Quantifying the economic burden of productivity loss in rheumatoid arthritis

Ivana Filipovic¹, David Walker², Fiona Forster¹ and Alistair S. Curry¹

Abstract

Objective. In light of the large number of recent studies and systematic reviews investigating the cost of RA, this article examines the methods used to assess the impact of RA on employment and work productivity, and provides an overview of the issues surrounding work productivity loss in the RA population.

Methods. A review of the published literature was conducted in order to identify relevant articles. These articles were then reviewed and their methodologies compared. The various methods used to calculate economic loss were then explained and discussed.

Results. We found that although methods of lost productivity and associated costs varied between studies, all suggest that RA is associated with significant burden of illness. Economic analyses that exclude indirect costs will therefore underestimate the full economic impact of RA. However, the methods used to calculate productivity loss have a significant impact on the results of indirect cost analyses, and should be selected carefully when designing such studies. Several factors relating to the disease, the job and socio-demographics have been found to predict work disability.

Conclusions. Consideration of these factors is vital when measuring the extent of both absenteeism and presenteeism, and will allow for more accurate estimation of the impact of RA on work productivity. This information may also guide interventions aiming to prevent or postpone work disability and job loss.

Key words: Rheumatoid arthritis, Cost, Economic, Productivity, Burden of illness.

Introduction

RA is a chronic progressive autoimmune disease associated with flares of inflammation and progressive joint erosion, which often lead to a decline in functional status, joint replacement, severe morbidity and premature mortality [1]. Approximately 70% of patients experience irreversible joint destruction within the first year of disease onset [2] and ~80% of working-age adults with RA experience disabling pain, stiffness and reduced functional ability [3], leading to limitations in activities and restrictions in performance of social roles [4].

A body of literature now documents the impact of RA on workplace productivity [5, 6], the likelihood of unemployment or reduced earning potential due to RA [7], and the effectiveness of early aggressive treatment in postponing and slowing disease progression [8, 9]. Although the disease can occur at any age, >50% of patients with RA are of working age at symptom onset [10]. Work disability has consequently been shown to be one of the most important economic consequences of RA [8], placing a significant economic burden on both individuals and society.

Evidence suggests that a window of opportunity for aggressive treatment during the early course of RA may improve a patient’s ability to maintain employment [11]. Since active treatment of early RA effectively reduces long-term disability [12], this treatment strategy may also offset productivity losses and allow substantial savings to society. Motivated by many recent publications in this area, this article intends to examine the methods used to assess the impact of RA on employment and work productivity, and provide an overview of the issues surrounding work productivity loss in the arthritis population, which have been identified in previously conducted systematic literature reviews.
Valuation of productivity loss

The introduction of several new therapeutic agents for the treatment of RA has driven increasing interest in the costs associated with the disease. Consequently, a wealth of literature has been published investigating the impact of RA on progressive functional disability, reduced work capacity and productivity losses in order to estimate the cost of illness (COI) of RA. These data have been used to highlight the significant economic impact of the disease on patients, their families and society as a whole.

In order to identify relevant studies, searches were conducted in August 2008 across two computerized literature databases: MEDLINE 1996 onwards and Embase 1996 onwards. The cited sources were searched in the keyword fields, using the terms shown in Table 1. After elimination of duplicate citations, the search yielded 204 articles. Retrieved titles and abstracts were examined for inclusion using the criteria outlined in Table 2, and the full text of the paper was obtained if deemed relevant for this review.

The reference lists of these papers were manually checked for any additional studies not identified by the computerized search, and the searches were supplemented by the articles known to the authors. In total, the full text of 15 papers identified from the computerized search was reviewed. An additional 149 papers were checked for any additional studies not identified by the computerized search, and the searches were supplemented by the articles known to the authors. In total, the full text of 15 papers identified from the computerized search was reviewed. An additional 149 papers were identified via the manual search and 119 excluded after reading.

The costs associated with RA have been reported from several countries. However, a direct comparison of findings is challenging due to methodological inconsistencies concerning the components of indirect costs, the criteria used to define work disability and assessment methods. Despite the differences in methods used to measure the COI, all studies have, however, indicated that RA has a significant impact on work productivity. In order to fully appreciate the implications of a COI study, it is important to understand which cost categories are included in the analysis, and how productivity loss has been defined and measured.

Cost classification

For the purposes of economic analyses, costs are typically divided into three categories: direct, indirect and intangible costs [13]. Direct costs are those costs for which direct payments are made and include medical costs that are mainly borne by the health-care sector, and non-medical costs such as transportation and home modifications, which are incurred by the patients and their families.

Indirect costs refer to those for which no actual payments are made but for which resources are lost [14]. These are often classified as either morbidity or mortality costs [15]. Morbidity costs represent the monetary value of lost production due to sick leave, early retirement and reduced work performance, whereas the monetary value of lost production due to the premature death of the patient is defined as a mortality cost.

The non-monetary effects of pain and suffering on an individual’s well-being and quality of life are known as intangible costs. These are very difficult to quantify and are often omitted from cost calculations.

Enabling individuals to remain fully productive members of the workforce allows the resources required to cover these direct and indirect costs to be used elsewhere. Consequently, worker productivity has become a key area of focus in assessing the value of productivity loss in RA.

Definition of worker productivity

The productivity of individual workers is a critical factor of workplace productivity, and is directly affected by an illness [6]. Health interventions that influence worker productivity can, therefore, result in improvements in workplace productivity.

Worker productivity is generally classified as either absenteeism or presenteeism. Absenteeism is defined as productivity loss due to health-related absence from work, and includes sick days, personal time off and time taken as short/long-term sick leave. Presenteeism refers to reduced performance or productivity while at work [16], and has been less frequently measured in the literature, although its importance is becoming increasingly apparent as patients with chronic conditions report impaired work performance, at-work burden and greater effort required to work at the highest capacity [17]. Research indicates that productivity loss without absence represents a significant cost to the economy, with presenteeism costs accounting for 41% of total lost productivity, whereas absenteeism constitutes 9.7% of total lost productivity costs [18].
Measurement of worker productivity

Measuring presenteeism is a complex process, since estimates of productivity loss rely on acquiring accurate data on the amount of work time affected by the disease and the treatment. Although, ideally, methods used to measure presenteeism would be designed specifically to suit the characteristics of a given firm, workplace and profession [19], the development of such methods would be challenging for many professions including research-based occupations where workers do not produce an easily quantifiable output. Nevertheless, several non-disease-specific instruments measure the effect of health on productivity and capture the extent of impaired work performance (Table 3). These instruments typically comprise one or more of four measures: perceived impairment; comparative productivity; performance and efficiency; and unproductive time while at work [19].

Assessment of perceived impairment is the most common approach to measuring presenteeism, and is captured by questioning employees on the extent to which their disease prevents them from performing physical, mental and interpersonal activities. Several tools record presenteeism in this manner, including the Health and Work Productivity Questionnaire (HPQ), Health and Work Questionnaire (HWQ), Stanford Presenteeism Scale (SPS), Work Limitation Questionnaire (WLQ), Work Productivity and Activity Impairment Questionnaire (WPAI), Health and Labour Questionnaire (HLQ) and the Work Instability Scale (WIS).

An alternative valuation method is to compare an employee’s productivity, performance and efficiency with that of their colleagues. It has been argued that the inclusion of a benchmark level of productivity provides more meaningful results than perceived impairment alone [20]. Furthermore, since the results of such comparative analyses are usually gauged on a percentage scale, they are easier to quantify than agreements or disagreements with statements about perceived impairment. HLQ, HWQ and HPQ encompass questions from both categories.

A small number of tools, including the Work Productivity Short Inventory (WPSI) and the HLQ, base their assessment of reduced work productivity on employees’ estimation of their unproductive time. Although this approach appears to be the simplest of the three categories, employees are unable to accurately estimate unproductive time in practice thus limiting its usefulness [19].

In addition to measuring presenteeism, the majority of questionnaires also capture the effect of ill health on absenteeism (Table 3). These questionnaires are usually administered as a part of individual or large-scale household surveys collecting data on absence from work or the number of days one is unable to fully perform job tasks. Recall periods usually range from 1 week to 3 months. The potential for recall bias and reporting on absence due to non-RA-related issues has led to questions surrounding the accuracy of patient-reported data [20], although data have proven to be fairly reliable when the recall periods were short. One study reported a 95% correspondence rate observed between self-reported absence from work and formally recorded data for recall periods of 2 and 4 weeks, declining to 57 and 51% when the recall periods increased to 6 and 12 months, respectively [21]. Strong correlations between patient-reported indirect cost data and official data have also been observed by

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Measures absenteeism</th>
<th>Concept of absenteeism</th>
<th>Recall period, weeks</th>
<th>Measures presenteeism</th>
<th>Number of questions about presenteeism</th>
<th>Recall period, weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPQ</td>
<td>+</td>
<td>Number of hours missed on full days/workdays being absent, extra hours worked</td>
<td>1</td>
<td>+</td>
<td>44</td>
<td>1, 4^a</td>
</tr>
<tr>
<td>HWQ</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>SPS</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>WLQ</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>WPAI</td>
<td>+</td>
<td>–</td>
<td>4</td>
<td>+</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>WPSI</td>
<td>+</td>
<td>–</td>
<td>52</td>
<td>+</td>
<td>4</td>
<td>2/12/52</td>
</tr>
<tr>
<td>WIS</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>2</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>HLQ</td>
<td>+</td>
<td>Number of work days lost</td>
<td>2</td>
<td>+</td>
<td>23</td>
<td>At the moment</td>
</tr>
</tbody>
</table>

Table adapted from Mattke et al. [19] with permission from the American Journal of Managed Care. ^One week for the clinical, 4 weeks for the employer.
other researchers, indicating that the observation of indirect costs by patient questionnaire is a valid method of assessing disease-related productivity losses and a reasonable substitute for records showing employee absenteeism, which many companies fail to collect on a regular basis [22, 23]. The decision regarding the most desirable way to capture work outcomes is further complicated by the fact that workers with arthritis transition in and out of different levels of disability [7]. Perhaps even more complex than deciding on the most appropriate instrument is selecting the most suitable calculation method to estimate productivity costs. The two main methods are the human capital approach and the friction cost approach (FCA).

Methods to quantify productivity loss
The Human Capital Approach (HCA) is the most commonly used method for valuing productivity costs. Although this method predominantly focuses on the impact of illness, treatment or death during paid employment, it can also be used to value time lost from unpaid work and leisure. The HCA stems from neoclassical economic theory, which states that profit-maximizing firms employ workers up to the point where their marginal contribution to production equals their gross wage [24].

Under the HCA, mortality-related productivity costs correspond to the present value of lost gross wages from time of death to retirement age. A life-prolonging intervention therefore reduces productivity costs by the gross wages earned over the additional years of life. Similarly, morbidity-related productivity costs represent the present value of lost gross wages over the period of illness; hence, an intervention that avoids illness reduces productivity costs by the wages earned over the duration of illness prevented [24].

A variety of studies have used the HCA to estimate productivity loss by multiplying the cumulative number of missed workdays by a daily salary [25]. Depending on the availability of data sources, or on guidelines for socio-economic evaluation, authors have either used gross national wages (top-down approach) for the conversion or the actual salaries of individual patients (bottom-up approach). The ethics surrounding the use of individualized wages has been questioned as this approach leads to the identification of patients with lower incomes, and a preference for treating patients with higher incomes [13, 26].

In addition to productivity losses arising from gainful employment, housewives, retired people and students also incur substantial productivity losses. Household productivity costs have been found to account for up to 88% of total productivity costs, suggesting that loss of household productivity might actually exceed that of paid productivity [26]. As RA affects women more than men and its prevalence peaks in the fifth and sixth decade of the life cycle, the exclusion of unpaid work underestimates the magnitude of the overall productivity loss caused by RA, and implies that individuals in higher paid professions achieving potentially greater work productivity are more valuable candidates for expensive therapies. It is, therefore, preferable for estimates of productivity losses to incorporate the valuation of time for unpaid workers as well as for those in paid employment.

Significant debate exists not only around the issue of whether indirect costs should be taken into account in an economic evaluation, but also on the proper way to estimate these costs. Although the HCA has traditionally been used for the estimation of the economic losses, it has been criticized for overestimating true productivity costs to society. Koopmanschap and Rutten [26] argued that counting productivity losses until the date of usual retirement estimates the value of potential rather than actual production loss since, for short-term absences, urgent work might be taken over by others, while non-urgent work may be cancelled or made up by a sick employee upon their return, and long-term absences would lead to replacement with new hires. The friction cost method was therefore proposed as an alternative approach.

According to the FCA, productivity losses still occur but are confined to the period until a previously unemployed individual is able to replace the absent worker. The duration of this period, known as the friction period, depends on the degree of unemployment and the flexibility of the labour market in the country. Under the FCA, productivity costs include the economic losses incurred prior to the absent worker’s substitution, productivity costs as well as the costs of filling the vacancy and training new personnel. Since the amount of production lost as a result of a disease depends on the time organizations need to restore the initial production levels, it is argued that the friction cost method provides a more realistic picture of productivity loss occurring to a society [27], with an increasing number of health economists arguing that this method reflects societal productivity costs most accurately.

Overview of issues relating to reduced performance and work loss
The most common definition of work disability is cessation of paid employment, working a reduced number of hours or receipt of disability benefits. However, these definitions fail to account for the risk factors and barriers to remaining in employment experienced by individuals with RA [28]. Systematic and non-systematic literature reviews have previously examined studies examining the determinants of reduced work performance and work loss [29–31], and it is important to be aware of the existence of such risk factors when evaluating productivity loss. These determinants could also be of considerable interest to policymakers and employers as they could enable preparation for workplace adjustments and thus ameliorate the long-term financial consequences of RA.

Evolution of research into RA and work disability
Initially, the link between RA and work disability was explored from a biomedical perspective. Disease activity or inflammation, measured through laboratory and clinical parameters of RF*, ESR, active joint count (tender and
swollen) or a combination of these individual variables as measured by the DAS was found to be strongly associated with subsequent joint damage and deformity. This structural damage was, in turn, found to result in impaired mobility, reduced muscle strength and reduced manual dexterity [30], giving rise to eventual work loss. Consequently, people who ceased employment were found to suffer from more severe RA in terms of physiological measures compared with those who continued working [32].

Evolving research on work disability has, however, shown that demographic and environmental variables, such as patient’s age, level of education and occupation, are even more important determinants of work status than physiological factors [31]. Patients with comparable levels of disease activity may differ greatly in their work capacity, as ability to work often ties in with other factors including demands of the job. Thus, although the measurement of functional ability may offer valuable insight into the ability to work, it is still a surrogate measure that may not relate to actual work tasks [33]. In 1987, Yelin et al. [33] demonstrated that social and work-related factors have a larger impact on permanent work disability than the disease itself.

The changing outlook on work disability has led to research being conducted from a wider bio-psycho-social perspective in which work disability is viewed as a combination of functional capabilities and work/social conditions [30]. Consequently, a variety of instruments have been developed aiming to determine the extent to which health-related problems interfere with capacity to work (Table 3). Despite the ongoing research, the interaction of disease-related elements, socio-economic background and type of work as determinants of work disability remains an unresolved issue in the rheumatological literature.

Risk factors for work disability and work limitations

Numerous published studies have analysed variables that are either predictive of or associated with RA-induced work disability from a statistical perspective (Table 4). Many of these factors are related, only some were found to be modifiable through medical care, and not all were found to be equally associated with the occurrence of disability status. Generally, the most common factors associated with work disability fall into three main categories:

(i) disease characteristics—assessed by ESR and pain/fatigue scores, disease duration, structural damage and level of functional disability;
(ii) job-related characteristics—occupation, nature of the job, level of physical activity, degree of autonomy at work and employers’ attitude towards disease; and
(iii) socio-demographic variables—patients’ age at RA onset, sex and level of formal education.

All of the studies identified in this review have demonstrated that subjects with RA and high disease activity have an increased chance of becoming work disabled, while job characteristics such as physically demanding labour are equally important risk factors. This suggests that non-medical interventions may prove vital in preventing occurrence of work disability. From a patient’s perspective, fatigue has been cited as a very important aspect of RA and a major threat to loss of employment, indicating that further research on fatigue measurement and management would be of significant interest [35, 16].

Sokka and Pincus [30] argued that in certain European countries work disability commonly arises earlier in the disease course due to favourable health care and social disability arrangements. Such confounding factors should, therefore, be borne in mind when making inter-country comparisons.

Disease duration vs functional outcome

Despite the fact that joint damage does not generally become apparent until late in the disease process, a long-term prospective study has found that recently diagnosed patients experience substantial work loss [35], while a study by Meenan et al. [3] reported that the impact of RA on the health and work status of patients with disease duration of <1 year is similar in magnitude to those with more established disease.

Self-perceived functional disability in RA patients is commonly measured using the HAQ. Scores range from 0 (no functional impairment) to 3 (most impaired). It has been demonstrated that in early RA, HAQ disability is mainly the result of inflammation and pain, whereas joint damage is the main driver of HAQ disability in patients with late disease [37, 38]. These studies suggest that it may, therefore, be appropriate to consider disease duration when assessing work capacity in RA, and efforts to improve work disability must account for the fact that a significant proportion of work impairment occurs during the first few years of the disease.

In summary, even in its early stages, RA has a considerable effect on work status. Work dysfunction results from a complex interplay of ‘medical disease’, demographic variables (age, occupation) and social conditions including government policies on disability payments [31]. Since disease activity is an important risk factor of productivity loss, early disease control may delay the onset of functional disability, hence reducing the impact of RA on worker productivity. This assertion is supported by a growing body of evidence which indicates that early and appropriate treatment of RA improves a patient’s ability to work [39, 40].

Discussion

Over the past decade, a number of studies reporting on the impact of RA on work loss and work disability have been published. Although these studies have reached a common conclusion that absenteeism and presenteeism represent very real expenses to both employers and employees, work disability rates and associated indirect costs vary between the studies. These disparities may be due to differences in indirect cost-calculation methods,
flexibilities in the labour market at the time of the study, definitions of workplace productivity, populations studied, length of follow-up or differences in the social security systems influencing patient motivation to carry on working. It is, therefore, important to consider such factors when reviewing studies of work productivity loss.

Given that all studies have found that patients with RA experience considerable work restrictions, decreased productivity, disability, unemployment or unattainable career choices, regardless of the methodology used to measure and quantify these losses, it is apparent that any COI or pharmaco-economic analyses, which do not include indirect costs, underestimate the full economic impact of RA. Despite this, there is still a reluctance to include the indirect costs associated with RA in pharmaco-economic evaluations, and the debate as to whether to incorporate these costs into the overall assessment of the true value of novel treatment interventions remains ongoing. The authors of this article hope that an increased awareness of the importance and scale of the aforementioned losses will strengthen the case for their inclusion in economic analyses, and drive the search for effective solutions that can be used to minimize the considerable workplace burdens of RA.

Although one would expect that the control of disease activity would naturally be accompanied by the ability to maintain paid or unpaid employment, studies have shown that in many cases employment is not sustainable and patients eventually gravitate towards long-term sick leave, job reassignment or a reduction in workplace commitment. In recent years, there has been considerable research into the development of innovative RA medications that act

### Table 4 Risk factors indicative of work disability in RA

<table>
<thead>
<tr>
<th>Reference</th>
<th>Country</th>
<th>Study design</th>
<th>Precursors to work disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sokka and Pincus [31]</td>
<td>Review of studies conducted in: USA, Finland, Norway, Sweden, Denmark, Finland, Iceland, The Netherlands, Germany</td>
<td>Review of 15 published studies</td>
<td>Disease: disease duration, joint count, raised HAQ score at baseline, pain score</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Job-related: heavy labour</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Socio-demographic: high age, low formal education</td>
</tr>
<tr>
<td>Allaire [43]</td>
<td>Review of studies conducted in: The Netherlands, Germany, USA, Sweden, UK, Finland</td>
<td>Literature review</td>
<td>Disease: high HAQ score at baseline, joint count</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Job-related: physically demanding, low job autonomy</td>
</tr>
<tr>
<td>De Croon et al. [30]</td>
<td>UK, Sweden, Norway, Germany, Finland, USA, The Netherlands</td>
<td>Systematic literature review</td>
<td>Disease: high HAQ disability score</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Socio-demographic: older age, lower education</td>
</tr>
<tr>
<td>Puolakka et al. [5]</td>
<td>Finland</td>
<td>A multicentre, parallel group, randomized, 5-year follow-up study; 195 DMARD-naïve patients with recent-onset active RA (disease duration &lt;2 years)</td>
<td>Disease: high scores in HAQ, patient’s and physician’s global assessment of RA severity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Socio-demographic: low education level, older age</td>
</tr>
<tr>
<td>Barret et al. [7]</td>
<td>UK</td>
<td>Two prospective, primary-care-based cohorts of patients with early RA (n = 160 and n = 134), economically active at symptom onset; mean follow-up: 8.6 and 4.1 years</td>
<td>Disease: high baseline disability score (HAQ),</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Socio-demographic: lower social class, older age at symptom onset, level of educational achievement</td>
</tr>
<tr>
<td>Young et al. [43]</td>
<td>UK</td>
<td>Prospective study of 732 consecutive patients with RA; 5 years follow-up</td>
<td>Disease: severe RA (measured by ESR and HAQ), comorbid conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Job-related: manual-type work</td>
</tr>
<tr>
<td>Jännti et al. [35]</td>
<td>UK</td>
<td>Survey of 782 patients who self-completed questionnaires</td>
<td>Disease: pain, fatigue, physical limitations,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Job-related: absenteeism, lack of support and understanding from the employer</td>
</tr>
<tr>
<td>Doeglas et al. [44]</td>
<td>The Netherlands</td>
<td>Survey of 292 patients with mean RA duration of 1.8 years</td>
<td>Disease: high disease activity (measured by ESR), high functional disability (Ritchie index, HAQ)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Socio-demographic: lower educational level</td>
</tr>
</tbody>
</table>
beyond symptom relief and inhibit subsequent joint destruction. Although the literature examining the impact of these new therapies on work productivity has historically been limited, recent studies suggest that the biologic therapies have a positive impact across a range of workplace burdens [39]. These studies support the increasing belief held by the rheumatology community that biologic therapies are directly associated with employment-related benefits.

However, the effectiveness of any remedial intervention (clinical or vocational) requires an understanding of the reasons leading to employment loss. As described in this article, multiple risk factors interact to create work limitations and work loss, and a variety of valid and reliable instruments have evolved aiming to capture the extent of work disability, employment interruption and cessation. Combining these instruments with the identified risk factors may provide researchers with a way of estimating the impact of RA on work-related productivity, and may also guide early interventions for individual patients to prevent or at least postpone work disability and job loss. Currently, a large number of people with RA face potentially devastating changes in their lifestyles if the impact of the disease is not curbed during the few months following onset. The concept of the ‘window of opportunity’ has recently emerged in rheumatology reflecting the belief that the early introduction of an aggressive treatment results in a greater impact on long-term outcomes, particularly disability. The theory underlying this concept is that the earlier the stage of RA, the smaller the load of disease cells, and the greater the chances for remission [41]. Researchers appear to agree that to minimize the risk of productivity loss and prevent irreversible joint damage, patients with active recent-onset RA should be treated aggressively from the very start. The most recent RA clinical guidelines for England and Wales recommend optimal sequencing of traditional and biological DMARDs, and that these treatments should be initiated as quickly as possible [42].

### Rheumatology key messages
- RA is associated with a significant burden of illness.
- Disease, job and socio-demographic variables predict work disability and should be considered when designing COI studies.

**Disclosure statement:** F.F. and I.F. are employees of Abbott Laboratories. A.S.C. is an employee of Abbott Laboratories and owns stock in the company. The other author has declared no conflicts of interest.

### References


