores ranging from 0 to 100 are calculated for each subscale, with higher scores corresponding to greater work limitation and productivity loss (25). An overall WLQ Productivity Score is calculated and expressed as the percentage loss in productivity associated with illness (25). Patients are assigned to one of four levels of work impairment based on productivity scores, where normal corresponds to <5% productivity loss, mild impairment 5–10.9%, moderate impairment 11–16.9%, and severe impairment ≥17% work productivity loss (25). Most patients completed these questionnaires during their clinic visit; a small number did so outside of clinic time and returned them by mail due to logistical concerns. Responses were used to calculate WLQ subscale and overall productivity scores according to standard scoring methodology, which requires that at least half of the questions on each scale are answered with a response other than "does not apply to my job" (25).

Assessment of work-related factors

To assess work characteristics that may influence the relationship between illness and productivity at work, participants were given a questionnaire for the assessment of work-related factors (QAWRF). In addition to quantifying the average number of hours that they had worked per week over this period, participants were asked whether or not they had worked fewer hours than they would have liked to because of their PsA. Three additional questions addressed how much of the time their job involved physical labour, how much control they had over their work schedule, and how well supported (defined as able to get the resources and/or assistance they needed to be productive) they felt at work, with responses given on a Likert scale ranging 1–5.

Demographic and clinical measures

Patients are reviewed in the PsA clinic at 6-12 month intervals with a detailed history (including demographics, detailed medication level and comorbidities), physical exam (including actively inflamed (AJC) and damaged joints (DJC) as well as the psoriasis area severity index (PASI)), and laboratory investigations (26). Education level, functional class (grade 1 corresponds to all activities without pain or handicap and grade 4 represents little or no self-care, including confinement to a bed or wheelchair), the number of co-morbidities, and the Functional Comobridity Index (FCI) are recorded or calculated at each protocol visit (27, 28).

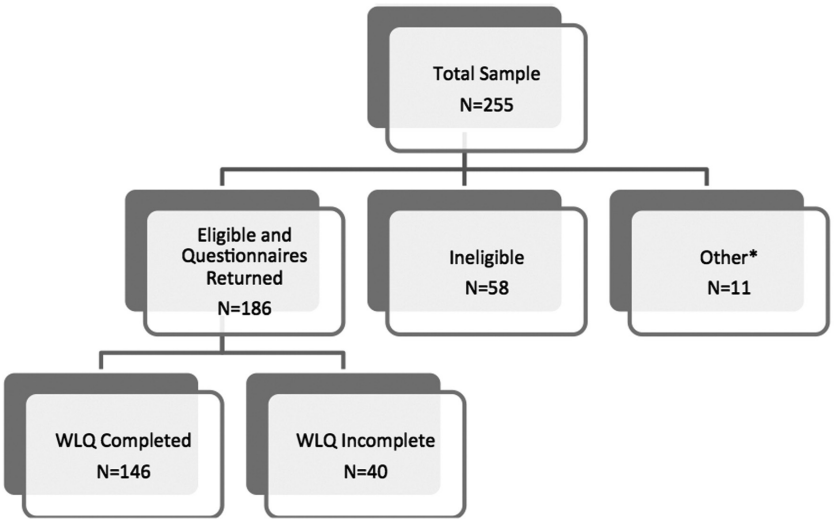

Fig. 1. Flowchart of patient categories (n=255).
WLQ, Work Limitations Questionnaire.
*Includes patients unwilling to be screened for eligibility, patients who agreed to complete their WLQ after their clinic visit, but failed to return it prior to analysis, and one patient who was unable to participate due to language barrier.

Statistical analysis

Descriptive statistics were generated. Chi square and ANOVA analyses were used to compare patient groups in terms of categorical and continuous variables, respectively. Pearson and Spearman correlation coefficients were calculated to evaluate the association between WLQ Productivity Score and demographic, clinical, and work-related variables. Univariate and multivariate linear and logistic regression analyses were also performed using the WLQ Productivity Score as a continuous and binary outcome (moderate-severe impairment *vs.* none-mild impairment), respectively. The associations between demographic, work, and disease characteristics and work productivity were studied adjusting for the following: age, duration of PsA, sex, education status, PASI, AJC, DJC, Erythrocyte Sedimentation Rate (ESR), FCI, medications, physical labour at work, work schedule control, and support at work. All analyses were performed using the Statistical Analysis System (SAS 9.2). Significance was set at $\alpha<0.05$.

Results

A total of 255 patients agreed to participate in this study (Fig. 1). One hundred and eighty-six patients were eligible to complete all of the study questionnaires and returned their assessment forms for analysis. Among this cohort of patients, 146 participants provided a sufficient number of applicable WLQ scale responses to be assigned an overall work productivity score. The remaining 69 patients were either ineligible or did not complete questionnaires for other reasons, including unwillingness to be screened for eligibility, requesting to be able to return the WLQ by mail and then failing to do so, or, in one case, a language barrier. As shown in Table I, significant differences existed between eligible patients, ineligible patients, and those who did not complete questionnaires for other reasons, including differences in age, PsA duration, AJC, functional class, FCI, and DMARD use. When the eligible group was compared to the ineligible and "other"

Table I. Demographic and clinical sample characteristics (n=255).

Characteristic	Frequency (%) or Mean (SD)			*p*-value
	Eligible (n=186)	Ineligible (n=58)	Other* (n=11)	
Sex (males)	112 (60.9%)	34 (59.7%)	9 (81.8%)	0.36
Age	50.5 (10.7)	58.0 (14.7)	57.8 (9.5)	<0.0001
Duration of Psoriasis	24.4 (13.3)	25.6 (13.1)	30.6 (15.2)	0.34
Duration of PsA	14.2 (10.0)	14.8 (11.6)	23.3 (15.0)	0.03
Education status (post-secondary)	149 (84.2%)	41 (74.6%)	7 (63.6%)	0.09
PASI	3.5 (4.2)	2.4 (2.0)	5.9 (8.8)	0.08
Abnormal ESR	13 (9.7%)	5 (12.8%)	0 (0%)	0.63
Active joint count	6.5 (7.5)	8.2 (6.7)	18.3 (22.4)	0.02
Damaged joint count	10.5 (13.7)	10.9 (9.5)	14.5 (18.5)	0.77
Functional class (Grade 3 or 4)	2 (1.4%)	6 (14.3%)	0 (0%)	0.0009
FCI	1.08 (1.13)	1.90 (1.41)	1.09 (1.04)	<0.0001
Biologics	87 (47.8%)	29 (52.7%)	3 (27.3%)	0.30
DMARDs	95 (52.2%)	38 (66.7%)	9 (81.8%)	0.04
NSAIDs	113 (61.4%)	35 (63.6%)	4 (36.4%)	0.23

PsA: psoriatic arthritis; PASI: Psoriasis Area and Severity Index; ESR: erythrocyte sedimentation rate; FCI: Functional Co-Morbidity Index; DMARDs: disease-modifying anti-rheumatic drugs; NSAIDs: non-steroidal anti-inflammatory drugs.
*Includes patients unwilling to be screened for eligibility, patients who agreed to complete their WLQ after their clinic visit, but failed to return it prior to analysis, and one patient who was unable to participate due to a language barrier.

Table II. Work characteristics and productivity loss (N=186)*.

Characteristic	Frequency (%) or Mean (SD)
Hours worked per week	37.2 (14.6)
Physical labour: "some of the time" or more	67 (36.6%)
Work schedule control: "some" or more	135 (73.7%)
Supported at work: "somewhat" or more	146 (83.4%)
Worked fewer hours than desired due to PsA	26 (14.3%)
Missed ≥1 Full work day(s) in past two weeks**†	29 (17.3%)
Missed ≥1 Partial work day(s) in past two weeks**‡	48 (28.7%)
Work Productivity Impairment Category$^{\Delta}$	
• No impairment	93 (63.7%)
• Mild impairment	39 (26.7%)
• Moderate impairment	9 (6.2%)
• Severe impairment	5 (3.4%)
Work Productivity Score$^{\Delta}$	4.3 5.0)

*Some sample sizes are smaller than 186 as indicated due to incomplete answering of WLQ questionnaires. **Includes days missed only due to health or medical care. Health includes physical and emotional health problems. †n=168 ‡n=167 $^{\Delta}$n=146.

Table III. Correlation of demographic, work, and clinical characteristics with WLQ Productivity Score (n=146).

Characteristic	Pearson r	*p*-value	Spearman r	*p*-value
Age	0.09	0.26	0.04	0.62
Duration of PsA	-0.10	0.21	-0.12	0.15
Education status	-0.22	0.01	-0.21	0.01
PASI	0.20	0.04	0.21	0.03
ESR	0.31	0.001	0.35	0.0003
Active joint count	0.28	0.0009	0.23	0.006
Damaged joint count	0.02	0.86	0.03	0.76
FCI	0.30	0.0002	0.37	<0.0001
Physical labour at work	0.12	0.15	0.14	0.10
Work schedule control	-0.11	0.17	-0.17	0.047
Support at work	-0.30	0.0004	-0.34	<0.0001

PsA: psoriatic arthritis; PASI: Psoriasis Area and Severity Index; ESR: erythrocyte sedimentation rate; FCI: Functional Co-Morbidity Index.

groups combined (data not shown), significant differences existed only for age, FCI, and DMARD use, with the eligible group being characterised by younger age, fewer co-morbidities, and lower DMARD use.

Among eligible patients, 60.9% were male, the mean age was 50.5, and the average duration of PsA was 14.2 years (Table I). The majority of eligible participants had obtained a post-secondary education. The mean PASI was 3.5, while the mean AJC and the mean DJC were 6.5 and 10.5, respectively. Less than 10% of eligible patients had an abnormal ESR and only two participants were in functional class 3 or 4. The mean FCI score was 1.08 with a standard deviation of 1.13. In terms of medications, over 60% were using a NSAID, while just over half were on DMARDs and slightly less than half were on a biologic.

As shown in Table II, eligible participants worked a mean of 37.2 hours per week with 14.3% reporting that they worked fewer hours than desired due to their arthritis and/or psoriasis. More than one third of subjects were employed in positions that involved physical labour at least some of the time; the majority had at least some control over their work schedule and at a minimum felt somewhat supported in their jobs. Based on WLQ scores, the mean percentage productivity loss at work was 4.3% with more than one third of patients being at least mildly work productivity impaired. Furthermore, 17.3% of patients lost 1 or more full days at work and 28.7% lost 1 or more partial workdays due to health concerns.

As highlighted in Table III, education status, work schedule control, and support at work were significantly negatively correlated with work productivity impairment, while PASI, ESR, AJC and FCI were significantly positively correlated with this outcome measure.

In univariate logistic regression analysis, work productivity was significantly associated with gender, education status, ESR, FCI, medications, and support at work. Associations with medications and FCI remained significant in the reduced multivariate model with odds ratios of 2.10 (95% CI 1.13, 3.91, p=0.02)

Table IV. Univariate and multivariate logistic regression to determine associates of moderate-severe work impairment *vs*. none-mild work impairment (n=146).

	Univariate model			Multivariate model					
				Full model			Reduced model		
Covariate	OR	95% CI	*p*-value	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Age (1 yr. increase)	1.01	(0.98, 1.04)	0.49	0.98	(0.91, 1.05)	0.53	---	---	---
Sex (males *vs*. females)	0.17	(0.08, 0.33)	<0.0001	0.32	(0.09, 1.10)	0.07	---	---	---
Duration of PsA (1 yr. increase)	0.99	(0.96, 1.03)	0.71	0.99	(0.93, 1.06)	0.79	---	---	---
Education status (college/university *vs*. high school or less)	0.36	(0.15, 0.90)	0.03	0.53	(0.11, 2.45)	0.42	---	---	---
PASI (1 unit increase)	1.08	(0.99, 1.19)	0.09	1.13	(0.97, 1.31)	0.12	---	---	---
Active joint count (1 unit increase)	1.05	(0.99, 1.12)	0.09	1.04	(0.94, 1.15)	0.44	---	---	---
Damaged joint count (1 unit increase)	1.01	(0.98, 1.03)	0.71	1.04	(0.99, 1.10)	0.14	---	---	---
ESR (1 unit increase)	1.04	(1.01, 1.08)	0.01	1.02	(0.97, 1.08)	0.44	---	---	---
FCI (1 unit increase)	1.94	(1.40, 2.69)	<0.0001	2.31	(1.19, 4.50)	0.01	2.39	(1.40, 4.09)	0.001
Medications*	1.40	(0.98, 2.00)	0.06	2.22	(1.00, 4.92)	0.05	2.10	(1.13, 3.91)	0.02
Physical labour at work (1 unit increase)	1.00	(0.78, 1.27)	0.98	0.98	(0.62, 1.55)	0.92	---	---	---
Work schedule control (1 unit increase)	0.91	(0.73, 1.14)	0.43	1.15	(0.71. 1.87)	0.56	---	---	---
Support at work (1 unit increase)	0.68	(0.52, 0.90)	0.006	0.91	(0.50, 1.66)	0.75	---	---	---

PsA: psoriatic arthritis; PASI: Psoriasis Area and Severity Index; ESR: erythrocyte sedimentation rate; FCI: Functional Co-Morbidity Index; DMARDs: disease-modifying anti-rheumatic drugs; NSAIDs: non-steroidal anti-inflammatory drugs. DMARD: disease-modifying anti-rheumatic drugs.
*Medications modelled as 3=Biologic ± DMARD ± NSAID; 2=DMARD ± NSAID; 1=NSAID 0=none
Note: We expect a positive association with physical labour at work and a negative association with work schedule control and support at work, respectively.

and 2.39 (95% CI 1.40, 4.09, p=0.001), respectively (Table IV). Linear regression yielded similar results with associations with gender, education status, PASI, AJC, ESR, FCI, and support at work significant on the univariate level (data not shown). Associations with gender, ESR, FCI, and medications were also significant in the reduced multivariate linear model, whereas only DJC and FCI were significantly associated with work productivity in a full multivariate model.

Discussion

The results of the present study support findings previously reported in the literature regarding employment. For example, in a Hungarian study 25% of patients were receiving permanent disability pension and 23% reported sick leave related to PsA while in a German suty only 44% of females and 66% of males under the age of 65 with PsA were employed, 29% of whom had taken sick leave in the past year (14, 15). Similarly, in our cohort, of the 377 patients seen in the time period, 17.5% were disabled and 82.5% were employed or homemakers. Of those under 65 who were employed 62% were males and 38% were female (data not shown).

This study provides additional insight into the challenges faced by PsA patients during work. Over 35% of eligible patients in this study were impaired in work productivity with a mean decrease in work output for the entire sample of 4.3%. This degree of work limitation is less than was found among a group of treatment resistant PsA patients, and is also lower than values reported in studies of rheumatoid arthritis and other inflammatory arthritides, but still represents a significant source of morbidity for some patients (18, 22, 29, 30). Furthermore, the limitations that these patients face in the workplace extend past the individual, also affecting their employers and society at large, as an indirect cost of their disability (13).

The present study demonstrates that work productivity is associated with demographic, clinical, and work-related factors. In terms of demographic variables, female gender was significantly associated with increased work limitation in both univariate and multivariate analyses. This finding is consistent with a previous study of work disability in PsA patients, which found that females were more than twice as likely as males to be receiving disability pension, and suggests that female gender may be an independent risk factor for presenteeism in PsA (12). Participants with a post-secondary education reported less limitation in the workplace than those with a high school education or less. However, this relationship was not significant after adjusting for other factors like work characteristics. This is in contrast to a 2009 study by Wallenius *et al*., which found that PsA patients with a high school education or less were more than five times as likely to be work disabled as those with post-secondary education in multivariate regression analysis (12). The univariate relationship demonstrated in our study may in part reflect the ability of patients with higher levels of education to secure jobs with more flexibility and support, but less physical labour, such that when these variables were adjusted for the association was no longer significant. This may also partially account for the discrepancy between this study and the one by Wallenius *et al*., as they did not collect data on work characteristics (12).

Disease activity, in terms of PASI score, AJC, and ESR, was found to be significantly associated with impaired work productivity. This is in keeping with previous studies showing that joint activity in PsA patients is positively associated with physical functional disability and that clinical indicators of disease activity and damage correlate with increasing fatigue levels (5, 31). Moreover, tender joint count, swollen joint

count, and disease activity score 28 (DAS-28), which includes ESR, have been found to correlate with impaired work productivity in PsA patients with treatment refractory disease (21). Thus markers of disease activity may be predictive of work limitation in PsA.

Interestingly, cumulative disease damage as measured by the damaged joint count was independently associated with reduced work productivity in the full multivariate linear model, but not in other analyses. Presence of erosive disease has been independently associated with work disability in PsA as well and may relate to a unique aspect of disease burden that limits productivity (12).

Medication use was associated with work limitation in multivariate, but not univariate, linear regression analysis, with patients on more aggressive forms of therapy tending to have greater productivity impairment. Since biologic therapy has been shown to reduce work productivity losses in PsA, medications are clearly a marker of more severe disease rather than themselves a cause of increased work limitation in this case (11, 18). This observation also underscores the likely importance of utilising multiple strategies to address presenteeism in addition to medication, such as workplace modification. Increasing levels of self-perceived support at work was associated with increased work productivity in this study, and may offer one means of favourably adjusting work conditions in order to improve productivity.

The Functional Co-morbidity Index was associated with the WLQ in all analyses, suggesting that other health conditions experienced by PsA patients also have important effects on their work productivity (27, 32). Clinicians managing patients with PsA should likely consider all of their co-morbidities in assessing the risk of presenteeism.

Although this study has a number of strengths, including the large sample size, inclusion of homemakers, reporting of work-related factors, as well as inclusion of several demographic and disease related factors, several limitations should be acknowledged. Significant differences were found between eligible, ineligible, and "other" groups of participants, which may point to a selection bias and thus limit the generalisability of the study results. However, given that the ineligible group likely included a number of patients who were retired and therefore not employed, it is not surprising that this group tended to be older and have a higher frequency of co-morbidities. Similarly, the increased utilisation of DMARDs among ineligible and "other" participants compared to eligible patients may have been at least partly because these groups contained patients who were disabled as a result of more severe disease and therefore unable to maintain employment. Another limitation of the study is the lack of data on income, which precluded economic analysis to determine the financial implications of presenteeism in PsA. Similarly, a future analysis is planned by our group to examine the association between patient reported outcomes, such as fatigue and mental health, and work productivity, as these variables may also be important associates of work limitation and yet were not assessed in this report. Finally, it should be noted that the study sample was taken from a specialised PsA clinic, which may limit its generalisability to less focused practice settings. However, this clinic has the full scope of the disease from very mild to very severe cases, and patients in this clinic were similar to those reported in community settings in Canada (33).

In conclusion, this study demonstrates that a significant number of PsA patients may experience issues with productivity in the workplace and that these work limitations are significantly associated with demographic, clinical, and work-related factors. These findings may be useful to clinicians in identifying patients at risk of experiencing presenteeism and thus further inform management strategies, including decisions around the use of effective drugs to control disease activity in these patients. Future studies should examine the economic ramifications of work limitations in PsA, as the results of such investigations could be useful in advocating for work impaired patients to be better supported in obtaining expensive medications, such as tumour necrosis factor-α (TNF-α) inhibitors. It is also important for clinicians, patients, and employers to work together to develop supportive work environments in which reasonable resources and assistance can be accessed when needed.

Acknowledgments

The authors would like to acknowledge the contributions of Adele Carty, Sutha Shanmugarajah, and Daniel Pereira to the acquisition of the data.

References

1. MEASE PJ: Psoriatic arthritis assessment and treatment update. *Curr Opin Rheumatol* 2009; 21: 348-55.
2. CHANDRAN V, RAYCHAUDHURI SP: Geoepidemiology and environmental factors of psoriasis and psoriatic arthritis. *J Autoimmun* 2010; 34: J314-J321.
3. KANE D, STAFFORD L, BRESNIHAN B, FITZGERALD O: A prospective, clinical and radiological study of early psoriatic arthritis: An early synovitis clinic experience. *Rheumatology* (Oxford) 2003; 42: 1460-8.
4. MCHUGH NJ, BALACHRISHNAN C, JONES SM: Progression of peripheral joint disease in psoriatic arthritis: A 5-yr prospective study. *Rheumatology* (Oxford) 2003; 42: 778-83.
5. HUSTED JA, TOM BD, FAREWELL VT, SCHENTAG CT, GLADMAN DD: Description and prediction of physical functional disability in psoriatic arthritis: A longitudinal analysis using a Markov Model approach. *Arthritis Rheum* 2005; 53: 404-9.
6. SOKOLL KB, HELLIWELL PS: Comparison of disability and quality of life in rheumatoid and psoriatic arthritis. *J Rheumatol* 2001; 28: 1842-6.
7. ZINK A, THIELE K, HUSCHER D *et al*.: Healthcare and burden of disease in psoriatic arthritis. A comparison with rheumatoid arthritis and ankylosing spondylitis. *J Rheumatol* 2006; 33: 86-90.
8. SALAFFI F, CAROTTI M, GASPARINI S, INTORCIA M, GRASSI W: The health-related quality of life in rheumatoid arthritis, ankylosing spondylitis, and psoriatic arthritis: A comparison with a selected sample of healthy people. *Health Qual Life Outcomes* 2009; 18; 7: 25.
9. HUSTED JA, GLADMAN DD, FAREWELL VT, COOK RJ: Health-related quality of life of patients with psoriatic arthritis: A comparison with patients with rheumatoid arthritis. *Arthritis Rheum* 2001; 45: 151-8.
10. HUSTED JA, GLADMAN DD, FAREWELL VT, LONG JA, COOK RJ: Validating the SF-36 health survey questionnaire in patients with psoriatic arthritis. *J Rheumatol* 1997; 24: 511-7.
11. KAVANAUGH A, ANTONI C, MEASE P *et al*.: Effect of infliximab therapy on employment, time lost from work, and productivity in patients with psoriatic arthritis. *J Rheumatol* 2006; 33: 2254-9.

12. WALLENIUS M, SKOMSVOLL JF, KOLDINGSNES W *et al*.: Work disability and health-related quality of life in males and females with psoriatic arthritis. *Ann Rheum Dis* 2009; 68: 685-9.
13. ZHU TY, TAM LS, LEUNG YY *et al*.: Socioeconomic burden of psoriatic arthritis in Hong Kong: Direct and indirect costs and the influence of disease pattern. *J Rheumatol* 2010; 37: 1214-20.
14. BRODSZKY V, BALINT P, GEHER P *et al*.: Disease burden of psoriatic arthritis compared to rheumatoid arthritis, Hungarian experiment. *Rheumatol Int* 2009; 30: 199-205.
15. HUSCHER D, MERKESDAL S, THIELE K *et al*.: Cost of illness in rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis and systemic lupus erythematosus in Germany. *Ann Rheum Dis* 2006; 65: 1175-83.
16. 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: 304-10.
17. SCHULTZ AB, EDINGTON DW: Employee health and presenteeism: A systematic review. *J Occup Rehabil* 2007; 17: 547-79.
18. GLADMAN DD, ACCLAIM STUDY INVESTIGATORS, SAMPALIS JS, ILLOUZ O, GUERETTE B: Responses to adalimumab in patients with active psoriatic arthritis who have not adequately responded to prior therapy: Effectiveness and safety results from an open-label study. *J Rheumatol* 2010; 37: 1898-906.
19. ROY JS, DESMEULES F, MACDERMID JC: Psychometric properties of presenteeism scales for musculoskeletal disorders: A systematic review. *J Rehabil Med* 2011; 43: 23-31.
20. LERNER D, AMICK BC, 3RD, ROGERS WH, MALSPEIS S, BUNGAY K, CYNN D: The work limitations questionnaire. A Self-Administered Instrument for Assessing On-The-Job Work Disability. *Med Care* 2001; 39: 72-85.
21. GLADMAN DD, SAMPALIS JS, MARTEL MJ, GOOCH KL, WONG R, GUERETTE B: Reliability and validity of the work limitations questionnaire (WLQ) and impact of adalimumab (HUMIRA) on presenteeism for patients with psoriatic arthritis (PsA). *Arthritis Rheum* 2008; 58 (Suppl. 9): S202.
22. WALKER N, MICHAUD K, WOLFE F: Work limitations among working persons with rheumatoid arthritis: Results, reliability, and validity of the work limitations questionnaire in 836 patients. *J Rheumatol* 2005; 32: 1006-12.
23. LERNER D, REED JI, MASSAROTTI E, WESTER LM, BURKE TA: The work limitations questionnaire's validity and reliability among patients with osteoarthritis. *J Clin Epidemiol* 2002; 55: 197-208.
24. TAYLOR WJ, GLADMAN DD, HELLIWELL PS, MARCHESONI A, MEASE P, MIELANTS H: Classification criteria for psoriatic arthritis: development of new criteria from a large international study. *Arthritis Rheum* 2006; 54: 2665-73.
25. LERNER D, CHANG H, ROGERS WH, BENSON C, SCHEIN J, ALLAIRE S: A method for imputing the impact of health problems on at-work performance and productivity from available health data. *J Occup Environ Med* 2009; 51: 515-24.
26. GOTTLIEB AB, CHAUDHARI U, BAKER DG, PERATE M, DOOLEY LT: The national psoriasis foundation psoriasis score (NPF-PS) system versus the psoriasis area severity index (PASI) and physician's global assessment (PGA): A comparison. *J Drugs Dermatol* 2003; 2: 260-6.
27. FORTIN M, HUDON C, DUBOIS MF, ALMIRALL J, LAPOINTE L, SOUBHI H: Comparative assessment of three different indices of multimorbidity for studies on health-related quality of life. *Health Qual Life Outcomes* 2005; 23; 3: 74.
28. GROLL DL, TO T, BOMBARDIER C, WRIGHT JG: The development of a comorbidity index with physical function as the outcome. *J Clin Epidemiol* 2005; 58: 595-602.
29. WOLFE F, MICHAUD K, CHOI HK, WILLIAMS R: Household income and earnings losses among 6,396 persons with rheumatoid arthritis. *J Rheumatol* 2005; 32: 1875-83.
30. ROHEKAR S, POPE J: Assessment of work disability in seronegative spondyloarthritis. *Clin Exp Rheumatol* 2010; 28: 35-40.
31. HUSTED JA, TOM BD, SCHENTAG CT, FAREWELL VT, GLADMAN DD: Occurrence and correlates of fatigue in psoriatic arthritis. *Ann Rheum Dis* 2009; 68: 1553-8.
32. KHRAISHI M, MACDONALD D, RAMPAKAKIS E, VAILLANCOURT J, SAMPALIS JS: Prevalence of patient-reported comorbidities in early and established psoriatic arthritis cohorts. *Clin Rheumatol* 2011; 30: 877-85.
33. GLADMAN DD, THAVANESWARAN A, CHANDRAN V, ZUMMER M: Psoriatic arthritis (PsA) in Canadian clinical practice: the PsA assessment in rheumatology (PAIR). *J Rheumatol* 2012; 39: 1850-3.