# Prescription Opioid Dependence Is Associated With Poorer Outcomes in Disabling Spinal Disorders

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**Study Design.** Prospective outcomes study involving patients with chronic disabling occupational spinal disorders (CDOSD) diagnosed with (n = 199) or without (n = 1124) postinjury opioid-dependence disorder (ODD), based on the Diagnostic and Statistical Manual of Mental Disorders–fourth edition cirteria.

**Objective.** To determine whether prescription opioid dependence, assessed at the beginning of rehabilitation treatment, is associated with poorer treatment outcomes in patients with CDOSDs attending an interdisciplinary rehabilitation program.

**Summary of Background Data.** Controversy exists regarding the risk of iatrogenic ODD and treatment outcomes when long-term opioid therapy is used in the treatment of chronic nonmalignant pain conditions.

**Methods.** A consecutive sample of patients with CDOSDs [n = 1323; mean (SD) length of disability = 18.8 (20.7) months] attending a tertiary referral center received intensive physical reactivation and pain/disability management interventions, based on a functional restoration model, including detoxification from opioids. One-year outcomes included return to work, work retention, healthcare utilization, new surgeries, recurrent injuries, and disability claim settlement.

**Results.** Prevalence of ODD in this CDOSD population on entering the rehabilitation program was 15%. Even after adjusting for relevant demographic factors and comorbid psychiatric disorders, opioid-dependent patients were 1.7 times [95% confidence interval (CI): 1.0, 2.7] less likely to return to work, 2 times (95% CI: 1.3, 3.0) less likely to retain work at the 1-year interview, and 1.7 times (95% CI: 1.2, 2.5) more likely to engage in healthcare utilization from new providers, compared with nonopioid-dependent patients.

**Conclusions.** Iatrogenic prescription opioid dependence may be a risk factor for less successful long-term work and health outcomes, even after detoxification from opioids as part of an interdisciplinary functional rehabilitation program. Chronic prescription opioid dependence in this patient population is also associated with a significantly higher prevalence of comorbid psychiatric conditions, both axis I and II.

**Key words:** Opioid dependence, chronic pain, disabling occupational spinal disorders, functional restoration rehabilitation, interdisciplinary pain programs, socioeconomic outcomes, return to work, workers' compensation, occupational medicine. **Spine 2008;33:2219–2227**

The costs and prevalence of nonmalignant chronic disabling occupational spinal disorders (CDOSDs) in industrialized countries are extremely high. For people under the age of 45, it is the primary cause of federally compensated disability, and it is the third leading cause of disability for those over the age of 45.[1–3] Occupational low back pain accounts for at least 33% of all healthcare and indemnity costs under workers' compensation.[4] A study examining chronic back pain estimated that the cost of lost industrial productivity alone amounts to $28 billion annually.[5] The majority of these patients are managed with medication, often opioid medications; and these medications can be expensive.[6–8]

Use and misuse of opioid medications are an increasing public health problem. The Substance Abuse and Mental Health Services Administration's 2003 national survey on drug use and health reported that 31.2 million people 12 or older (13% of the population) had used prescription pain relievers nonmedically at least once in their lifetime, and 4.7 million in the past month, more than misused prescription tranquilizers, stimulants, and sedatives combined.[9] Liberalization of regulations regarding use of opioids for chronic nonmalignant pain occurred in the late 1990s, associated with increased prescription of opioid medications for this population, particularly the more potent schedule II opioids.[10–14] Other trends include increased diversion of these medications to recreational users, higher rates of addiction to various substances, and more deaths associated with prescription opioids.[10,15–17] The 2003 national survey found that an estimated 415,000 Americans received treatment for pain medication abuse and addiction during the previous year.[9] Correspondingly, the number of new opioid users increased from 573,000 in 1990 to 2.5 million in 2000.[9] In 2002, prescription opioids were the most prescribed drugs of all controlled substances (153 of 234 million total prescriptions), representing a 222% increase in the absolute number of opioid prescription during a 10-year period.[18–19]

The role of opioids in the treatment of CDOSDs, as in other chronic nonmalignant pain conditions, remains

controversial.[20–22] Proponents of long-term opioid use in this population argue that most patients with stable pain pathophysiology can achieve satisfactory analgesia by using a nonescalating dose of opioids while remaining functional citizens, with a minimal risk of addiction or other serious side effects.[23–28] Other experts have provided evidence that their use is often associated with significant problems, which include the risk of serious adverse effects (*e.g.*, sedation, cognitive impairment, respiratory depression, nausea, constipation, edema, hypogonadism, hormonal changes, immunosuppression).[20,21] Concern is also expressed over development of "physical dependence" (*i.e.*, tolerance to analgesic effects, withdrawal syndrome on discontinuation) leading to dose escalation, and risk of iatrogenic "addiction."[20–29] Several investigators and groups have reported a significant and growing number of deaths attributable to prescription opioids.[10,17,30,31] Long-term use of opioids may also be associated with the development of abnormal sensitivity to pain (*i.e.*, hyperalgesia and allodynia).[20,32–37]

An area of consensus between both proponents and opponents of long-term opioids is the lack of high-quality empirical research addressing their efficacy and the long-term risk of developing opioid addiction.[20,21,29,38,39] There are no randomized controlled studies documenting the long-term (*i.e.*, more than 3 months) efficacy of opioids in CDOSD or other chronic nonmalignant pain patients. The impact of long-term opioid use on functional capacities, quality-of-life, and other important outcomes (*e.g.*, return or maintenance of work) has also not been well studied. A number of early studies, primarily involving heterogeneous chronic pain groups, found that long-term opioid therapy exacerbated psychological distress and worsened treatment outcomes.[40–42] Indeed, Schofferman (1993) contended that long-term opioid use may lead to a "downward spiral" characterized by a loss of functional capacity and a corresponding increase in depressed mood.[43] Other investigators have studied populations of chronically disabled patients, finding that opioid users display more disability, higher rates of healthcare utilization, higher rates of tobacco and other substance use, and higher levels of depression.[12,44,45] Interestingly, most of the studies showed that the opioid users had higher pain ratings despite use of opioids, suggesting the presence of opioid-induced hyperalgesia.

There were a number of goals of the present study[1]; to investigate the association of injury-related (*i.e.*, postinjury) opioid dependence with demographic factors[2] and to determine whether other psychiatric disorders linked to opioid dependence in the broader addiction research literature (substance-use disorders, major depressive disorder, personality disorders) are, in fact, associated with iatrogenic opioid dependence.[3] Finally, we examined the relationship of opioid dependence with completion of the treatment program, and 1-year post-treatment socioeconomic outcomes, to determine whether postinjury

prescription opioid-dependence disorder (ODD) is a risk factor for undesirable outcomes.

## ■ Materials and Methods

### *Participants*

Subjects in this study consisted of consecutive patients (n = 1323), over a 5-year period (1994–1999), with chronic disabling occupational spinal disorders, and who entered treatment in an interdisciplinary functional restoration program at a regional referral center. These patients were divided into 2 groups, with those meeting criteria for postinjury prescription ODD (n = 199) compared with those not meeting these criteria (non-ODD, n = 1124). Patients were referred for their disabling chronic pain conditions after occupational claims from community-based sources in a large metropolitan area. Physicians referred 90% of the patients, about equally divided between specialists (orthopedic surgeons, neurosurgeons and pain management/rehabilitation specialists) and primary care physicians (occupational or internal medicine, family practice). About one-third of the patients had prerehabilitation spinal pathology sufficient to warrant a surgical procedure (discectomy, decompression and/or fusion). The remainder were not felt to be surgical candidates for various reasons, with disc degeneration being the predominant pathologic finding. Some patients with confirmed discogenic pain were included, as they either wished to avoid surgery, or were denied surgery in a dispute with their insurance carrier. All patients had partial or total work disability for at least 4 months. The inclusion criteria that had to be met before entering this treatment program were as follows: (1) more than 4 months elapsed since a work-related injury; (2) primary or secondary nonoperative care failed to overcome chronic disability; (3) surgery had not produced resolution, or was not an option; and (4) severe functional limitations remained.

### *Treatment*

All patients received an initial evaluation consisting of a medical history, a physical examination, a psychological intake interview, a disability assessment interview, and a quantitative functional evaluation. The medically directed functional restoration treatment program consisted of quantitatively directed exercise progression, supervised by physical and occupational therapists, in conjunction with a component of multimodal disability management, which included individual counseling, group therapeutics, and education focusing on disability management, vocational reintegration, stress management, improvement in coping skills, and future fitness maintenance. The functional restoration and chronic pain disability management program applied to this sample was initially developed for CDOSDs and is well-described and replicated in the literature.[46–62]

### *Detoxification From Opioid Medications*

A requirement of the treatment program is that patients must taper off all opioid medications early in the treatment program. Most patients entered the earlier phases of treatment taking one or more prescribed opioids. Before starting treatment, the requirement and rationale for detoxification were explained to patients, and consent to taper and discontinue opioids was obtained from all patients. For those taking low-dose/potency opioids, and for those without a known history of current or lifetime substance-use disorders, a taper schedule was developed by the attending physician and implemented by the nurs-

ing staff under the physician's supervision. Patients taking high-dose/potency opioids or multiple opioids, patients with a known history of current or lifetime substance-use disorders, patients with known or easily apparent psychiatric disturbance, and/or patients who did not progress well in their detoxification under the care of the attending physician, were referred to the facility psychiatrist (PBP), who is also board certified in addiction medicine. Various medications were used to help patients during and after the opioid taper (based on the patient's unique clinical presentation), including nonopioid analgesics; the partial opiate agonist buprenorphine (alone or in combination with the opiate antagonist naloxone) or less potent opioids (as a transitional step); generalized and/or joint-specific steroid injections; benzodiazepines; other sleep medications; low-dose atypical neuroleptics; and the central $\alpha$-adrenergic agonist clonidine. Dispensing of opioids in only small quantities and/or linking dispensing with treatment attendance were also common strategies to aid in the detoxification process. Patients suspected of ongoing opioid use despite all of these measures were subjected to urine toxicology screening.

Concurrent with the opioid taper, patients were engaged in a progressive, quantitatively guided physical reactivation activities under the supervision of physical and occupational therapists, and were also taught a variety of pain management techniques, including icing, stretching, postural adjustment, and relaxation training. Individual and group education and counseling also addressed detoxification issues. For a small number of patients, the opioid taper was associated with significant ambivalence toward the program, and some resistance to early implementation. The program was "slowed down" for these patients during this phase, with greater efforts being made to educate patients on the benefits of program completion.

### Assessments

The official criteria for establishing problematic substance use (including problematic opioid use in CDOSD and other chronic nonmalignant pain patients) is provided by the Diagnostic and Statistical Manual of Mental Disorders–fourth edition (DSM-IV), with criteria for substance "abuse" and "dependence." The criteria for substance dependence, used in the present study, are detailed in Table 1. Patients were administered the structured clinical interview for DSM-non-patient version (SCID-NP)[63] and the SCID personality disorders (SCID-II)[64] early in the treatment program. The SCID was administered in Spanish to non-English-speaking Hispanic patients. The SCID-NP is a structured interview designed to assess the presence or absence of major current (i.e., meets criteria during the past month) and lifetime (i.e., meets criteria at any time during entire lifespan, including currently) DSM axis I psychiatric disorders such as schizophrenia, depression, and substance-use disorders. The SCID-II consists of a 120-item questionnaire to be completed by the patient, followed by a structured evaluation of positive answers by the clinician. From this assessment axis II DSM personality disorder (PD) diagnoses are derived (e.g., borderline PD). Common PDs identified in chronic pain patients are described in Table 2. The SCID evaluator determined whether each diagnosed axis I psychiatric disorder first occurred before the injury associated with the CDOSD (pre-existing) or subsequently (postinjury or injury related).[64,65]

Previous versions of the SCID and SCID-II have demonstrated acceptable clinical sensitivity and specificity.[63,66–68]

### Table 1. DSM-IV Criteria for Substance Dependence

1. Tolerance, as defined by either of the following:
   (a) A need for markedly increased amounts of the substance to achieve intoxication or desired effect
   (b) Markedly diminished effect with continued use of the same amount of the substance
2. Withdrawal, as manifested by either of the following:
   (a) The characteristic withdrawal syndrome for the substance
   (b) The same (or a closely related) substance is taken to relieve or avoid withdrawal symptoms
3. The substance is often taken in larger amounts or over a longer period than was intended
4. There is a persistent desire or unsuccessful efforts to cut down or control substance use
5. A great deal of time is spent in activities necessary to obtain the substance (e.g., visiting multiple doctors or driving long distances), use the substance (e.g., chain-smoking), or recover from its effects
6. Important social, occupational, or recreational activities are given up or reduced because of substance use
7. The substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance (e.g., current cocaine use despite recognition of cocaine-induced depression, or continued drinking despite recognition that an ulcer was made worse by alcohol consumption)

A maladaptive pattern of substance use, leading to clinically significant impairment or distress, as manifested by three (or more) of the above, occurring at any time in the same 12-month period.
Adapted from the American Psychiatric Association: DSM-IV.

High interrater agreement ($k = 0.95$) was reported for the diagnosis of opioid dependence and the predictive validity of diagnoses derived with the SCID has recently been demonstrated among patients being treated for substance abuse.[67,69] In the present study, all SCID interviewers who participated in this study had graduate training in clinical psychology and had a thorough understanding of DSM diagnostic criteria. The vast majority of these interviews were performed by a single experienced interviewer, who had performed many thousands of these assessments over an extended period of time. She was blinded to patient treatment issues, and her only patient contact was for a SCID-NP and intellectual performance assessments. In addition, interviewers had a regular conference with a psychiatrist (PBP), knowledgeable in regard to diagnosis, to maintain the fidelity of administration/diagnoses. It is noteworthy that in the past, the "gold standard" for clearly defining the DSM psychiatric diagnosis was the psychiatric clinician's interview, which may vary according to the individual clinician's skill, interests, education, and experience. In the present study, the use of the SCID-NP instrument, a consistent interviewer,

### Table 2. Relevant Personality Disorders in CNP Patients: Personality Disorder Description

| | |
|---|---|
| Borderline | A persistent pattern of instability of interpersonal relationships, self-image, and marked impulsivity beginning by early adulthood and present in a variety of contexts |
| Antisocial | A pervasive pattern of disregard for and violation of, the rights of others occurring since age 15 yr and evidence of conduct disorder before 15 yr of age |
| Paranoid | A pervasive distrust and suspiciousness of others such that their motives are interpreted as malevolent, beginning by early adulthood and present in a variety of contexts |

**Table 3. One-Year Health and Socioeconomic Outcomes**

| Outcome | Description of Outcome |
|---|---|
| Return to work | Any period of work during the post-treatment year |
| Work retention | Employed at the time of the 1-yr interview |
| New injury | A new injury claim to the original compensable injured area resulting in lost time from work |
| New surgery | Surgery to the original compensable injured area during the post-treatment year |
| New healthcare provider | Percentage of patients seeking healthcare from a new provider, suggesting dissatisfaction with health status and disability determinations by current treating and referral doctors |
| Claim settlement | Settlement of patient's disability-related compensation claim |

and a homogeneous population suggests that the validity of the methodology is high.

### One-Year Outcomes

A structured interview, administered 1-year postdischarge, in person or by telephone, assessed socioeconomic outcome data, including work status, health utilization, new surgery, new injury, and claim resolution status of program completers (n = 1200).[70] The 1-year outcomes examined in this study are described in Table 3. These outcomes have been consistently reported from this program in the past, and have been shown to be reliable discriminant indicators of patients who complete the program compared with those that refuse treatment or do not complete it.[47,49,58–61] Outcome data were collected on all patients. Complete information was collected on 94% of patients, with partial information on the remaining 6%. Partial information was typically collected from patients' family members, insurance staff or attorneys.

### Statistical Methods

For all categorical variables, a $\chi^2$ statistic was calculated to determine if there were any differences between the 2 ODD groups. Associated $P$ values are reported, along with odds ratios (ORs) and their associated 95% confidence intervals (CIs) where applicable. For all continuous variables, an independent sample $t$ test was used to test for differences between the ODD and non-ODD groups. Associated $P$ values for the $t$ tests were reported. For program completion status and 1-year socioeconomic outcomes, multivariate regression analyses were used to adjust for demographic, self-reported pain intensity (assessed *via* visual analog scale), premorbid (*i.e.*, preinjury) substance use, and comorbid DSM-IV axis I and axis II variables found to be significantly associated with ODD. Thus, the $P$ values, ORs, and 95% CIs for the ORs reported, reflect the unique association between ODD, the program completion status, and 1-year socioeconomic outcomes.

### ■ Results

#### Demographic and Pretreatment Characteristics

Table 4 presents basic demographic variables for the consecutive cohort of patients (n = 1323) evaluated in the study. Significant differences between the ODD groups were found for race, length of disability, prerehabilitation pain intensity, any previous surgeries to the compensable body part (pretreatment surgeries), and legal representation status. Compared with patients without ODD, those with ODD had a significantly greater length of disability (28.54 *vs.* 17.08 months), were 2.5 times (95% CI: 1.8, 3.4) more likely to have had pretreatment surgery, and were 1.5 times (95% CI: 1.0, 2.1) more likely to be represented by an attorney. In addition, the ODD group differed significantly with respect to race, relative to the non-ODD group (P = 0.002), with a disproportionate amount of white patients in the ODD group relative to other races.

#### Psychiatric Comorbidity and Premorbid Substance Use

A diagnosis for ODD, was also found to be significantly associated with a greater number of DSM-IV axis I and

**Table 4. Demographic Characteristics of Study Patients (N = 1323)**

| Variables | Non-ODD 85.0% (1124) | ODD 15.0% (199) | P | OR (95% CI) |
|---|---|---|---|---|
| Age in years (SD) | 41.87 (9.80) | 41.97 (8.44) | NS | NS |
| Gender [% Male (n)] | 61.6 (692) | 62.3 (124) | NS | NS |
| Race [% (n)] | | | 0.002 | N/A |
|   Caucasian | 68.8 (766) | 82.1 (161) | | |
|   African-American | 12.3 (137) | 6.6 (13) | | |
|   Hispanic | 18.2 (203) | 10.7 (21) | | |
|   Other | 0.7 (8) | 0.5 (1) | | |
| Marital status [% (n)] | | | NS | N/A |
|   Single | 14.0 (153) | 8.2 (16) | | |
|   Married | 60.1 (657) | 64.3 (126) | | |
|   Divorced/separated | 25.0 (273) | 25.5 (50) | | |
|   Widowed | 1.0 (11) | 2.0 (4) | | |
| Years of education (SD) | 11.65 (2.94) | 11.56 (2.62) | NS | N/A |
| Length of disability in months (SD) | 17.08 (17.69) | 28.54 (30.99) | <0.001 | N/A |
| Pre-rehabilitation surgery [% (n)] | 27.5 (305) | 48.5 (96) | <0.001 | 2.5 (1.8, 3.4) |
| Pre-rehabilitation pain intensity VAS (SD) | 6.67 (1.90) | 6.97 (1.70) | 0.042 | N/A |
| Attorney retained [% (n)] | 19.7 (213) | 26.8 (51) | 0.026 | 1.5 (1.0, 2.1) |
| Injured spinal region [% (n)] | | | NS | N/A |
|   Cervical and/or thoracic only | 6.9 (77) | 5.0 (10) | | |
|   Lumbar only | 53.9 (606) | 59.3 (118) | | |
|   Multiple spinal | 17.5 (197) | 17.6 (35) | | |
|   Multiple musculoskeletal (at least 1 spinal) | 21.7 (244) | 18.1 (36) | | |

**Table 5. Association Between Post-Injury Opioid Dependence and Other DSM-IV Axis I and Axis II Disorders Among Study Patients (N = 1323)**

| Variables | Non-ODD 85.0% (1124) | ODD 15.0% (199) | P | OR (95% CI) |
|---|---|---|---|---|
| Mean no. current axis I Dx* (SD) | 0.75 (.73) | 1.62 (.99) | <0.001 | N/A |
| Mean no. axis II Dx (SD) | 1.50 (1.51) | 2.06 (1.52) | <0.001 | N/A |
| Type of comorbidity* [% (n)] | | | <0.001 | N/A |
| Single axis Dx | 36.1 (406) | 21.1 (42) | | |
| Axis I and axis II Dx | 45.8 (515) | 75.9 (151) | | |
| Current major depressive disorder [% (n)] | 54.4 (611) | 66.3 (132) | 0.002 | 1.7 (1.2, 2.3) |
| Any current anxiety [% (n)] | 9.7 (109) | 15.6 (31) | 0.013 | 1.7 (1.1, 2.6) |
| Current alcohol use disorder [% (n)] | 4.2 (47) | 5.0 (10) | NS | NS |
| Current Drug use disorder† [% (n)] | 1.1 (12) | 2.5 (5) | NS | NS |
| Premorbid substance-use disorder [% (n)] | 24.6 (277) | 38.2 (76) | <0.001 | 1.9 (1.4, 2.6) |
| Premorbid alcohol-use disorder [% (n)] | 18.0 (202) | 27.1 (54) | 0.003 | 1.7 (1.2 2.4) |
| Premorbid drug-use disorder† [% (n)] | 23.0 (258) | 38.2 (76) | <.001 | 2.1 (1.5, 2.9) |
| Premorbid opioid dependence [% (n)] | 1.7 (19) | 0 | NS | NS |
| Paranoid PD [% (n)] | 30.2 (340) | 33.7 (67) | NS | NS |
| Antisocial PD [% (n)] | 3.7 (42) | 9.0 (18) | .001 | 2.6 (1.4, 4.6) |
| Borderline PD [% (n)] | 24.7 (278) | 45.7 (91) | <.001 | 2.6 (1.9, 3.5) |

*Excludes pain disorder.
†Excludes opioid-use disorder.

axis II disorders in this patient cohort (Table 5). Patients with ODD had a greater prevalence of combined axis I and axis II comorbidity compared with non-ODD patients (75.9% vs. 45.8%). Among the most common current axis I disorders, ODD was associated only with higher rates of current major depressive disorder (OR = 1.7; 95% CI: 1.2, 2.3) and current anxiety disorders (OR = 1.7; 95% CI: 1.1, 2.6). No significant associations were found between ODD and other current substance-use disorders (e.g., alcohol use disorders and other drug use disorders). However, ODD was significantly associated with preinjury substance-use disorders (O.R. = 1.9, 95% CI: 1.4, 2.6), including both alcohol use disorders and drug (not including opioids) use disorders. No significant difference in preinjury opioid use disorders was found between the ODD and non-ODD groups. Finally, among the axis II personality disorders (PDs), only antisocial PD and borderline PD were significantly associated with ODD. Patients with ODD were 2.6 times more likely to have antisocial and borderline PDs [95% CI's: (1.4, 4.6) and (1.9, 3.5), respectively].

### Program Completion and One-Year Socioeconomic Outcomes

Associations between ODD and program outcomes (program completion status and 1-year socioeconomic outcomes) were determined, after adjusting for potentially confounding demographic variables (length of disability, pretreatment surgeries), pain intensity, comorbid psychiatric disorders (current major depressive disorder, current anxiety disorders, antisocial personality disorder, borderline personality disorder), and premorbid substance-use disorders (alcohol and/or other drug use). Program completion status was not significantly different between the ODD groups (Table 6). The primary reasons for program noncompletion (n = 123) included noncompliance and treatment refusal (39%) and failure to develop a work plan (14%). Only 5% of patients noncompleted for continued substance abuse/dependence (opioid and/or nonopioid) issues.

However, among the program completers (n = 1200), patients diagnosed with ODD demonstrated less successful work- and health-related outcomes (Table 7). Patients with ODD were 1.7 times (95% CI: 1.0, 2.7) less likely to return to work after completing the functional restoration program, compared with non-ODD program completers. Patients with ODD were also 2 times (95% CI: 1.3, 3.0) less likely to retain work at 1-year follow-up, compared with patients without ODD. Additionally, patients with ODD were 1.7 times (95% CI: 1.2, 2.5) more likely to seek treatment from a new healthcare provider, with a significantly greater mean number of healthcare visits, compared with patients without ODD (3.9 vs. 2.2).

### ■ Discussion

Prescription opioid dependence, assessed at the beginning of interdisciplinary rehabilitation treatment for CDOSDs, was found to be significantly associated with poorer 1-year outcomes, despite detoxification from opioids during treatment. ODD patients were approximately 2 times more likely than non-ODD patients to fail

**Table 6. Association Between Post-Injury Opioid Dependence and Program Completion Among Patients Admitted Into the Program (N = 1323)***

| Variables | Non-ODD | ODD | P | OR (95% CI) |
|---|---|---|---|---|
| | 85.0% (1124) | 15.0% (199) | | |
| Program completers [% (n)] | 91.5 (1028) | 86.4 (172) | NS | NS |

*P values and ORs reflect unique contribution of ODD to the respective outcomes after using regression analyses to take into account the effect of length of disability, pre-treatment surgeries, self-reported pain intensity ratings, premorbid substance use disorders, and comorbid axis I and II predictors on the outcomes.

**Table 7. Association Between Post-Injury Opioid Dependence and One-Year Socioeconomic Outcomes Among Program Completers (N = 1200)\***

| Variables | Non-ODD | ODD | P | OR0 (95% CI) |
|---|---|---|---|---|
| | 85.7% (1028) | 14.3% (172) | | |
| Return to work [% (n)] | 89.7 (832) | 80.4 (123) | 0.043 | 1.7 (1.0, 2.7) |
| Work retention [% (n)] | 84.4 (783) | 70.6 (108) | 0.002 | 2.0 (1.3, 3.0) |
| Seeking healthcare from new provider [% (n)] | 24.9 (240) | 39.9 (65) | 0.004 | 1.7 (1.2, 2.5) |
| Mean no. visits to new provider (SD) | 2.19 (5.63) | 3.94 (7.25) | 0.010 | N/A |
| New surgeries (original area) [% (n)] | 2.7 (26) | 5.6 (9) | NS | NS |
| New injury (original area with lost time) [% (n)] | 3.2 (30) | 1.9 (3) | NS | NS |
| Claim settled [% (n)] | 93.5 (843) | 89.9 (133) | NS | NS |

*\*P values and odds ratios reflect unique contribution of ODD to the respective outcomes after using regression analyses to take into account the effect of length of disability, pre-treatment surgeries, self-reported pain intensity ratings, premorbid substance use disorders, and comorbid axis I and II predictors on the outcomes.*

to return to work and retain work after 1 year. They were also almost twice as likely to excessively use healthcare in the year after treatment. These results, in combination with the findings of a previous study[71] demonstrating de novo prescription opioid dependence rates of 15% in this population, suggest that the risk of iatrogenic DSM-IV opioid dependence is significant and, when it occurs, continues to have deleterious effects on patients even after detoxification has been completed. The harmful sequelae of opioid exposure, even after adjusting for premorbid substance-use disorders, are significant in these patients. These individuals may have psychosocial and/or physiologic risk factors for opioid addiction. Thus, the findings in the present study lend support to Schofferman's downward spiral hypothesis.[43]

The association between ODD and less successful treatment outcomes was maintained even after adjusting for other relevant demographic factors and comorbid conditions, thus indicating that prescription ODD may be an independent risk factor for poorer treatment outcomes. Although the reason(s) for the poorer 1-year outcomes among opioid-dependent patients can only be speculated about, it may be that these patients are at risk for resumption of post-treatment opioid dependence or other substance-use disorders, and associated morbidity. Unfortunately, follow-up of these patients did not include assessment of post-treatment resumption of opioid use, so this hypothesis could not be formally investigated.

In light of these findings, clinicians who prescribe opioids should become familiar with preinjury risk factors for ODD and behaviors indicative of high risk of problematic opioid use.[20,72–76] The use of screening instruments to identify those at high risk for opioid dependence may be considered as part of standard clinical care.[77–81] Once risk factors or problematic behaviors are identified in a particular patient, effective management procedures can balance the dual goals of analgesia and avoidance of iatrogenic ODD. Advanced and ongoing detection strategies have been described in the literature.[82] Explicit limit setting, in the form of opioid agreements, have been found to be effective in these circumstances.[83] Some patients will require treatment of

addictive disease before pain management can be effectively addressed.[76,84,85] It should also be noted that the demographic results indicated a greater proportion of white patients diagnosed with ODD. Although the present study cannot make any inferences on potential predisposing factors for developing opioid dependence related to race, it should be noted that the general trend of a greater prevalence of whites mirrors the trend in differential prescription of opioid prescription based on ethnicity.[86] Therefore, the differences in race observed in this study may simply be a consequence of differential access to prescription opioids.

Another important finding of the present study was that, despite being a risk factor for less successful 1-year outcomes, opioid dependence was not associated with higher program noncompletion rates. When opioid-dependent patients with CDOSD consented to detoxification from opioids, they statistically were just as likely to be successful in completing treatment. This conclusion is bolstered by the fact that, despite the association between ODD and poorer outcomes, a large majority of ODD patients had satisfactory outcomes. For example, 80.4% of these patients returned to work after completing treatment, and 70.6% retained work at the 1-year mark. These results speak to the overall effectiveness of the comprehensive functional restoration approach with this patient population. This approach includes intensive management of psychiatric disorders by mental health professionals, including management of detoxification from opioids. It has been suggested that interdisciplinary rehabilitation clinics are particularly appropriate for such patients, because the focus is on functional improvement, and not limited to pain palliation.[39] In addition, functional improvements have been achieved in conjunction with concomitant reductions in opioid use.[87] A recent study of chronic pain patients supports this assertion, with almost all patients able to detoxify from opioid medications.[88] With appropriate treatment, then, palliation, functional rehabilitation, and opioid detoxification can occur simultaneously.

Although it has been argued that the DSM-IV diagnosis of "substance dependence" (the official psychiatric term for addiction) may be inappropriately based, in

part, on expected physical habituation (*i.e.*, physiologic dependence and/or tolerance) to opioids in patients treated for chronic pain; DSM-IV criteria also require at least 1 additional sign or symptom indicative of addiction, including impaired control over opioid use, compulsive use, continued use despite harm, and craving.[89] Certainly, the DSM-IV criteria are consistent with the most certain sign of opioid addiction in CDOSD and other chronic pain patients–a "lack of improvement or worsening in psychological well-being and social and vocational functioning despite the clinician's best attempts at pain control."[90] All patients diagnosed with opioid dependence in the present study exhibited this sign, and at least 1 or more of the addiction symptoms described above, in addition to physical tolerance and withdrawal. Other potential critics might suggest that "pseudo addiction," or behaviors that seem to mimic addiction but instead point to inadequate control over pain, may play a part in our findings. Although no definitive consensus has been reached about how to differentiate pseudo addiction from real addiction, the aberrant opioid-seeking behavior attributed to pseudo addiction is usually indicative of substance-use problems.[20,91,92] In the present study, despite the fact that a majority of the patients were using substantial amounts of prescribed opioid medication when they were admitted into the treatment program, only a minority were diagnosed with opioid dependence.

Of course, one can always identify potential limitations of a large prospective study like the current investigation. One such limitation is the lack of objective assessment of opioid detoxification (*i.e.*, urine toxicology) for the vast majority of opioid-using patients. However, daily treatment team meetings provided a forum to discuss any signs indicative of ongoing opioid use. Also, other patients in the treatment milieu often functioned as unofficial detectors of the ongoing opioid use. Many shared such concerns with treatment staff, out of concern for their copatients. When continuing use was suspected, this issue was discussed with the patient. Simultaneously, the treatment staff attempted to prevent access to prescribed opioids by contacting other involved physicians and asking them to not prescribe opioids, and also by contacting insurance adjustors who were asked to not pay for opioids while the patient was under treatment. Urine toxicology screening was used only as needed in selected cases, with payor authorization an issue. If use continued despite these measures, patients were offered inpatient detoxification. If this was refused, patients were discharged from the program as noncompleters because of noncompliance with previously agreed on mutual goals regarding opioid use. These patients were usually noncompleted for multiple causes, including lack of progress and pervasive noncompliance. Despite the use of multiple procedures to ensure that all patients discontinued use of opioid medications, it is likely that a small percentage of patients surreptitiously continued using low doses of this type of medication throughout the rehabilitation program.

An additional limitation of the present study pertains to dichotomous categorization of patients as either ODD or non-ODD. This type of categorization runs counter to an emerging consensus in which opioid misuse in chronic pain is conceptualized as occurring on a continuum.[76] However, this new conceptualization has not yet produced a system to categorize such patients. The DSM-IV-dependence criteria capture the most severe end of the proposed continuum. Finally, the lack of a randomized controlled trial design with respect to the functional restoration program in the present study is a limitation that raises questions about the causal relationship between ODD and treatment outcomes, especially given that ODD in the present study was also confounded with greater length of disability and a higher percentage of patients having received surgery. Although the present study evaluated the association between ODD and treatment outcomes after adjusting for baseline and demographic differences with respect to the non-ODD group, future research could use a matched cohort design to further refine conclusions about the impact of ODD on long-term socioeconomic outcomes. Although it is obviously not feasible to expect randomization to an ODD group, future research could use a randomized controlled trial design to evaluate the efficacy of an interdisciplinary functional restoration approach compared with other less intense treatment methods, in managing and rehabilitating patients who have developed ODD.

Although the generalizability of the findings of the present investigation is limited to the study population–patients with CDOSDs presenting to a tertiary rehabilitation center–the results raise the provocative issue of whether prescription opioid dependence is both more common and more problematic than previously known in the broader population of patients with chronic nonmalignant pain conditions. Future research in other chronic pain populations is necessary to investigate this issue.

### ■ Key Points

- A significant number of patients with chronic disabling occupational spinal disorders presenting for intensive functional restoration treatment exhibit iatrogenic prescription opioid dependence (15%).
- Postinjury ODD is associated with a high degree of psychiatric comorbidity.
- Postinjury ODD at the initiation of rehabilitation is a limiting factor in the attainment of optimal 1-year socioeconomic outcomes after completion of a complex treatment regimen for patients with chronic disabling spinal disorders, despite successful detoxification from opioid medication.

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