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## Factors Associated With Early Opioid Prescription Among Workers With Low Back Injuries

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**Abstract:** Prescription of opioids for nonmalignant musculoskeletal pain has increased substantially in recent years, but there is little information on the incidence of, or factors associated with, such prescription for work-related back pain. In a prospective cohort study (N = 1067), we examined associations between worker sociodemographic and other characteristics and opioid prescription within six weeks of the first medical visit for workers' compensation claims for work loss due to back injury. We examined administrative, pharmacy, and worker-reported data. In bivariate logistic regression models, Hispanics were less likely than non-Hispanic whites to receive opioid prescriptions, and very high body mass index, daily tobacco use, greater pain and physical disability, pain radiating below the knee, injury severity categorizations (from medical records) of major sprain and radiculopathy, and worse mental health were associated with opioid prescription. Adjusting for demographics, pain intensity, and physical disability, opiate prescription was significantly associated with daily tobacco use, pain radiating below the knee, and injury severity categories (major sprain and radiculopathy). Knowledge of worker characteristics associated with early opioid prescription may be useful in future studies of the role of early pain treatment in influencing subsequent course of pain and disability among workers with back injuries.

**Perspective:** Little is known about patient characteristics that may influence physicians' decisions concerning prescription of opioids for acute back pain. Not surprisingly, workers with more severe back injuries are more likely to be prescribed opioids, but reasons for prescription disparities based on ethnicity and tobacco use warrant further study.

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Between 1980 and 2000, despite little change in musculoskeletal pain office visit rates, United States (U.S.) office-based opioid prescriptions increased for acute musculoskeletal pain and doubled for chronic musculoskeletal pain.<sup>6</sup> Prescriptions for more potent opioids (e.g., oxycodone, morphine) for chronic musculoskeletal pain increased from 2% to 9% of visits.<sup>6</sup> Similarly, from 1996 to 1999, the use of oxycodone for back pain doubled in the U.S.<sup>13</sup> In the Washington State workers' compensation system, the proportion of all opi-

oid prescriptions that were for more potent opioids (Schedule II) increased from 19% in 1996 to 37% in 2002.<sup>10</sup>

There is little empirically-based evidence to guide decisions concerning opioid prescriptions for musculoskeletal pain. Only a few studies have addressed the question of what patient and injury characteristics influence prescription of opioids for such problems. A U.S. nationwide household survey of adults with back pain found that less education and lower income were associated with higher rates of opioid use.<sup>13</sup> Among U.S. veterans with chronic back pain, those who were prescribed nonsteroidal anti-inflammatory drugs (NSAIDs) (and not opioids) did not differ from those prescribed opioids in pain intensity, gender, or body mass index (BMI), but age, depression, personality disorder, and substance abuse disorders were associated with opioid use.<sup>3</sup> Among specialty spine center patients, those who received opioids reported greater pain and physical disability, and were more likely to smoke, be unemployed, be obese, and have objective findings (eg, radiation of pain, neurologic signs).<sup>8</sup> The importance of learning more about the relationship between smoking and opioid use is also indicated by recent findings of high rates of smokers among accidental opioid poisoning-related deaths<sup>10</sup> and of higher opiate use postoperatively among smokers.<sup>29,7</sup> Reports of higher accidental opioid<sup>10</sup> and other (including opioid)<sup>5</sup> nonillicit drug poisoning death rates among individuals with higher BMI scores suggest the need to examine BMI in relationship to opioid prescription.

None of these studies examined factors associated with prescription of opioids for acute back pain. Knowledge concerning patient characteristics associated with early opioid prescription may prove helpful in increasing understanding of the effects of early pain treatment on the subsequent course of pain or disability. For example, use of opioids for acute disabling work-related back pain for more than seven days was associated with significantly greater length of work disability,<sup>14</sup> but reasons for this association are unknown.

This study identifies worker and injury characteristics associated with opioid prescription in the first six weeks after a disabling work-related back injury. We explored relationships between such prescription and worker characteristics found previously to be associated with opioid use for chronic back pain (eg, greater pain intensity and physical disability, pain radiating below the knee, obesity, tobacco use, and worse mental health).

## Materials and Methods

### *Study Participants and Procedures*

This report focuses on early opioid prescription among individuals with work-related back injuries who enrolled in the first year of the Washington Workers' Compensation Disability Risk Identification Cohort (D-RISC) study.<sup>24</sup> The study was approved by the University of Washington institutional review board and each study participant provided informed consent. Workers aged 18 years or older who filed new Washington State workers' compen-

sation back injury claims and had at least four days of work disability (the required period for receipt of wage replacement benefits) were identified each week between July 1, 2002 and June 30, 2003. We examined all claims covered by the State Fund, which insures approximately two-thirds of non-federal Washington State workers. The other third, covered by approximately 400 larger self-insured companies, were excluded due to insufficient administrative and medical data.

Trained interviewers telephoned all claimants who met these criteria, screened them for eligibility, and conducted computer-assisted telephone interviews with enrollees. Exclusion criteria were worker denial of work-related back injury and inability to complete a telephone interview in English or Spanish. For Spanish-speaking participants, we used the U.S. Spanish Short Form-36 version 2 (SF-36 v2; 1-week time frame version) Mental Health (MH) scale<sup>28</sup> and the rest of the interview was translated into Spanish by an accredited translator.

Among 2,277 claimants identified, 514 (22%) could not be contacted within the six-week window for baseline interviews, 85 (4%) did not meet the study inclusion criteria, 473 (21%) declined to participate, and 1,205 (53%) enrolled. For this report, we excluded 137 claims that ultimately were not accepted by the workers' compensation agency for wage replacement benefits and one participant whose age could not be determined. The remaining 1,067 study participants did not differ significantly from non-participants who were accepted for disability compensation ( $n = 857$ ) in age or gender (the two demographic characteristics of non-participants that we could obtain).

## Measures

### Baseline Telephone Interview

The interview included questions concerning race, ethnicity, weight, height, education, household income, and tobacco use. For analysis of education, the following categories were used: 1) less than high school graduate; 2) high school graduate; 3) vocational-technical or trade school or some college; and 4) college graduate or professional degree. BMI was computed from height and weight ( $\text{kg}/\text{m}^2$ ) and categorized according to accepted guidelines.<sup>15</sup> For analysis, workers with BMI less than 25 were combined into one group and those with BMI greater than or equal to 35 were likewise combined due to the small number of workers in those categories.

### Pain and Physical Disability

Workers rated their average pain intensity in the past week on a scale of 0 to 10, where 0 is no "pain" and 10 is "pain as bad as could be."<sup>27</sup> For purposes of analysis, we categorized the ratings as low (0-3), moderate (4-6), and high (7-10). We also asked whether their back pain radiated to their leg(s), and if so, "Does your low back pain go as far as the thigh, stop at the knee, or go below the knee?". For analysis, responses were categorized as pain radiating below the knee versus non-radiating pain or pain at the knee or above. The Roland-Morris Disability

**Table 1. Back Injury Severity Rating Instrument**

SCORE	EVIDENCE OF SEVERITY OF DISEASE
1	Mild sprain or strain and/or minor physical examination findings (mildly decreased mobility and/or range of motion; paravertebral tenderness, including muscle spasm or muscle tightness). May include equivocal straight-leg raise
2	Major sprain or strain, indicated by substantial immobility (ie, can't get up; difficulty walking, turning in bed, or sitting) without evidence of nerve injury or radiculopathy. May include equivocal straight-leg raise greater than 45°
3	Evidence of radiculopathy with appropriate symptoms (ie, pain or tingling radiating down the leg below the knee, or dermatomal sensory loss) or clearly positive straight-leg raising test, less than or equal to 45°
4	Absent reflexes (knee or ankle), bladder complaints, or motor abnormalities. Includes dermatomal sensory loss or muscle weakness (ie, foot raising, extending toes, or standing on toes)

Questionnaire (RDQ)<sup>17</sup> was used to assess physical disability due to back pain. The RDQ has been shown to be valid, reliable, and responsive to change.<sup>17,1,25</sup>

### Mental Health

The Mental Health (MH) scale of the SF-36 v2 (one-week timeframe version),<sup>28</sup> a widely used, valid, reliable quality of life measure, was scored using the U.S. general population norms. For analysis, scores were categorized as at or above the population mean, up to 1 standard deviation (SD) below the mean, 1-2 SD below, and greater than 2 SD below the mean.

### Alcohol and Tobacco Use

Workers completed the 3-item version of the Alcohol Use Disorders Identification Test (AUDIT-C).<sup>4</sup> The questions assess frequency and quantity of alcohol consumed in the previous year. Scores can range from 0 to 12. The measure has been shown to be a valid screening test for heavy drinking and active alcohol abuse or dependence.<sup>4,16</sup> We categorized scores as either less than four or four and higher. Workers were also asked about current frequency of use of tobacco products (eg, cigarettes, cigars, pipes, and chewing tobacco; never, occasionally, frequently, daily). For analysis, we used three categories: never, occasionally or frequently, and daily.

### Injury Severity Rating

As part of our larger study, we developed an instrument to rate back injury severity from medical records.<sup>24</sup> The back injury severity rating was designed so that the presence of symptoms or objective signs with high specificity would result in a higher score. Trained nurses reviewed each study participant's medical records (including history, physical examination findings, current symptoms, and diagnoses) from the first medical visit for the worker's compensation claim. The nurses also reviewed the medical records from subsequent visits over the next eight weeks for corroboration of the initial findings. We chose an 8-week timeframe because it can take that long to have a second or third visit, and because occasionally that period of time is necessary to obtain more complete information concerning the nature of the back problems. The injury severity ratings were based on the relevant information available at the time closest to the date of injury. In most cases, this informa-

tion was obtained from the first medical visit records, but occasionally, important supplemental information was obtained from a later visit. In cases in which symptoms resolved or worsened after the first visit, the ratings were based on the first visit. Thus, the rating was not based on the most severe findings, regardless of when they occurred, but rather on the findings at the time closest to the date of injury.

The low back injury severity instrument is used to classify workers with back injuries into one of four categories, based on the most complete information available from medical records closest to the time of the injury: 1) mild sprain or strain or minor physical examination findings; 2) major sprain or strain as evidenced by substantial immobility; 3) evidence of radiculopathy or positive straight leg raising test; and 4) knee or ankle reflexes absent, injury-related bladder complaints, or motor abnormalities (Table 1). Due to the small number of cases in the last category, we combined the last two categories for data analyses.

After the initial training in the use of the instrument, a 5% sample of each rater's cases was independently scored by an occupational medicine physician or an occupational health nurse for purposes of evaluating interrater reliability. Additional training was provided as needed. Overall weighted percent agreement (calculated by giving exact agreement a weight of 1, disagreement by one category a weight of 0.66, disagreement by two categories a weight of 0.33, and disagreement by three categories no credit)<sup>11</sup> between the raters and an the occupational medicine physician or occupational health nurse was 90%. Weighted Kappa (chance-corrected agreement) was 0.66, indicating a substantial level of agreement.<sup>12</sup>

### Opioid Prescription Data

Information concerning opioid prescriptions was extracted from the workers' compensation system's computerized Medical Information Payment System, which tracks all health care services for which payment is requested. Pharmacy records from this database include prescription date, days supply, drug strength, and schedule (for controlled substances). Opioids are scheduled by the U.S. Drug Enforcement Administration (DEA) according to their potential for abuse and dependence, with lower categories indicating higher abuse or dependence

potential. We categorized each worker as having received or not any schedule II, III, or IV opioid prescription at the first medical visit in the claim or within the next six weeks.

### Statistical Analyses

We used descriptive statistics to characterize the study sample. We examined associations between worker characteristics and opioid prescription (yes, no) within six weeks from the first medical visit for the back injury using logistic regression. We first conducted bivariate logistic regressions to examine the individual associations of each independent variable. We then conducted separate multivariate logistic regression analyses to examine the association of opiate prescription with income, BMI, tobacco use, AUDIT-C scores, pain below the knee, injury severity ratings, and mental health scores after controlling for age, race, gender, education, pain intensity, and physical disability.

## Results

### Study Participants and Opioid Prescription Rates

Among the 1067 study participants (739 men and 328 women), the mean age was 39.2 (SD = 11.1) years. Fifty-one percent of the workers had some education beyond high school. Seventy percent described their race or ethnicity as white non-Hispanic, 17% as Hispanic, and 13% as another category.

In the workers' compensation system, a medical visit for a work-related injury is necessary to submit a claim; the claim is submitted after the medical visit for the injury. Thus, all study participants completed the baseline study interview after the first medical visit for their claim. The baseline interview was completed a median of 27 days after the first medical visit for the injury (IQR = 21-37 days). Most workers ( $n = 885$ ; 83%) completed the interview within 6 weeks of the first medical visit. The median number of days between claim submission and the baseline interview was 18 (IQR = 15-24 days). The mean baseline interview rating of average pain intensity in the last week (0-10 scale) was 5.3 (SD = 2.7) and the mean RDQ physical disability score (range = 0-24) was 12.7 (SD = 7.1).

An opioid was prescribed at the first medical visit or within the next 6 weeks for 373 (35%) workers. The median number of days between the first medical visit and the first opioid prescription was 1 (IQR = 0-20 days), with 195 (52% of those prescribed an opioid) workers obtaining the prescription on the day of the first visit. In this 6-week period, 209 workers (56% of those who received any opioid prescription) received more than one opioid prescription. The first opioid prescription was for a schedule II opioid for 79 workers (21% of the 373 workers prescribed an opioid). **Table 2** shows the opioids prescribed and the number of workers who received a prescription for each type and schedule of opioid during the 6-week period. Hydrocodone was the most frequently

**Table 2. Types of Opioids Prescribed Among 373 Workers Who Received an Opioid Prescription During the First Medical Visit or Next 6 Weeks**

OPIOID	DEA DRUG SCHEDULE	NO. WORKERS	%*
Hydrocodone	III	283	75.9
Oxycodone	II	116	31.1
Propoxyphene	IV	25	6.7
Codeine	III	22	5.9
Hydromorphone	II	7	1.9
Fentanyl	II	2	0.5
Meperidine	II	2	0.5
Morphine	II	2	0.5
Methadone	II	1	0.3

Abbreviations: DEA, Drug Enforcement Administration.

\*Percents sum to over 100 (and number of workers sum to over 373) because some workers received more than one type of opioid prescription.

prescribed opioid (76% of workers who received an opioid prescription), with oxycodone second (31%).

**Table 3** provides worker and prescription counts of schedule II, III, and IV opioids over the 6 weeks. One hundred twenty-three workers received a schedule II opioid prescription, 296 workers received a schedule III, and 25 workers received a schedule IV opioid prescription during the 6-week period.

### Bivariate Associations Between Worker Characteristics and Opioid Prescription

In the bivariate logistic regression analyses, age, gender, education, income, and AUDIT-C scores (alcohol use) were not significantly associated with opioid prescription (**Table 4**). Compared with non-Hispanic whites, those reporting Hispanic ethnicity were significantly less likely to receive an opioid prescription (OR = 0.58, 95% CI = 0.40-0.83). Compared with workers in the lowest BMI category (<25), those in the highest category (> 35) were significantly more likely to receive an opioid pre-

**Table 3. Number of Prescriptions per Worker by Drug DEA Schedule During the First Medical Visit or Next 6 Weeks**

NO. PRESCRIPTIONS PER WORKER	DEA DRUG SCHEDULE		
	II n (%)	III n (%)	IV n (%)
1	71 (58)	164 (55)	17 (68)
2	19 (15)	66 (22)	6 (24)
3-4	21 (17)	50 (17)	1 (4)
5-8	11 (9)	15 (5)	1 (4)
9-14	1 (1)	1 (0)	0 (0)
Total workers	123 (100)	296 (100)	25 (100)
Total prescriptions	262	565	39

There were 866 opioid prescriptions for the 373 workers. Some workers received prescriptions for opioids from more than one schedule.

Abbreviations: DEA, Drug Enforcement Administration.

**Table 4. Worker Characteristics and Bivariate Associations With Opioid Prescription During the First Medical Visit or Next 6 Weeks**

CHARACTERISTIC	No OPIOID n = 694 n (%)	OPIOID n = 373 n (%)	OR 95% CI
Age, yrs			
<30	166 (68)	79 (32)	1.00
30–44	300 (62)	181 (38)	1.27 (0.92–1.76)
45–54	155 (65)	84 (35)	1.14 (0.78–1.66)
>54	73 (72)	29 (28)	0.83 (0.50–1.39)
Gender			
Male	468 (63)	271 (37)	1.00
Female	226 (69)	102 (31)	0.78 (0.59–1.03)
Race/ethnicity			
White, non-Hispanic	466 (62)	284 (38)	1.00
Hispanic	131 (74)	46 (26)	0.58 (0.40–0.83)
Other	97 (69)	43 (31)	0.73 (0.49–1.07)
Education			
< High school	105 (68)	50 (32)	1.00
High school	234 (63)	138 (37)	1.24 (0.83–1.84)
Some college or vocational	294 (65)	160 (35)	1.14 (0.78–1.68)
College or higher	61 (71)	25 (29)	0.86 (0.48–1.53)
Pain intensity			
Low (0–3)	193 (73)	73 (27)	1.00
Moderate (4–6)	278 (70)	122 (31)	1.16 (0.82–1.64)
High (7–10)	220 (55)	178 (45)	2.14 (1.53–2.99)
RDQ			
0–6	182 (71)	75 (29)	1.00
7–13	194 (77)	59 (23)	0.74 (0.50–1.10)
14–18	177 (65)	96 (35)	1.32 (0.91–1.90)
19–24	141 (50)	143 (50)	2.46 (1.72–3.51)
Body mass index			
Underweight or normal (<25)	215 (68)	101 (32)	1.00
Overweight (25–29.9)	274 (64)	153 (36)	1.19 (0.87–1.62)
Obesity I (30–34.9)	142 (65)	78 (35)	1.17 (0.81–1.68)
Obesity II/III (>=35)	43 (56)	34 (44)	1.68 (1.01–2.80)
Household income, annual, US\$			
< 30,000	275 (67)	138 (33)	1.00
30–45,000	177 (64)	100 (36)	1.13 (0.82–1.55)
45–70,000	150 (63)	90 (38)	1.20 (0.86–1.67)
> 70,000	68 (68)	32 (32)	0.94 (0.59–1.50)
Tobacco use			
Never	417 (71)	168 (29)	1.00
Occasional/frequent	105 (64)	59 (36)	1.40 (0.97–2.01)
Daily	172 (54)	146 (46)	2.11 (1.59–2.80)
AUDIT-C			
0–3	497 (65)	271 (35)	1.00
4–12	194 (66)	100 (34)	0.95 (0.71–1.25)
Pain below knee, self-report			
No	539 (70)	232 (30)	1.00
Yes	155 (52)	141 (48)	2.11 (1.61–2.78)
SF-36v2 MH			
At/above population mean	283 (71)	114 (29)	1.00
<1 SD below population mean	188 (64)	105 (36)	1.38 (1.00–1.91)
1–2 SD below population mean	129 (60)	87 (40)	1.67 (1.18–2.37)
>2 SD below population mean	93 (58)	67 (42)	1.79 (1.22–2.62)
Injury severity rating			
Mild sprain	480 (73)	179 (27)	1.00
Major sprain	94 (59)	65 (41)	1.85 (1.29–2.66)
Radiculopathy	113 (48)	124 (52)	2.94 (2.16–4.00)

Missing data: 27 BMI, 36 income, 5 AUDIT-C, 2 pain intensity, 12 injury severity rating, 1 mental health scale.

Abbreviations: RDQ, Roland-Morris Disability Questionnaire; AUDIT-C, Alcohol Use Disorders Identification Test; SF-36v2 MH, Short Form-36 version 2 Mental Health scale.

scription (OR = 1.68, 95% CI = 1.01–2.80). Daily tobacco users had over twice the odds of non-users of receiving an early opioid prescription. Compared with workers with mild pain (0–3 on the 0–10 scale), those who reported severe pain (7–10) had over twice the odds of receiving an opioid. Workers in the highest category of RDQ physical disability scores had 2.5 times the odds of those in the lowest category of receiving a prescription, and those who reported that their low back pain radiated below the knee had twice the odds of receiving a prescription. Workers with increasingly worse mental health, as assessed by the SF-36v2 MH scale, had increasingly higher odds of receiving an early opioid prescription.

The injury severity ratings were also significantly associated with opioid prescription. In 12 cases (1%), insufficient information from the medical records was available to rate injury severity and therefore these workers were excluded from analysis of injury severity. Compared with workers judged to have a mild sprain, those judged to have a major sprain had almost twice the odds of an opioid prescription and those with radiculopathy had 2.9 times greater odds of a prescription.

### **Multivariate Associations Between Worker Characteristics and Opioid Prescription**

After adjusting for the covariates (age, race, gender, education, pain intensity, and physical disability), daily tobacco users had higher odds (OR = 1.8, 95% CI = 1.3–2.5) of receiving an opioid prescription, as compared with workers who never used tobacco products. Those who reported that their low back pain radiated below the knee also had higher odds of receiving an early opioid prescription (OR = 1.8, 95% CI = 1.3–2.4). In addition, the injury severity ratings remained statistically significant after adjustment. Compared with workers rated as having a mild sprain, workers judged to have a major sprain (OR = 1.8, 95% CI = 1.2–2.6) or radiculopathy (OR = 2.5, 95% CI = 1.7–3.5) had higher odds of receiving an opioid prescription. After adjustment, BMI and SF-36v2 MH scores were not significantly associated with receiving an early opioid prescription. As found in the bivariate analyses, income and AUDIT-C scores were not significantly associated with opioid prescription.

### **Discussion**

To our knowledge, this is the first study to examine factors associated with opioid prescription for acute work-related back pain. Early opioid treatment was common among these 1,067 workers with at least 4 days of work disability: Thirty-five percent received one or more opioid prescriptions at their first health care visit for the injury or during the next 6 weeks. This is comparable to a previous report of a 38% rate of opioid prescriptions among U.S. workers with work disability related to acute uncomplicated low back pain.<sup>19</sup> Fifty-two percent of the workers in our sample who were prescribed an opioid

received the prescription at the first health care visit for their pain. The observed practice of early opioid prescribing in this study contrasts with current practice guidelines for the treatment of acute low back pain that recommend NSAIDs and acetaminophen as first line analgesics.<sup>26</sup>

Most study participants were interviewed after their first opioid prescription and in some cases, workers were interviewed after the end of the six-week medication recording period. Thus, self-report measures such as pain intensity, physical disability, and mental health could have been influenced by opioid use and the status of these variables prior to opioid prescription is unknown. Although the study design precludes causal or sequential inferences concerning the finding of greater odds of receiving an opioid prescription among those with worse pain, disability, and mental health, we hypothesize that patients who received opioids had these problems at the time of the prescription and that presence of these factors (eg, communication of greater suffering) influenced physician prescribing. For workers who received an opioid prescription later in the observation period, physicians may have been responding to a persistence of pain and disability after other interventions had failed. Other variables examined in this study (age, gender, race, education, income, BMI, and probably also alcohol and tobacco use history) reflected worker status at the time of first opioid prescription.

Workers who reported daily tobacco use had over twice the odds of receiving an opioid prescription as compared with those who did not use tobacco products and significantly higher odds were found even after adjusting for other important characteristics. This result is consistent with those of a survey of patients seen in U.S. spine centers between 1995 and 1998,<sup>8</sup> which found that patients for whom opioids were recommended, prescribed, or continued were significantly more likely to smoke cigarettes than were those not treated with opioids (23% versus 17%). Further research is needed to elucidate the reasons for greater odds of receiving an opiate prescription among those who smoke, even after controlling for pain intensity; one possibility is that smoking may be a marker for other characteristics (eg, jobs with greater physical demands, more widespread pain) that influence physicians to prescribe opioids.

Hispanics were significantly less likely than non-Hispanic whites to receive an opioid prescription. Previous research found that Hispanics were less likely than non-Hispanic whites to receive analgesic medication for long-bone fractures in emergency departments<sup>22</sup> despite the fact that patient and physician ratings of pain severity did not appear to differ for these two ethnic groups.<sup>21</sup> A U.S. national study found that Latinos were significantly less likely than whites to receive an opioid in emergency departments.<sup>20</sup> Further research is needed to understand the reasons for ethnic disparities in analgesic prescription.

Worse mental health was significantly associated with opioid prescription bivariate, but not in the multivariate model. Previous studies have yielded conflicting find-

ings concerning the relationship between mental health and prescription of opioids for pain. In a study of patients with spinal and radicular pain, those who did versus did not receive a prescription or continued prescription for an opioid did not differ in SF-36 mental health scores.<sup>8</sup> However, a study of veterans with chronic back pain found that among the factors examined, including pain intensity, psychiatric disorder diagnoses were the strongest predictors of long-term opioid prescription (at least once a month for at least 5 months).<sup>3</sup>

We found that pain severity was significantly associated with opioid prescription. Some studies have found an association between pain intensity and opioid prescription<sup>8</sup> whereas others have not.<sup>3,9,23</sup> However, these latter three studies were of patients with chronic pain; it is possible that the effect of pain severity is more important for acute pain problems.

Workers with self-reported pain radiating below the knee and those classified using the injury severity rating instrument as having a major sprain or radiculopathy were significantly more likely to receive opioid prescriptions, even after controlling for pain severity, disability, and other factors. Objective findings of radiculopathy (dermatomal pain distribution, radiation of pain, and neurologic signs) were also significantly associated with opiate use among a large cohort of patients seen for their initial visit in a U.S. national network of spine centers.<sup>8</sup>

Workers with possible alcohol use problems as indicated by AUDIT-C scores of 4 or higher were not more likely to receive an opioid during the time period examined in this study. A study of U.S. veterans with chronic back pain found that a history of substance abuse was associated with opioid prescription,<sup>3</sup> but this study did not distinguish alcohol dependence or abuse from other substance abuse disorders. Self-reported alcohol consumption was not associated with opioid medication use among male patients with chronic spinal pain,<sup>2</sup> although the numbers of men in the different alcohol use categories were small. In a nationally representative health care survey, excluding individuals with cancer, multivariate models indicated that individuals with alcohol problems were no more likely than those without alcohol problems to report regular use of prescription opioids in the past year.<sup>18</sup> There are several possible explanations for the lack of relationship between alcohol use and opioid prescription in our study, including lack of a true relationship, insensitivity of the AUDIT-C categories ana-

lyzed in this study, and inaccurate reporting by study participants.

Some study limitations should be noted. First, as discussed above, some of the worker self-reported measures may have been influenced by prior opioid use. Second, we located and interviewed 51% of potentially eligible workers. Although the participants and non-participants did not differ in age or gender, they may have differed on unmeasured characteristics that could affect the generalizability of study findings. Third, we did not assess all potentially important factors that may be associated with opioid prescription, including worker and prescriber geographic location, prescriber characteristics (including beliefs about opioids for pain, or history of inappropriate or excessive opioid prescribing), and patients' requests for and acceptance of opioid prescriptions. Fourth, the examination of opioid prescription was for a limited, early period of the first health care visit for the injury and the next six weeks. We intend in future work to examine associations between worker characteristics and opioid prescription over a 1-2 year period of time.

Despite these limitations, the study has notable strengths. First, this is the first prospective, population-based study of acute low back injury in a workers' compensation system to examine factors associated with opiate prescription. Second, data on opioid prescriptions were from administrative databases, with complete information on all study participants and ability to link these data to worker self-reported measures. The results point to the need to further examine reasons for racial and ethnic differences in opiate prescription, as well as for higher prescription rates among daily tobacco users. Finally, research is needed to examine effects of early opioid prescription on longer-term outcomes, including pain, disability, and health care use and costs. Knowledge of worker characteristics associated with early opioid prescription may be useful in future studies of the role of early pain treatment in influencing subsequent course of pain and disability among workers with back injuries.

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