REVIEW ARTICLE

# The Impact and Burden of Chronic Pain in the Workplace: A Qualitative Systematic Review

Ajay S. Patel, BSc*; Rachel Farquharson,*; Dawn Carroll, MSc†; Andrew Moore, DSc‡; Ceri J. Phillips, PhD§; Rod S. Taylor, PhD¶; Jodie Barden, DPhil*

**Abacus International, Bicester; †Health Economics and Outcomes Research, Pfizer Ltd, Tadworth; ‡Pain Research, Nuffield Division of Anaesthetics Churchill Hospital, University of Oxford, Oxford; §Swansea Centre for Health Economics, Swansea University, Swansea; ¶Peninsula College of Medicine & Dentistry, University of Exeter, Exeter, U.K.*

■ **Abstract:**

*Background:* Chronic pain (CP) poses a diverse and substantial burden for employees, employers, and society. The deleterious consequences of CP in the workplace are frequently underestimated.
*Objective:* To estimate the burden of CP in the European workplace.
*Methods:* A systematic review following PRISMA statement guidelines was conducted to identify studies reporting work-related outcomes for people with CP. EMBASE, MEDLINE, EconLit, and Cochrane Library databases were searched up to 18th August 2010.
*Results:* We identified 91 observational studies. Few were specifically designed to investigate the association between CP, productivity, and employment. The focus for this review was studies clearly reporting outcomes relating to the burden of CP on employment status ($n = 37$), sickness absence (absenteeism, $n = 47$), and loss of productivity because of reduced ability at work (presenteeism, $n = 8$).
*Conclusion:* The body of evidence identified from the systematic review indicates that CP has a substantial negative impact on work-related outcomes, supporting the importance of interventions to reduce the burden of CP. Well-designed prospective studies specifically assessing the direct consequences of CP on employment are needed to confirm these findings. ■

**Key Words:** chronic pain, employment, productivity, absenteeism, systematic review

## INTRODUCTION

Chronic pain (CP) poses a diverse and significant burden for employees, employers, and society. Musculoskeletal disorders associated with CP, such as rheumatoid arthritis (RA) and back pain, have a negative impact upon quality of life that exceeds that of other chronic diseases, including cardiovascular conditions and cancer.[1] The societal costs of CP, in terms of

Address correspondence and reprint requests to: Ajay S. Patel, BSc, Abacus International, 6 Talisman Business Centre, Talisman Road, Bicester, Oxfordshire OX26 6HR, U.K. E-mail: ajay.patel@abacusint.com.

Disclosures: This study was funded by Pfizer Inc. Dawn Carroll is a paid employee of Pfizer. Ajay S. Patel, Rachel Farquharson and Jodie Barden are or were employees of Abacus International, a health outcomes consultancy commissioned by Pfizer Europe to conduct the systematic review., Rod S. Taylor, Ceri J. Phillips and Andrew Moore have had specified relationships with Pfizer and have received financial reimbursement. The authors thank Dr. Rachael D Baker-Searle (Abacus International) for assistance in writing the article.
Submitted: November 11, 2011; Accepted: January 14, 2012
DOI. 10.1111/j.1533-2500.2012.00547.x

*Pain Practice, Volume 12, Issue 7, 2012 578–589*

lost productivity because of sickness absence and reduced work capacity, are considerable and represent the largest proportion of the total costs of CP. For example, in a Swedish study, 85% of total lower back pain costs per patient were attributable to indirect costs.[2] Work can be a cause and aggravator of several conditions associated with CP.[3] Despite the known problems CP creates for the individual and healthcare systems, there is no accurate measure of the total burden of CP in the workplace, so the deleterious consequences of CP are probably underestimated.

In September 2010, the Pain Proposal Steering Committee, an independent group of European experts with a shared interest in CP, published a European consensus with the aim of motivating policy makers and healthcare professionals to deliver more effective and efficient management of CP.[4] The Pain Proposal Steering Committee believe it is unacceptable that more is not being done to directly tackle the issue of CP.[4] They suggest that repeat visits to primary care and specialist referrals because of inadequate management and treatment of CP are key drivers of avoidable healthcare costs.[4] The ineffective treatment of CP may result in the affected individual being unable to work. The burden of CP through absenteeism, presenteeism, and early retirement, for example, is damaging to economies and is a substantial component in the rationale for improving pain management.[5]

The objective of this article is to assess the impact of CP in the workplace. We employ a systematic review methodology and consider evidence from across Europe.

## METHODS

The systematic review follows PRISMA (preferred reporting items for systematic reviews and meta-analysis) statement guidelines.[6]

### Literature Search

EMBASE, MEDLINE, EconLit, and Cochrane Library databases were searched from 2000 to August 2010. Several systematic search strategies were piloted to maximize sensitivity and specificity of the search; the selected terms were combined using a syntax and structure suitable for each individual database. The inclusion date of 2000 were selected to limit included studies to those most recently published and more accurately reflect current workplace policies. Sickness absence and early retirement because of illness are influenced by national insurance and benefits systems that are continually being revised. Search strategies are provided in Tables S1–S4. Studies were screened on the basis of title and abstract; those that appeared relevant (or where a decision could not be made) were reviewed in full. Reference lists from publications meeting the inclusion criteria were hand-searched for further studies.

### Study Selection and Data Extraction

European, observational (prospective and retrospective) studies of people with CP in paid employment or in retirement postemployment were included. CP is defined as any etiology where pain is continuous of duration of 12 weeks or more, or pain that persists following trauma or surgery. Outcomes of interest included the impact of CP on: employment status, absenteeism (absent from work because of CP), return to work rates, and presenteeism (at work but underperforming). Studies were excluded if they were available as abstracts only, non-English language, non-European populations, or assessed only the impact of CP on schooling.

Two reviewers independently scanned all the titles and abstracts and identified potentially relevant articles to be retrieved. Where there was uncertainty, full-text copies of papers were obtained. Study characteristics and results from included studies were extracted into a predetermined table in Microsoft Excel® by 2 independent reviewers and disagreements relating to eligibility or interpretation resolved by consensus.

### Data Analysis and Presentation

Given the marked heterogeneity in study design, populations, and reporting, we were unable to undertake a quantitative pooling of the results of included studies. Instead, we present a qualitative synthesis of findings.

In the absence of an accepted tool for the assessment of the quality of risk of bias of studies assessing association, we sought to apply epidemiological principles in our presentation of findings. This article seeks to examine the question of the association between CP (exposure) and workplace (outcome). In the absence of randomized controlled trials, and to provide adequate evidence of a causal relationship between exposure and outcome, certain conditions should be fulfilled; the so-called "Bradford-Hill criteria."[7,8] Two key elements of the evidence of causation are as follows: (1) Is there a dose–response relationship between outcome and exposure, for example, is the increased intensity/severity of CP associated with a higher (or lower) level of presenteeism? (2) Does the relationship between outcome and exposure take into account potential confounders? For example, is the association between CP and unemployment status consistent after adjusting for age, gender and socioeconomic status of employed and unemployed individuals? Therefore, in our presentation of findings, we focus on evidence from those studies that present their workplace findings according to pain intensity (ie, dose–response) and adjust their analyses to take account of potential confounding variables.

## RESULTS

### Search Results

Of 15,561 studies retrieved, 3,414 were duplicate publications, 11,930 were excluded on the basis of title or abstract, and 217 papers were reviewed in full. Of these, 10 studies referring to CP-associated conditions, such as RA, were excluded because the association with CP was not clearly defined. Sixty-eight studies were included from the electronic searches, and a further 23 studies meeting the inclusion criteria were identified by hand searching of reference lists. A total of 91 studies were included in the review (Data S1). The study selection process is summarized in Figure 1.

### Description of Included Studies

The main characteristics of the 91 studies reporting work-related outcomes in association with CP are summarized in Table 1. Overall, 37 studies reported on employment status, 47 on sickness absence, and 8 on presenteeism. Other work-related outcomes, such as occupational therapist use, were reported but are outside the scope of this article. Studies were broadly grouped by design, but because few studies clearly defined the design, this categorization is not exhaustive. The duration of data collection or follow-up period for the studies was variable (7 days to 12 years), as were the outcome measures assessed and reported.

Classifications, and our reporting of these, should be approached with caution as CP may be described by cause, location, or type, and descriptors are not mutually exclusive. Studies may fall into several categories and be counted more than once. We have not subdivided data by condition for analysis; rather, we consider the impact of CP, irrespective of cause and categorization.

Of the 91 studies, 64 reported pain intensity and 14 of these reported the relationship between pain intensity and a workplace outcome (dose–response relationship).[9–22] Five of the 14 studies adjusted their analyses to take account of potential confounding factors,[13,14,17,19,21] thus highlighting the paucity of high quality studies investigating the dose–response relationship between exposure and outcome.

### Summary of Outcomes

*The Impact of CP on Employment Status.* Thirty-seven publications presented outcomes relating to the burden of CP on employment status (Table S5). Overall, 35 studies reported a negative impact of CP on employment status. Across these 35 studies, interference in employment because of pain was reported in 26%[23] to 88%[24] of participants. Two studies observed no association between CP and employment status. A population-based survey in France determined that the majority of people with chronic back problems were employed despite their functional limitations.[25] However, the author commented that legislation in France at the time of the study meant there were few alternatives to ordinary work for those with back problems. The second study investigated factors associated with the course of persistent pain and observed that recovery from persistent pain was not significantly related to work role disability.[26]

Two studies reported an association between pain intensity and employment status and adjusted for confounding factors.[13,19] The first was a cross-sectional study of the Scottish general population.[19] Three categories of CP were defined for analysis: "any CP"; "significant CP" (CP for which painkillers had been taken and treatment sought recently and frequently); and "severe CP" (CP resulting in high disability and severe limitation; CPG IV[27]). Multiple regression analysis showed that being unable to work through sickness or disability was independently associated with all categories of CP; [odds ratio [OR] "any CP" 7.8 (95% CI: 4.6 to 13.1); "significant CP" 10.1 (95% CI: 6.9 to 14.8); "severe CP" 49.4 (95% CI: 29.9 to 81.7)]. The association of CP with employment status was further investigated by analysis of respondents of working age. Employment rates fell from 81% in people without CP

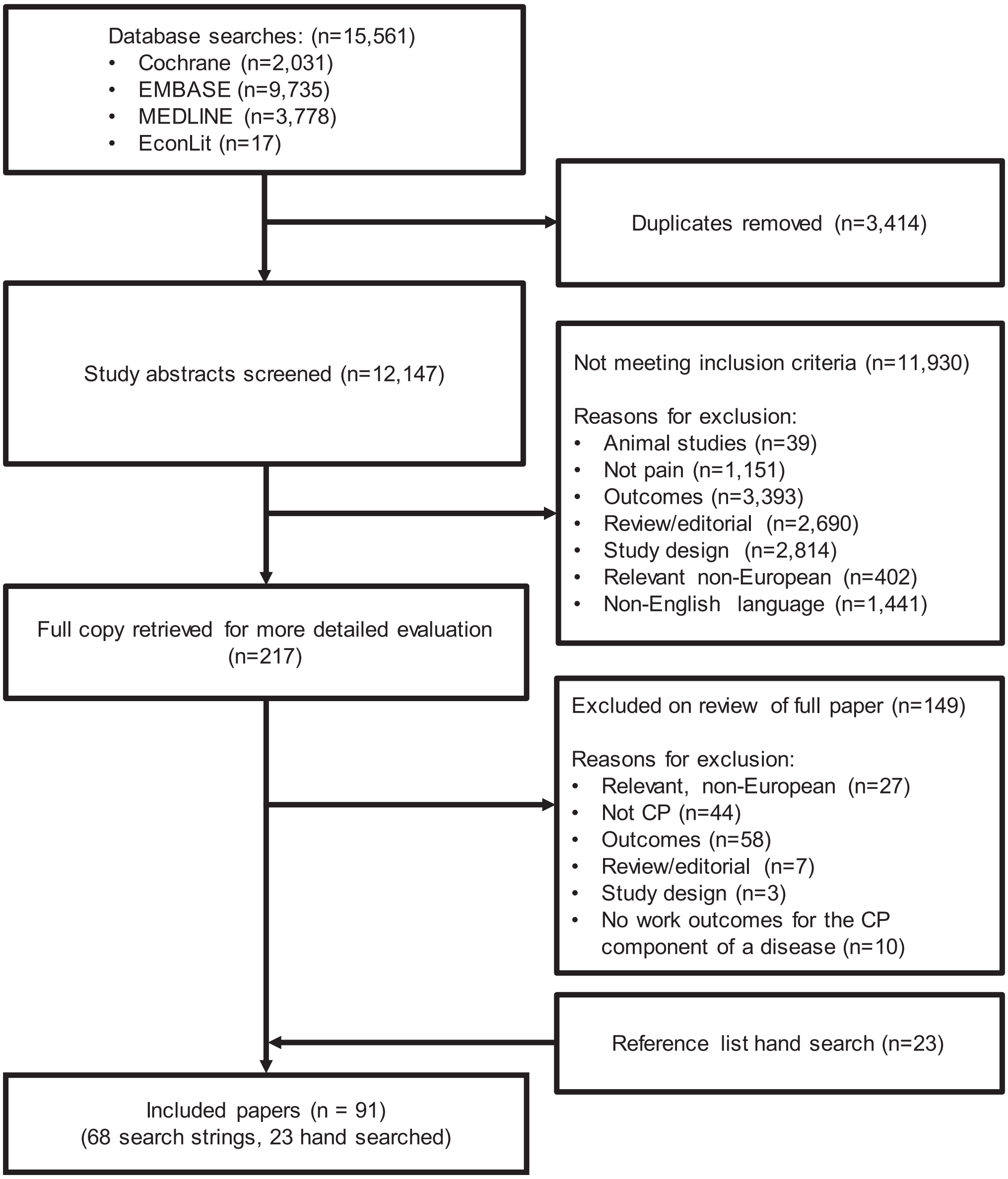

**Figure 1.** Flow diagram to illustrate the selection of studies.

to 24% in those with severe CP (CPG questionnaire). Inability to work rose with increasing pain severity from 1.3% for those with no CP to 61% for those with severe CP.[19] The second study, a survey of a representative sample of the Swedish population, reported an association between pain intensity and the ability to work 25 or more hours a week.[13] Among the 7,637 participants, the prevalence of CP was 54%. CP was associated with a significantly lower prevalence of working 25 or more hours per week in those < 65 years (prevalence ratio: 0.89 [95% CI: 0.84 to 0.95]), whereas pain not considered chronic did not have a significant impact.[13] In those subjects with CP pain aged 65 years or less, pain intensity was a factor associated with working fewer hours. The estimated prevalence of working 25 or more hours per week was considerably lower for those subjects with unbearable/severe CP (prevalence ratio 0.83 [95% CI: 0.72 to 0.95]).[13]

Five studies considered the association between employment status and pain intensity.[11,12,16,20,22] Young et al.[22] assessed the factors associated with the ability of people with RA in a U.K. cohort to maintain paid work. Subjects with RA (of < 2 years duration)

**Table 1. Summary of Characteristics of Included Studies (*n* = 91)**

| Study Characteristic | No. of Studies |
|---|---|
| Outcome(s) reported* | |
| Employment status | 37 |
| Sickness absence | 47 |
| Presenteeism | 8 |
| Other work-related outcomes | 23 |
| Country of study | |
| Multi-country | 12 |
| Sweden | 27 |
| the Netherlands | 15 |
| U.K. | 11 |
| Denmark | 7 |
| Norway | 5 |
| France | 4 |
| Germany | 3 |
| Finland | 3 |
| Spain | 1 |
| Austria | 1 |
| Republic of Ireland | 1 |
| Switzerland | 1 |
| Description of chronic pain* | |
| Type | |
| Lower back pain/back pain | 36 |
| Musculoskeletal | 11 |
| Neck/shoulder | 6 |
| Chronic noncancer pain | 6 |
| Associated with a condition | |
| Arthritis (including RA) | 2 |
| Severe irritable bowel syndrome | 1 |
| Fibromyalgia | 4 |
| Repetitive strain injury | 1 |
| Ongoing postsurgical/post-trauma pain | 9 |
| Neuropathic pain | 6 |
| Complex regional pain syndromes | 1 |
| Undefined | |
| Chronic pain | 14 |
| Persistent/disabling/long duration pain | 5 |
| Study type | |
| Cross-sectional | 47 |
| Prospective cohort | 40 |
| Controlled observational | 2 |
| Cost-of-illness | 2 |

*Studies may fall into several categories and be counted more than once.

were followed for 5 years. In those who had stopped working by 5 years follow-up, higher pain levels were significantly associated with permanent work disability. The median Pain visual analogue score (VAS) for those still working was 28.4 (interquartile range [IQR]: 13.2 to 40.5) vs. 41 (IQR: 26 to 53), for those who had stopped working because of RA, $P < 0.00001$.[22] In a U.K. cohort study, there were significant differences in the percentage of people not working because of pain based on category of back pain ($P < 0.001$). The majority of people with severe CP (Chronic Pain Grade [CPG-Von Korff][27]) scores characterized using longitudinal latent class analysis) were not working as a consequence of their pain (baseline: 39/72, 57%; at 12 months: 30/63, 54%). In comparison, only 9% of people classified as recovering (ie, not CP sufferers and unlikely to experience further back pain) were unable to work because of pain at baseline (1% at 12 months).[12] Some level of interference in employment because of pain was reported in 43% (225/524) of people with neuropathic pain in a multi-country study (6 European countries). The overall impact of neuropathic pain on employment status was 30% lower for people with mild vs. severe pain (Brief Pain Inventory [BPI] severity score[16,28]). CP significantly interfered with work irrespective of severity (Wisconsin Brief Pain Questionnaire [WBPQ][29]; $P < 0.001$) in a Scottish cross-sectional study of 60 people with CP after groin hernia repair; the effect on employment was more marked in those who reported severe/very severe pain.[11] Further evidence of the association between pain intensity and poorer work outcomes is derived from a multi-country European study of 140 people with painful diabetic peripheral neuropathy (DPN)[20]; a third (35%) reported some work disruption due to pain, with significant association between pain severity (Pain Severity Index [PSI] from the BPI[28]) and employment status ($P < 0.05$). Pain was associated with disruptions in employment in 38% and 48% of patients with moderate and severe pain, compared with only 14% of those with mild pain.[20]

The remaining studies did not define the intensity of CP but simply reported the burden of CP, as a whole, on employment status. Loss of employment because of CP was observed in 18% to 23% of individuals across 3 studies.[23,30,31] An additional study reported baseline job loss in people with RA (3.5%) but included people with co-morbidities and took no account of those losing their job during the study.[22] In conditions such as fibromyalgia and arthritis, reasons for job loss are multifactorial, with CP potentially a driving factor. Only one study considered CP rather than a specific condition.[23] In this multi-country study (15 European countries plus Israel) including more than 4,000 people with CP, 19% of participants stated "pain" as the cause for employment loss.[23] This was the largest European study (> 4,000 participants) demonstrating an association between CP and work.

Chronic pain is a frequent cause of work disability, between 13% and 76% of people were reported work-disabled because of CP across 7 studies with variation probably due to differences in underlying CP-associated conditions.[30–36] Early retirement because of CP was reported in 8% to 28% of individuals across 6 studies.[2,16,20,37–39] A study in Norway demonstrated the societal impact of early retirement—15% of disability pensions granted from 1983 to 1993 were because of back pain, and the 11-year cumulative incidence of disability retirement because of inflammatory and noninflammatory back pain was 0.15% and 1.6%, respectively.[38] Full disability/inability to work was reported in 10 studies.[12,19,22,30,32,39–43] This varied from 12% in those with long-term groin pain after surgery for a groin hernia[41] to 61% in those with severe CP (in contrast to 1.3% for those with no pain in the same study).[19] In addition, Breivik et al.[23] reported that 61% of participants were less able/unable to work outside of the home in a large CP study.

While unemployment because of ill-health in CP-associated conditions is likely to be multi-factorial, CP is probably a key factor affecting employment status. For example, days with pain per month were significantly greater in people with IBS who were unemployed than in others (mean: 26 days, SD: 6.7 vs. mean: 23 day SD: 9.7; $P = 0.008$).[40]

***The Impact of CP on Sickness Absence.*** Forty-seven of the 91 included publications reported outcomes relating to sickness absence (Table S5). The reporting of sickness absence varied considerably between studies, with some studies including only people with 3 to 4 months sickness absence at baseline. This made it difficult to make a comparison of mean duration of sick leave between studies.

Seven publications considered the association between pain intensity and sickness absence.[9,10,14,15,17,18,21] Pain intensity was measured using the various scales: Von Korff,[27] $n = 2$; VAS,[44] $n = 3$; Multidimensional Pain Inventory (MPI),[45] $n = 1$; and 10 point numerical scales, $n = 2$.

Three of the 7 studies adjusted their analyses to account for confounding variables.[14,17,21] Participants from a Dutch community with a higher intensity of musculoskeletal pain at baseline (10-point numerical scale) had a greater risk of absenteeism at 6 months follow-up (OR 1.2; 95% CI: 1.02 to 1.4; $P < 0.05$).[17] Pain intensity and return to work (RTW) rates were considered in the other 2 studies.[14,21] The first was a multi-country study that included 4 European countries (Denmark, Germany, The Netherlands, and Sweden) and, where data were pooled, the United States and Israel.[14] This study demonstrated that lower pain intensity, in people who had been fully work incapacitated during the 3 consecutive months prior to the study because of chronic low back pain (LBP), was a predictor of RTW within 1 year (all European countries: $P < 0.005$).[14] The second study, a Dutch cohort study of employees with 3 to 4 months sickness absence because of LBP, demonstrated that those with less pain (VAS) at entry were significantly more likely to RTW within 1 year (adjusted OR: 0.85; 95% CI: 0.7 to 0.99).[21]

Among the remaining studies that considered pain intensity, another multi-country study demonstrated that lower pain intensity scores (Von Korff Grading Severity Scale[27]) were one of the health-related variables associated with earlier sustainable RTW (HR 0.95; 95% CI: 0.92 to 0.99; $P = 0.004$).[9] The influence of various factors on the management of LBP was explored in a Spanish study, with logistic regression analysis demonstrating that greater severity of leg pain (VAS), but not LBP, was associated with sickness absence (OR 1.1; 95% CI: 1.0 to 1.2; $P = 0.024$). However, only 4.3% (28/648) of participants were described as having CP in this study.[15] In a Dutch cross-sectional study of people with RSI, those who were sick-listed ($n = 376$) reported a greater intensity of pain (VAS) vs. the working group ($n = 745$; 52 [SD 24] vs. 36 [SD 25]; $P < 0.001$).[18] In the final study, it appeared that length of sickness absence, rather than simply pain intensity, played a role in the outcome of a vocational rehabilitation program.[10] In this Swedish cohort study of 142 patients with CP (neck/back) followed for 7 years, dysfunctional patients had a significantly greater intensity of pain than adaptive copers and interpersonally distressed people (groups derived from the Swedish equivalent of the MPI scale). Although the duration of sickness absence and the risk of receiving a full-time disability pension were generally higher in the dysfunctional group, no clear association with pain intensity was noted in the publication. Rather, when sub-grouping was performed, it appeared that a significantly greater total amount of sickness absence and a higher risk of full-time disability pension was only reported with dysfunctional vs. adaptive copers where the subject had > 60 days of sickness absence prior to the rehabilitation program.[10]

Of the studies that considered CP pain, with no measure of intensity, the following examples illustrate the burden of absenteeism.

- A Swedish cross-sectional study demonstrated that in a representative sample of the population (7,637 participants), the prevalence of CP was 54% and was significantly associated with sickness absence or early retirement (prevalence ratio (PR): 1.5; 95% CI: 1.3 to 1.6).[13]

- In a Dutch study of 253 people with musculoskeletal disorders, chronic lower back pain was significantly associated with a longer duration of sickness absence in univariate analysis (HR 1.5; 95% CI: 1.0 to 2.3; $P \leq 0.05$).[46]
- A significant difference with regards to sickness absence ($P < 0.001$) was reported a study which compared people with CP to the general Swedish population. The reported mean sickness absence was 43 days for people with CP vs. 12 days in the control group.[47]
- A Danish epidemiological study found that 17% (130/772) of participants with CP had at least 1 day of absence because of illness during the previous 14 days compared with 10% (511/5,187) in the no-pain group. The odds of having such an absence were twice as high in the CP group vs. the no-pain group.[37]
- A Finnish cohort study of people with pain demonstrated that self-certified (1 to 3 days) and medically certified sickness (≥ 4 days) absences were more common among those with CP than those with no pain.[48]
- At 3 years follow-up in a Swiss study, people with CP after sustaining a severe accidental injury reported significantly more days off work than similar people without pain (580 vs. 215, $P < 0.001$).[49]

Prolonged sickness absence because of CP may lead to negative self-beliefs that strongly hinder a sustained RTW.[50] In a multi-country study, the RTW rate varied extensively between countries, ranging from 22% in Germany to 62% in the Netherlands.[9] This study included 2,825 compensation claimants off work for 3 to 4 months because of LBP. A sustainable RTW at 2 years after the first sickness absence was achieved in only 44%.[9] Another multi-country cohort study included over 1,600 people sicklisted for 3 to 4 months.[51] Fifty-seven percent of the study population had a history of sick leave because of LBP in the year before the study and only 72% (1,179/1,631) of these were still working 2 years later.[51] Two other studies also demonstrated low RTW rates. Only 66% (198/298) of people had returned to work within 1 year after the first day of sick leave in a Dutch cohort of employees with 3 to 4 months sick leave because of LBP.[21] A number of factors may impact on RTW rates following sick leave for CP. A Swedish study assessing a multi-professional rehabilitation program demonstrated that significantly more people on long-term sick leave because of musculoskeletal pain returned to work after an 8-week program compared with matched people who were not offered the therapy (31% vs. 16%, $P < 0.001$).[52] This study indicated that effective management of CP can improve RTW rates.

Sick leave is arguably a crude predictor for future work disability in patients with CP and has variable impact across Europe depending on socio-economic variables. A Dutch cohort study using data derived from a randomized controlled trial in people with chronic arthritis demonstrated that a significantly larger proportion of patients who lost their job after 24 months follow-up had been on sick leave or complete (as opposed to partial) sick leave at baseline vs. those who remained employed ($P = 0.026$ and $P = 0.002$, respectively.[31] A duration of sick leave of ≥ 6 weeks at baseline was significantly associated with increase in work disability pension (OR 3.1; 95% CI: 1.4 to 6.7).[31] Univariate analysis demonstrated significant associations with being currently on sick leave and complete sick leave at baseline with job loss and increase in disability pension. In multivariate analysis, the presence of complete sick leave was significantly and independently associated with job loss (OR 4.3; 95% CI: 1.6 to 11) and increase in work disability (OR 5.0; 95% CI: 2.1 to 12) after 2 years follow-up.[31]

***Loss of Productivity Because of Presenteeism.*** Eight studies reported on loss of productivity (LOP) (Table S5) because of reduced ability at work.[2,16,20,21,47,53–55] Only one of the 8 publications, however, considered an association with pain intensity, and analyses were not adjusted to account for confounding variables. In this European cross-sectional study, the majority (60%) of employed patients with painful DPN (13% of 140 people) reported being less productive at least some of the time. Loss of productivity described as occurring all/most of the time, a good bit/some of the time, and a little/none of the time was significantly associated with increased pain severity ($P < 0.05$).[20]

Although there is a paucity of high quality studies, the available data suggest that presenteeism because of CP places a substantial burden on the workplace:

- A Dutch cohort study of employees with 3 to 4 months sickness absence because of LBP demonstrated that out of the 66% (198/298) of employees who were working at 1 year after the first day of sickness absence, 21% worked less hours and/or were less productive compared with their old job.[21]

- In 2 Swedish studies in which long-term/recurrent pain was considered, work performance was clearly affected by pain.[47,55] In the first, logistic regression analyses demonstrated that gnawing pain was significantly associated with an increased risk of problems with work performance (as assessed using the functional status questionnaire [FSQ]) (OR 0.38; 95% CI: 0.22 to 0.64; $P = 0.0003$).[55] The second study demonstrated that significantly fewer people with CP were considered in the acceptable zone for work performance (assessed by FSQ) vs. normative controls (6.9% vs. 98%; $P < 0.001$).[47]
- In a third Swedish study of 302 patients with LBP, the majority (55%) of patients who were employed experienced 43/60 days with reduced work capacity. The work productivity on these days was approximately 71%. Average costs per patient associated with reduced work capacity were estimated at 16% of the total annual costs of LBP (3,212 EUR per patient/per year [2002]).[2]
- The majority of employed patients with neuropathic pain (53% [58/109]) in a multi-country cross-sectional study (6 European countries) reported being less productive at work at least some of the time.[16]
- The impact of CP on productivity is illustrated in a Danish cross-sectional study of patients referred to a multidisciplinary pain clinic. During the time that the 47 employed participants (29%) were able to work in the previous 7 days, productivity was decreased by 51%, equating to 31 minutes of every hour being nonproductive because of CP. Overall, taking into account the total number of work hours available in the previous 7 days, 41% were lost because of CP.[53]

## DISCUSSION

The evidence from the systematic review supports the belief that CP has a substantial negative impact on work-related outcomes, for the individual who wants to work but cannot (permanent disability, early retirement, and absenteeism), and on loss of productivity in the workplace (presenteeism). Almost every study identified reported a negative association between CP pain and a work-related outcome. Only 2 studies observed no association between CP and employment status. A population-based survey in France found that the majority of people with chronic back problems were employed despite their functional limitations.[25] However, the author commented that legislation in France at the time of the study meant there were few alternatives to ordinary work for those with back problems. Thus, suggesting that in France, it may be more informative to consider the effect of CP pain on absenteeism and presenteeism, rather than on employment status. The second study investigated factors associated with the course of persistent pain and observed that recovery from persistent pain was not significantly related to work role disability.[26]

The majority of evidence identified was from cross-sectional studies that were not specifically designed to address the impact of CP pain on work outcomes. Nevertheless, the negative association between CP and a work-related outcome was sustained in higher quality studies that examined the relationship of CP severity (dose–response relationship) and adjusted for confounding variables. The negative association also appeared to be consistent across different European populations regardless of country (and social security policies) and CP etiology.

Further evidence supporting a negative impact of CP on work-related outcomes is provided by a recent meta-analysis of patient level data from trials (predominantly US) of pregabalin in fibromyalgia.[56] This study (published after the cut-off date for the current systematic review) demonstrates that patients with a large improvement in pain intensity and who achieve a low level of pain following treatment gain the most benefit in terms of work-related outcomes, suggesting a significant association between pain relief and reduced work interference.[56]

Evidence presented here suggests that the effects of CP translate into substantial, deleterious consequences for employees, employers and society. The ineffective treatment of CP is likely to exacerbate work-related problems for the patient. It is clear from the recent European consensus published by the Pain Proposal Steering Committee that more effective and efficient management of CP is required.[4] Owing to the nature of the systematic review performed, the majority of study participants were in employment (or on sickness absence) when the studies began. Although the studies captured the number of participants unable to work because of CP, the true impact of this burden may have been underestimated because many studies would not have included those already unable to work because of CP.

The association between CP and employment was not typically the primary focus of the included studies, and findings were often not adjusted for potential confounding variables. Positive associations do not therefore necessarily infer causation. Frequently data were presented in an arbitrary or incidental manner, with many publications acting as inventories rather than providing explanations for the data derived. Duration, localization and intensity of CP, the mean age of the participants, duration of previous sickness absence, income, and the employment status of subjects at baseline were inconsistently reported, and baseline characteristics of participants were diverse. Such variables are potential confounding factors and may have an impact on results relating to the burden of CP in the workplace. The diversity of outcomes, methods of reporting, and the qualitative nature of the studies meant that no formal assessment of quality was possible.

Another limitation of included studies was the use of self-reported data, which is open to bias. Subjects may attribute their inability to work primarily to CP; however, occupational status may be influenced by a variety of additional factors (such as self-efficacy). Data generated by surveys relies on the recall ability of the participants and sensitive information, such as sickness absence, may not be fully reported because of participants providing socially desirable answers. The use of outcome measures also varied between studies. For example, it was not always clear how the term "chronic" was applied and a variety of instruments were used where pain intensity was assessed. Standardized outcome measures to classify chronicity, sickness absence, and pain intensity will improve the quality of studies assessing CP in the workplace.

Clearly, this is a topic that deserves more attention in large, well-designed observational studies. Despite the large body of evidence identified in this systematic review, there is a paucity of high quality studies with primary objective outcomes of assessing the impact of CP in the workplace. Studies investigating the effectiveness of CP interventions on work-related outcomes could provide useful evidence of a causal relationship between exposure and outcome. In future research in this field, the use of consistent outcomes measures, such as the QoWL Work and Wellbeing Outcome Scale[57] and Work Productivity and Activity Impairment Questionnaire (WPAI),[58] would substantially aid comparisons between studies. Commonly used quality of life indicators, such as SF-36, do ask questions regarding work and interference, but the specific answers are often lost in the overall domain scores that are reported by most studies. They can be analyzed specifically by individual question in individual patient analyses, but this is rarely performed.[56]

Very few studies reported data regarding the association between pain length or intensity and employment outcomes. Although this seems intuitive and the limited evidence identified within the current systematic review supports the hypotheses that increased pain intensity and a longer duration of pain are associated with poorer work-related outcomes, there is a need for further well-designed studies exploring these correlations. It is important to identify workers currently on sick leave who are at risk of further lengthy absences and who may be unable to achieve sustainable RTW in their current situation. The identification of such employees would enable the implementation of strategies for a RTW (such as ergonomic interventions, role-adjustment, and/or reduced working hours) and would indicate those in most need of a greater degree of clinical management to remain in employment.[59]

Politics, economics, and socio-historical elements all influence clinical presentation and practice;[60] therefore, excessive generalization of evidence within a systematic review is inadvisable. Comparisons between studies in the current systematic review should be viewed with caution because of the diverse nature of the baseline characteristics of participants, and the methods of collecting and presenting data. There are also other potential confounding factors including the insurance and benefits system that operates in each of the respective countries, the type of CP-associated condition, duration/intensity of pain, and sickness absence prior to study commencement. However, this article employed a systematic literature search of several key databases with defined inclusion and exclusion criteria, and it considered a variety of CP-associated conditions. It is likely that the majority of studies on CP and work have been included. Moreover, the consistency in the negative influence of CP on measures of work suggests that the presence of a substantial body of unpublished studies showing no association is unlikely.

We conclude that CP represents a substantial burden in the European workplace. Despite the limitations of the current systematic review, there is consistent evidence of a negative impact of CP on employment status and absenteeism. The impact of CP on presenteeism is apparent, although the evidence base is weaker. There is a need for high quality studies specifically designed to assess the impact of CP on employment and quantify the burden to society. Innovative treatments, with proven efficacy and safety via clinical trials, and appropriate investment in this area in the future are required to alleviate individual patient suffering and reduce the burden of CP to society.

## ACKNOWLEDGEMENTS

This study was funded by Pfizer Inc. DC is a paid employee of Pfizer. AP, RF, and JB are or were employees of Abacus International, a health outcomes consultancy commissioned by Pfizer Europe to conduct the systematic review. RT, CP, and AM have had specified relationships with Pfizer and have received financial reimbursement. The authors thank Dr. Rachael D Baker-Searle (Abacus International) for assistance in writing the article.

## REFERENCES

1. Sprangers MA, de Regt EB, Andries F, et al. Which chronic conditions are associated with better or poorer quality of life? *J Clin Epidemiol*. 2000;53:895–907.
2. Ekman M, Jonhagen S, Hunsche E, Jonsson L. Burden of illness of chronic low back pain in Sweden: a cross-sectional, retrospective study in primary care setting. *Spine*. 2005;30:1777–1785.
3. Bevan S, Quadrello T, McGee R, Mahdon M, Vavrovsky A, Barham L. Fit For Work? Musculoskeletal Disorders in the European Workforce. Fit for Work Europe 2009:6.
4. Pain Proposal Steering Committee. Pain Proposal. Improving the Current and Future Management of Chronic Pain: A European Consensus Report, 2010. Available at: http://www.mijnpijn.nl/pdf/PainProposalEuropeanReport.pdf. Last accessed 20 June 2011.
5. Phillips C, Main C, Buck R, Aylward M, Wynne-Jones G, Farr A. Prioritising pain in policy making: the need for a whole systems perspective. *Health Policy*. 2008;88:166–175.
6. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ*. 2009;339:b2700.
7. Bradford-Hill A. The environment and disease: association or causation? *Proc R Soc Med*. 1965;58:295–300.
8. Sackett DL, Haynes RB, Guyatt GH, Tugwell P. *Clinical Epidemiology: A Basic Science for Clinical Medicine*. 2nd ed. Boston, MA: Little Brown; 1991:284–285.
9. Anema JR, Schellart AJM, Cassidy JD, Loisel P, Veerman TJ, Van Der Beek AJ. Can cross country differences in return-to-work after chronic occupational back pain be explained? An exploratory analysis on disability policies in a six country cohort study. *J Occup Rehabil*. 2009;19:419–426.
10. Bergstrom G, Bergstrom C, Hagberg J, Bodin L, Jensen I. A 7-year follow-up of multidisciplinary rehabilitation among chronic neck and back pain patients. Is sick leave outcome dependent on psychologically derived patient groups? *Eur J Pain*. 2010;14:426–433.
11. Courtney CA, Duffy K, Serpell MG, O'Dwyer PJ. Outcome of patients with severe chronic pain following repair of groin hernia. *Br J Surg*. 2002;89:1310–1314.
12. Dunn KM, Jordan K, Croft PR. Characterizing the course of low back pain: a latent class analysis. *Am J Epidemiol*. 2006;163:754–761.
13. Gerdle B, Bjork J, Henriksson C, Bengtsson A. Prevalence of current and chronic pain and their influences upon work and healthcare-seeking: a population study. *J Rheumatol*. 2004;31:1399–1406.
14. Hansson TH, Hansson EK. The effects of common medical interventions on pain, back function, and work resumption in patients with chronic low back pain: a prospective 2-year cohort study in six countries. *Spine*. 2000;25:3055–3064.
15. Kovacs FM, Fernandez C, Cordero A, et al. Non-specific low back pain in primary care in the Spanish National Health Service: a prospective study on clinical outcomes and determinants of management. *BMC Health Serv Res*. 2006;6:57.
16. McDermott AM, Toelle TR, Rowbotham DJ, Schaefer CP, Dukes EM. The burden of neuropathic pain: results from a cross-sectional survey. *Eur J Pain*. 2006;10:127–135.
17. Severeijns R, Vlaeyen JWS, Van Den Hout MA, Picavet HSJ. Pain catastrophizing is associated with health indices in musculoskeletal pain: a cross-sectional study in the Dutch Community. *Health Psychol*. 2004;23:49–57.
18. Sluiter JK, Frings-Dresen MHW. Quality of life and illness perception in working and sick-listed chronic RSI patients. *Int Arch Occup Environ Health*. 2008;81:495–501.
19. Smith BH, Elliott AM, Chambers WA, Smith WC, Hannaford PC, Penny K. The impact of chronic pain in the community. *Fam Pract*. 2001;18:292–299.
20. Tolle T, Xu X, Sadosky AB. Painful diabetic neuropathy: a cross-sectional survey of health state impairment and treatment patterns. *J Diabetes Complications*. 2006;20:26–33.
21. Van der Giezen AM, Bouter LM, Nijhui FJN. Prediction of return-to-work of low back pain patients sicklisted for 3–4 months. *Pain*. 2000;87:285–294.
22. Young A, Dixey J, Kulinskaya E, et al. Which patients stop working because of rheumatoid arthritis? Results of five years' follow up in 732 patients from the Early RA Study (ERAS). *Ann Rheum Dis*. 2002;61:335–340.

23. Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *Eur J Pain*. 2006;10:287–333.

24. Friessem CH, Willweber-Strumpf A, Zenz MW. Chronic pain in primary care. German figures from 1991 and 2006. *BMC Public Health*. 2009;9:299.

25. Leclerc A, Chastang JF, Ozguler A, Ravaud JF. Chronic back problems among persons 30 to 64 years old in France. *Spine*. 2006;31:479–484.

26. Gureje O, Simon GE, Von Korff M. A cross-national study of the course of persistent pain in primary care. *Pain*. 2001;92:195–200.

27. Von Korff M, Ormel J, Keefe FJ, Dworkin SF. Grading the severity of chronic pain. *Pain*. 1992;50:133–149.

28. Cleeland CS, Ryan KM. Pain assessment: global use of the Brief Pain Inventory. *Ann Acad Med Singapore*. 1994;23:129–138.

29. Daut RL, Cleeland CS, Flanery RC. Development of the Wisconsin Brief Pain Questionnaire to assess pain in cancer and other diseases. *Pain*. 1983;17:197–210.

30. Choy E, Perrot S, Leon T, et al. A patient survey of the impact of fibromyalgia and the journey to diagnosis. *BMC Health Serv Res*. 2010;10:102.

31. De Buck PDM, De Bock GH, Van Dijk F, Van den Hout WB, Vandenbroucke JP, Vliet Vlieland TPM. Sick leave as a predictor of job loss in patients with chronic arthritis. *Int Arch Occup Environ Health*. 2006;80:160–170.

32. Boonen A, Van Den Heuvel R, Van Tubergen A, et al. Large differences in cost of illness and wellbeing between patients with fibromyalgia, chronic low back pain, or ankylosing spondylitis. *Ann Rheum Dis*. 2005;64:396–402.

33. Buitenhuis J. Work disability after whiplash: a prospective cohort study. *Spine*. 2009;34:262–267.

34. Catala E, Reig E, Artes M, Aliaga L, Lopez JS, Segu JL. Prevalence of pain in the Spanish population: telephone survey in 5000 homes. *Eur J Pain*. 2002;6:133–140.

35. Friedrich M, Cermak T, Heiller I. Spinal troubles in sewage workers: epidemiological data and work disability due to low back pain. *Int Arch Occup Environ Health*. 2000;73:245–254.

36. Thomson S, Jacques L. Demographic characteristics of patients with severe neuropathic pain secondary to failed back surgery syndrome. *Pain Pract*. 2009;9:206–215.

37. Eriksen J, Jensen MK, Sjogren P, Ekholm O, Rasmussen NK. Epidemiology of chronic non-malignant pain in Denmark. *Pain*. 2003;106:221–228.

38. Hagen KB, Holte HH, Tambs K, Bjerkedal T. Socioeconomic factors and disability retirement from back pain: a 1983–1993 population-based prospective study in Norway. *Spine*. 2000;25:2480–2487.

39. McCracken LM, Eccleston C. A prospective study of acceptance of pain and patient functioning with chronic pain. *Pain*. 2005;118:164–169.

40. Creed F, Ratcliffe J, Fernandez L, et al. Health-related quality of life and health care costs in severe, refractory irritable bowel syndrome. *Ann Intern Med*. 2001;134(9 Pt 2):860–868.

41. Franneby U, Sandblom G, Nordin P, Nyren O, Gunnarsson U. Risk factors for long-term pain after hernia surgery. *Ann Surg*. 2006;244:212–219.

42. Meyer-Rosberg K, Kvarnstrom A, Kinnman E, Gordh T, Nordfors L, Kristofferson A. Peripheral neuropathic pain – a multidimensional burden for patients. *Eur J Pain*. 2001;5:379–389.

43. Torrance N, Smith BH, Bennett MI, Lee AJ. The epidemiology of chronic pain of predominantly neuropathic origin. Results from a general population survey. *J Pain*. 2006;7:281–289.

44. Streiner DL, Norman GR. *Health Measurement Scales*. 3rd ed. Oxford: Oxford University Press; 2003.

45. Bergstrom G, Jensen IB, Bodin L, Linton SJ, Nygren AL, Carlsson SG. Reliability and factor structure of the Multidimensional Pain Inventory – Swedish Language Version (MPI-S). *Pain*. 1998;75:101–110.

46. Lotters F, Burdorf A. Prognostic factors for duration of sickness absence due to musculoskeletal disorders. *Clin J Pain*. 2006;22:212–221.

47. Mullersdorf M, Soderback I. The actual state of the effects, treatment and incidence of disabling pain in a gender perspective – a Swedish study. *Disabil Rehabil*. 2000;22:840–854.

48. Saastamoinen P, Laaksonen M, Lahelma E, Leino-Arjas P. The effect of pain on sickness absence among middle-aged municipal employees. *Occup Environ Med*. 2009;66:131–136.

49. Jenewein J, Moergeli H, Wittmann L, Buchi S, Kraemer B, Schnyder U. Development of chronic pain following severe accidental injury. Results of a 3-year follow-up study. *J Psychosom Res*. 2009;66:119–126.

50. Busch H, Goransson S, Melin B. Self-efficacy beliefs predict sustained long-term sick absenteeism in individuals with chronic musculoskeletal pain. *Pain Pract*. 2007;7:234–240.

51. Anema JR, Cuelenaere B, van der Beek AJ, Knol DL, de Vet HCW, van Mechelen W. The effectiveness of ergonomic interventions on return-to work after low back pain; a prospective two year cohort study in six countries on low back pain patients sicklisted for 3–4 months. *Occup Environ Med*. 2004;61:289–294.

52. Norrefalk JR, Ekholm K, Linder J, Borg K, Ekholm J. Evaluation of a multiprofessional rehabilitation programme for persistent musculoskeletal-related pain: economic benefits of return to work. *J Rehabil Med*. 2008;40:15–22.

53. Kronborg C, Handberg G, Axelsen F. Health care costs, work productivity and activity impairment in non-malignant chronic pain patients. *Eur J Health Econ*. 2009;10:5–13.

54. Liedberg GM, Vrethem M. Polyneuropathy, with and without neurogenic pain, and its impact on daily life activities – a descriptive study. *Disabil Rehabil*. 2009;31:1402–1408.

55. Mullersdorf M. Factors indicating need of rehabilitation – occupational therapy among persons with long-term and/or recurrent pain. *Int J Rehabil Res*. 2000;23:281–294.

56. Straube S, Moore RA, Paine J, et al. Interference with work in fibromyalgia – effect of treatment with pregabalin and relation to pain response. *BMC Musculoskelet Disord*. 2011;12:125.

57. QoWL Quality of Working Life. The QoWL Work and Wellbeing Outcome Scale. Available at: http://www.qowl.co.uk/qowl_qwwo_scale.html. Last accessed 22 June 2011.

58. Reilly Associates Health Outcomes Research. Work Productivity and Activity Impairment Questionnaire (WPAI). Available at: http://www.reillyassociates.net/Index.html. Last accessed, 22 June 2011.

59. Haldorsen EM, Grasdal AL, Skouen JS, Risa AE, Kronholm K, Ursin H. Is there a right treatment for a particular patient group? Comparison of ordinary treatment, light multidisciplinary treatment, and extensive multidisciplinary treatment for long-term sick-listed employees with musculoskeletal pain. *Pain*. 2002;95:49–63.

60. Moore RA, Eccleston C, Derry S, et al. "Evidence" in chronic pain – establishing best practice in the reporting of systematic reviews. *Pain*. 2010;150:386–389.

61. Anema JR, van der Giezen AM, Buijs PC, van Mechelen W. Ineffective disability management by doctors is an obstacle for return-to-work: a cohort study on low back pain patients sicklisted for 3–4 months. *Occup Environ Med*. 2002;59:729–733.

## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

**Table S1** EMBASE search strategy.

**Table S2** MEDLINE search strategy.

**Table S3** EconLit search strategy.

**Table S4** Cochrane library search strategy.

**Table S5** Impact of chronic pain on employment status, sickness absence and presenteeism.

**Data S1** Results: List of European studies included and extracted in the systematic review.