Predicting return to work following treatment of chronic pain disorder

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Background
The care of injured workers with chronic pain remains an important public health issue given its increasing prevalence. The consequences often include loss of self-esteem and stress in family relationships.

Aims
To report our interdisciplinary approach to the care of chronic pain disorder (CPD) and describe the predictors associated with a successful return to work (RTW).

Methods
Relevant covariates, including demographic data, time from injury, and functional scores were recorded for clients injured at work in Ontario, Canada. Our primary outcome, RTW, was assessed at 3 months post-discharge. Descriptive statistics and logistic regression were used to identify those factors predicting a successful RTW.

Results
Of the injured workers who participated in the interdisciplinary CPD treatment programme, 1002 clients met our inclusion criteria and were included in the study. Fifty-five per cent were male with a mean age of 46 years. Median time from injury to treatment was 720 days. At 3 months post-treatment, 136 (14%) of the participants were working. Multivariable logistic regression revealed that earlier time since injury (OR = 0.71, 95% CI 0.55–0.92) and presence of an RTW coordinator (RTWC) (OR = 3.42, 95% CI 2.08–5.63) were significant predictors of successful RTW. There was also a significant interaction between RTWC involvement and time since injury. The latter did not appear to influence the likelihood of RTW when an RTWC was present.

Conclusions
Workers compensation boards should refer injured workers with CPD to treatment programmes as early as possible to achieve a successful RTW. Additionally, RTWCs play an important role in improving work outcomes.

Key words
Biopsychosocial; chronic pain; early intervention; return to work; vocational rehabilitation; workers compensation.

Introduction
The International Association for the Study of Pain defines chronic pain as ‘pain that persists beyond the normal time of healing’ [1]. Chronic pain is increasingly prevalent and is estimated to affect about 15% of the general adult population [2]; however, its greatest societal burden may be in the working population. In contrast to acute pain, which is predominantly a physiological response to tissue damage, chronic pain disorder (CPD) involves psychological and behavioural mechanisms as well as physiological mechanisms [2]. These include negative or distorted cognition, such as feelings of despair or hopelessness; inactivity or passivity; and depression [2].

In Canada it is estimated that the number of accepted time-loss injuries in Ontario alone in 2009 was 64,824 [3]. The consequences of such injuries extend beyond loss of earnings and productivity and workers who also have chronic pain often lose self-esteem and self-confidence and experience stress in family relationships [4]. Our experience at our clinics shows that most injured workers who experience pain do return to work (RTW) and are able to manage their pain in their pre-injury job. A small proportion of that population is seen in our specialty clinic, which treats workers whose chronic pain has progressed to a DSM-IV diagnosis of CPD.

Treatment to restore function in this population should take into account all the physical, psychological...
and social factors involved in human illness and disability. Currently, the biopsychosocial approach is the most commonly considered and consensual framework for understanding the multidimensional aspects of many health problems [5]. Treatments for chronic pain within this model of care have been shown to lead to a faster RTW following subacute and chronic low back pain [6,7], and improved quality of life [8] as compared with traditional models of care.

RTW coordination has been suggested as an effective strategy for promoting workplace rehabilitation. In a literature review conducted by Shaw and colleagues, it was shown that in studies where workplace intervention, including an RTW coordinator (RTWC), was assessed independently from clinical intervention the workplace intervention appeared to have the greater benefit. When the relative odds of RTW were the principal outcome most studies reported at least a 2-fold increase [9]. RTWCs assist injured workers by addressing any workplace barriers that may prevent a timely and safe RTW [10]. We wished to confirm that using an RTWC also improves the likelihood of returning to work in Ontario.

The literature for predicting RTW outcomes in disabled workers is extensive. A systematic review examining determinants of duration of disability and RTW after work-related injury identified about 100 different factors [11]. These included sociodemographic and psychological factors, physical and psychosocial job characteristics, social support and so on. However, many of these studies are limited by power and also by a uniform definition of RTW [12]. Further, only some of the factors identified are modifiable to help improve the likelihood of RTW. For example, the review by Krause et al. found that older age, lower education/income and blue collar occupation tended to prolong work disability [11]. Although these results help to identify which demographic characteristics predict success these factors cannot generally be modified during treatment. Other factors, such as individual prediction of continued disability, perception of inability to change jobs [11] and participation of an RTWC were also associated with duration of work disability [9]. These factors are much easier to modify within treatment programmes. Our primary objective was to study the factors, most notably the modifiable factors such as time since injury and use of an RTWC, that might affect the likelihood of RTW. We also examined the association between non-modifiable demographic factors, such as age, gender and education level and RTW outcome.

**Methods**

We used a retrospective cohort design. Study subjects’ data records from an interdisciplinary CPD treatment programme in Ontario, made between January 2009 and March 2011, were reviewed. Our inclusion criteria were being age 18 years or older and having pain complaints which were not alleviated through traditional therapies (pain medication, physiotherapy, etc.). Although the origin of the pain may have been the result of a musculoskeletal injury, clients were referred to the clinic because a DSM-IV diagnosis of CPD was being considered. All subjects were receiving compensation benefits from the local worker’s compensation board and only those who were not working at initial assessment were included. Subjects were excluded if they had an emergent musculoskeletal condition (e.g. acute trauma, myelopathy, etc.). Interpreters were provided as required. The study protocol was approved by the University Health Network Research Ethics Board (Toronto, Ontario, Canada).

Subjects participated in a 30-session, interdisciplinary CPD treatment programme spanning 6 weeks. Treatment was delivered by physicians, psychologists, occupational therapists, physiotherapists, certified kinesiologists and cognitive behavioural therapists. RTWCs, who are employed by the hospital, were also provided if recommended by the local worker’s compensation board. An RTWC became involved at programme entry, with the authorization and consent of the injured worker, third party payer and employer, to facilitate an appropriate RTW schedule given the subject’s special physical needs.

The RTWC requires diverse skills in ergonomic assessment, job modification and facilitation. RTWCs have a healthcare background (occupational therapist, physiotherapist or kinesiologist) with informal training in cognitive behavioural coaching provided by the cognitive behavioural therapists or psychologists who are also members of the clinical team [10].

The RTWC visits the workplace and individually interviews the various stakeholders, including the worker, workplace supervisors, managers and union (as applicable), to identify barriers to RTW. Next the RTWC identifies potential solutions through a joint meeting and tour of the workplace. This allows the injured worker and workplace decision makers to discuss suggested modifications and accommodations. Next an RTW plan is prepared and implemented. At each step the RTWC maintains contact with the worker to provide reassurance. The worker returns to work and follow-up contact and eventual discharge by the RTWC occurs. Lastly the RTW plan is evaluated by documenting solutions implemented in a progress report [10].

Prior to entry into the treatment programme a comprehensive assessment was conducted by an interdisciplinary team. During the first week of treatment, the clinical team performed a further evaluation and documented the client’s current functional ability, psychosocial status and any workplace or psychosocial barriers to return to function and work (e.g. difficulty with prolonged sitting or standing, drug or alcohol abuse, family or relationship difficulties, etc.). Clinicians collaborated with subjects to prioritize barriers and develop goals for treatment which were functional, work related and specific.
Based on the investigators’ experience in treating injured workers, factors chosen were those deemed important for predicting RTW. Baseline demographic data, including age, gender, place of birth and education were retrospectively collected. Time from workplace injury to the initial assessment was also documented and assignment of an RTWC was noted. The physical demand level of the subject’s pre-injury job was determined using the Dictionary of Occupational Titles (DOT) classification system [13]. Education was dichotomized into two groups, defined as post-secondary education (undergraduate or graduate degree, technical or trade certification) or high school education (high school diploma or less).

All study subjects were off work at the time of their initial assessment prior to entering our clinic’s treatment programme. RTW status, our primary outcome, was determined 3 months post-treatment using a questionnaire mailed to the subjects. A successful RTW outcome was defined as working at any job, part-time or full-time, at this time.

The Pain Catastrophizing Scale (PCS) was used to assess any catastrophic thinking related to pain. On this scale, subjects rated how often they experienced the 13 scenarios related to pain catastrophizing behaviour on a 4-point scale with responses ranging from ‘not at all’ to ‘all the time’. The PCS summarizes to a total score and to three subscales of magnification, helplessness and rumination. This study focused on the total score. The PCS has been demonstrated to be both a reliable and valid measure [14].

Depression was originally assessed by the 20-item Centre for Epidemiologic Studies Depression (CES-D) Scale for approximately half the study period and later by the 9-item Patient Health Questionnaire (PHQ-9), a change instituted since the questionnaire packages were extensive and the PHQ-9 contains fewer items. Depression was defined as a score >26 points on the CES-D, and >14 on the PHQ-9 [15,16]. The CES-D has good predictive validity among chronic pain patients and is able to discriminate significantly between persons with and without major depression [15]. The PHQ-9 is also a reliable and valid measure of depression severity [16]. Depression scores were dichotomized into a binary yes/no variable.

Bivariate analysis compared demographic data between those who returned to work at 3 months and those who did not. Categorical data were compared across groups with the Chi-squared test while continuous data were compared with Student’s t-test (after completing tests of normality). Due to high skewness in time from injury, natural log transformation was used.

Multivariable logistic regression modelling was used to determine the factors that predict a successful RTW outcome. The covariates entered into the models were age, gender, log (time from injury to referral), PCS, depression, education, place of birth, physical demand level of pre-injury job and involvement of an RTWC. Place of birth was dichotomized into categorical variables of born in Canada or not. We also tested for interactions between factors in predicting a successful RTW outcome.

Statistical analyses were performed on SAS Version 9.2 for Microsoft Windows by SAS Institute Inc.

**Results**

Of the 1268 injured workers who met our inclusion criteria and underwent and were discharged from the CPD programme between January 2009 and March 2011 we had complete RTW outcome data on 1002 patients (79%). Comparison of demographic data of those with and without complete outcome data showed no clinical differences (data not shown). Of the study cohort, 55% were male and the mean age was 46 years (range = 19–67, SD = 8.6). The median time from injury to treatment was 720 days.

Overall, a successful RTW outcome was reported by 136/1002 (14%) of the clients at 3 months post-treatment discharge. Of the 334 clients referred for care <15 months (first tertile) from injury, 71 (21%) had a successful RTW (Figure 1).

Bivariate analyses revealed that female gender, being born in Canada, earlier time since injury, and the use of an RTWC were significantly associated with a successful RTW outcome at 3 months post-treatment (P < 0.05, Table 1). There was no significant association between age, level of education and depression with RTW outcome (P > 0.05). The physical demand level of clients’ pre-injury job was also not significantly associated with RTW outcome (P > 0.05, Figure 2).

Multivariable logistic regression modelling showed that female gender, an earlier time to referral from injury, place of birth and the use of RTWC services were all significant predictors of a successful RTW outcome.

![Figure 1. RTW rates stratified by time since injury.](image-url)
The intervention of RTWC services had the greatest effect on positive RTW outcome (OR = 3.42). Age, level of education, intake PCS score, physical demand level of pre-injury job and depression were not significant predictors of RTW outcome ($P > 0.05$). Pearson residuals and Deviance residuals were checked and the Hosmer and Lemeshow [17] test was used. We did not find any evidence of lack of fit in the model. Additionally, the area under the ROC curve (AUC) [18] was found to be 0.75 which tells us that our model is a reasonable one.

After testing for an interaction, we found a significant interaction between the use of RTWC services and log (time since injury) ($P < 0.05$). In the absence of an RTWC increasing time since injury had a negative influence on the likelihood of returning to work. In contrast, time since injury did not appear to influence the likelihood of returning to work when a RTWC was involved (Figure 3).

**Discussion**

The results of this study reveal that by adopting the biopsychosocial model of care for CPD clients our interdisciplinary team achieved an overall RTW rate of 14% at 3 months after treatment discharge. The median time from injury to treatment was ~2 years (720 days). Adjusted analysis found that female gender, referral before 15 months post-injury, being born in Canada and the involvement of an RTWC predicted a greater likelihood of returning to work 3 months after treatment discharge. Without an RTWC a greater time since injury decreased the likelihood of successful RTW. However, when an RTWC was present time since injury did not appear to influence the likelihood of RTW. These results are in line with others’ findings of the positive influence of workplace liaison in significantly increasing the likelihood of a successful RTW [9]. Other studies have also found that having influence over working hours and tasks, positive support from the employer [19], employee-based vocational guidance and effective communication between the injured worker and all RTW stakeholders [20] were promoting factors for RTW.

One group examined the effectiveness of early intervention with high-risk back-injured workers suffering from subacute pain. They compared conventional workers’ compensation case management with integrated interdisciplinary early intervention and found that by 6 months post-pain onset those who received interdisciplinary early intervention were significantly more likely to RTW than those receiving conventional case management. Similar work in a chronic pain population has shown that referral <12 months after injury produced a greater pain improvement with treatment and an improved RTW rate [21]. Others have suggested early intervention within 6 months of pain onset is the optimum to achieve improved outcome [22,23].
Previous studies have found younger age to be a significant predictor of RTW at 6 months follow-up [19,24,25], although ours found that age did not have a significant association with RTW status at 3 months post-treatment discharge. One reason may be that we used a sample of injured workers with CPD, a mental health disorder characterized by negative belief systems and psychological impairment on top of physical injury, so that age may not significantly influence treatment success. We found that female subjects had a higher RTW rate compared with male clients, although the literature on this contains mixed findings, with some showing a lower RTW rate and more prolonged disability for females [22,26] while others reported findings in agreement with ours [27]. Whilst female gender may correlate with employment in less physically demanding industries our results showed that the physical demand level of the pre-injury job was not associated with RTW outcome. It is possible that female subjects worked in sectors that have a greater ability to accommodate modified work. Future studies examining the link between modified work availability and RTW could provide more insight.

We also found that being born in Canada predicted a greater likelihood of RTW. This might be due to greater barriers during treatment due to variables such as language barriers, lack of support networks, differences in workplace expectations and injury perception. Given the limits to our resources and expertise this link would be better studied by researchers in sociology or social anthropology.

The main strengths of our study include the large sample size and variety of client variables collected. The limitations include the potential for unmeasured confounders in analysis, such as medication use, misuse or substance abuse by participants trying to cope with their condition. Also although we only included subjects not working at initial assessment we do not have data about their work status between the time of injury and of assessment, so that some could have continued working for some time after their injury before being assessed. Secondly, our RTW outcome estimate was conservative since it did not include those deemed fit for work by the therapists but for whom the employer had no work available. Although we have shown that an earlier time to referral and use of RTWC services increased the likelihood of RTW, this was only beneficial if a subject had a job to return to. Possible explanations for lack of available work include that the workplace or position no longer existed or that modified duties were unavailable. Indeed, a 2010 study found that non-medical factors such as poor working relationships and lack of modified labour conditions were also perpetuating factors for long-term sick leave by chronically disabled workers [19]. Thirdly, given the missing data selection bias could have occurred although

**Table 2.** Odds ratio and 95% confidence intervals (CI) reported for multivariable logistic regression modelling predicting a successful RTW at 3 months follow-up

<table>
<thead>
<tr>
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<th>Odds ratio</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender Female</td>
<td>2.16</td>
<td>1.34 3.48</td>
<td>&lt;0.01</td>
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<tr>
<td>Age</td>
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<td>0.97 1.02</td>
<td>NS</td>
</tr>
<tr>
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<td>1.89</td>
<td>1.15 3.09</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Education Community College or University graduate</td>
<td>1.03</td>
<td>0.63 1.68</td>
<td>NS</td>
</tr>
<tr>
<td>Physical demand level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td>0.62</td>
<td>0.09 3.93</td>
<td>NS</td>
</tr>
<tr>
<td>Light</td>
<td>1.17</td>
<td>0.22 6.19</td>
<td>NS</td>
</tr>
<tr>
<td>Medium</td>
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</tr>
<tr>
<td>Heavy</td>
<td>1.45</td>
<td>0.27 7.84</td>
<td>NS</td>
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<tr>
<td>log (time since injury)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>–</td>
<td>0.71</td>
<td>0.55 0.92</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Intake PCS score Yes</td>
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<td>0.97 1.02</td>
<td>NS</td>
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<tr>
<td>Depression Yes</td>
<td>1.25</td>
<td>0.70 2.24</td>
<td>NS</td>
</tr>
<tr>
<td>RTWC Yes</td>
<td>3.42</td>
<td>2.08 5.63</td>
<td>&lt;0.001</td>
</tr>
</tbody>
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**Figure 3.** Predicted probabilities for successful return to work (RTW) based on time since injury for injured workers that received and did not receive RTW coordinator (RTWC) services.

![Figure 3](image-url)
we have shown that there were no systematic differences between those that did and did not provide follow-up data. It is possible that those that did not provide follow-up data were working and not allowed to return to complete the final data set, in which case our RTW estimate would again be conservative.

In conclusion we found an overall RTW rate of 14%, which improves with earlier referral or use of RTWC. Early intervention is now a well established modifiable factor influencing the likelihood of RTW in injured workers with CPD. Based on our findings we advocate earlier referral from the time of injury with incorporation of an RTWC for subjects with work available to optimize RTW success. Future studies are needed to understand the significance of other factors, such as anxiety level and sleep disorders, in the treatment of CPD.

In Canada, workers compensation claims are presently estimated at approximately $19 billion per year for both direct and indirect costs [28]. The savings to the compensation system and to the employer would be tremendous if improved work outcomes can be achieved in those making compensation claims.

Key points

• A successful return to work at 3 months post-treatment was reported by 14% of the injured workers participating in our interdisciplinary treatment programme.
• Female gender, earlier time since injury, being born in Canada and presence of a return to work coordinator were significant predictors of successful return to work.
• In the absence of a return to work coordinator, increasing time since injury had a negative influence on the likelihood of return to work.

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Conflicts of interest

None declared.

References


