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# The Effect of Opioid Use on Workers' Compensation Claim Cost in the State of Michigan

Jeffrey A. White, MS, Xuguang Tao, MD, PhD, Milan Talreja, MA, PMP, Jack Tower, MS, and Edward Bernacki, MD, MPH

**Objective:** To investigate the association between opioid utilization and catastrophic claim ( $\geq$ \$100,000) cost. **Method:** A total of 12,226 workers' compensation indemnity claims that were opened and closed from January 1, 2006 to February 28, 2010 in the State of Michigan were selected for multivariate logistic regression analyses. **Result:** Controlling for sex, age, claim duration, number of distinct *International Classification of Diseases–Ninth Revision* codes per claim, and legal involvement, the presence of short-acting opioids on a claim were 1.76 (95% confidence interval: 1.23 to 2.51) and long-acting opioids 3.94 (95% confidence interval: 2.35 to 6.89) more likely to have a final cost \$100,000 or more than a claim without any prescription. **Conclusion:** The use of opioid medications, particularly long-acting opioid medications, is an independent risk factor for the development of catastrophic claims.

Public concerns surrounding the use of opioids to treat chronic pain, not involving cancer or terminal illness, have grown as the number of prescriptions for opioid analgesics has continued to increase.<sup>1,2</sup> Prescribing patterns have shifted with more Schedule II and sustained-release opioids being prescribed today than ever before, particularly in the workers' compensation setting.<sup>2</sup> Escalating problems such as overdose, addiction, and even death are now reported in association with workers' compensation claims with 55% to 85% of injured workers across the country now receiving narcotics for chronic pain relief.<sup>3,4</sup>

This increase in the use of opioids is further complicated because individuals with chronic pain often take these medications in the presence of comorbid mood, anxiety, or somatization disorders. The presence of these disorders increases the risk that these individuals will exhibit substance-use disorders or aberrant drug-taking behaviors.<sup>5,6</sup> According to the most recent National Epidemiologic Survey on Alcohol and Related Conditions data, 18% to 20% of the US population with a substance-use disorder has a co-occurring independent anxiety or mood disorder.<sup>7</sup> For patients with occupational injuries having chronic pain, more frequent and longer-term use of narcotics may lead to addiction, increased disability, work loss,<sup>8</sup> or even death.<sup>9</sup> Consequently, the health risks and financial impact of workers' compensation claims resulting from use of opioids to treat chronic pain are a significant issue.

Historically, the workers' compensation industry has measured the impact of opioids on workers' compensation costs by only quantifying opioid-related medication cost focusing on the pharmacy share of total medical cost and the dynamics of utilization, drug mix,

and cost inflation. For instance, the most recent report from the National Council on Compensation Insurance<sup>10</sup> indicates that the most significant factors driving medical cost today are due to physician dispensing and pharmaceutical utilization patterns.

This study was conducted to determine alternative methods for measuring the impact of medications, particularly opioid medications, beyond inflation and utilization, by evaluating the overall effect of opioids on medical and total workers' compensation claims' costs. To this end, we utilized claim and pharmacy billing data from Accident Fund Holdings, Inc, for the State of Michigan. The pharmacy billing data was mapped to aggregate claim data to determine the financial impact of short- (SA) and long-acting (LA) opioids on claims controlling for case mix complexity, lost time, litigation, sex, and age. Our aim was to identify actionable trends that would allow for early interventions or prevention of behaviors that ultimately would improve care, reduce cost, and minimize the risk to injured workers.

## METHODS AND MATERIALS

### Cohort Selection

We identified 143,593 unique workers' compensation claims in the Accident Fund database of which 73,799 were claims from the State of Michigan. There were 16,122 indemnity claims (ie, claims involving payments for lost time) of which 12,226 were opened and closed between January 1, 2006 and February 28, 2010. These claims were matched with 60,006 prescriptions generated between January 1, 2006, and February 28, 2010 that were paid by the Accident Fund Holdings, Inc. Of these prescriptions, 18,456 were written for opioid medications. The study sample comprised all 12,226 indemnity claims in the Michigan Accident Funds Holdings database. There were 210 claims that were opened before 2006 and closed during the study period that were not included in the sample because opioid utilization before 2006 was not available.

### Data Collection

- 1) Claim-related records included demographic variables (ie, date of birth and sex), accident-related variables (ie, date of event, *International Classification of Diseases–Ninth Revision* (ICD-9) claim status, closing date, claim duration, medical cost, indemnity cost, final cost, lost time days, attorney involvement).
- 2) Opioid utilization records for the study cohort were collected for the same period from January 1, 2006 to February 28, 2010 from Michigan Accident Funds Holdings. The variables included drug names, costs, National Drug Code, dose, and date of prescription.

### Opioid Grouping

Opioids were defined as morphine-like medications that are naturally occurring, semisynthetic, or wholly synthetic substances utilized to control pain. All National Drug Codes that fit this definition were abstracted and consolidated into two groups; short-acting (SA) or immediate-release opioids and long-acting (LA) or controlled-release opioids. Claims were divided into four groups: (1) claims ever involving LA opioids, (2) claims involving only SA opioids, (3) claims involving nonopioid medications, and (4) claims that had no medications associated with them.

From the Medical Management Practices and Strategy (Mr White), Medical Center of Excellence (Mr Talreja), and Data Analytics and Medical Trends (Mr Tower), Accident Fund Holdings, Inc, Lansing, Mich; and Department of Medicine (Drs Tao and Bernacki), Division of Environmental and Occupational Medicine, Johns Hopkins School of Medicine, Baltimore, Md.

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Address correspondence to: Edward J. Bernacki, MD, MPH, Johns Hopkins University School of Medicine, 600 N. Wolfe Street, Billings Admin 131, Baltimore, MD 21287; E-mail: bernacki@jhmi.edu.

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**Data Analysis**

**Descriptive Analysis**

General distributions of number of claims, medical cost, indemnity cost, and total claim cost were described by sex, age, lost time days, opioid group, distinct ICD-9 code numbers, and legal involvement. General linear model *t* test was used for differences of means.

**Multivariate Analysis**

To analyze the impact of opioid utilization on the workers' compensation costs, logistic regression was used to control for possible confounding factors. The number of distinct ICD-9 codes and lost time days were used as surrogates for complexity and severity of injuries. Legal involvement was used as a control for added cost related to attorney involvement. The dependent variable was the odds ratio for the claim having the final cost at or more than \$100,000 at closing. The major focus was to explore the risks of having a final cost at or more than \$100,000 for claims associated with LA, SA only, and nonopioid medications compared with claims not associated with any medication utilization. The choice of \$100,000 as a cutoff point for catastrophic claims was based on previous studies<sup>11-16</sup> by the authors.

**Software**

For analysis and significance testing, SAS 9.1 (SAS, Inc, Cary, NC) was used. For presentation of regression and curve simulations, MS Excel 2007 (Microsoft, Redmond, WA) was used.

**RESULTS**

As seen in Table 1, 66% of the claimants were male with a mean age of 44.3 years. The mean age of the female claimants was 45.8 years, which was significantly greater than the mean age among male claimants. The mean claim duration was 304.5 days for the entire population with no significant differences found between the sexes. The mean number of lost time days was significantly greater in the male (118.3 days) than in the female (101.8 days) claimant populations. At claim closure, both medical and indemnity payments were significantly higher among men. The mean total claim payments amounted to \$19,127 for female claimants and \$29,023 for the male claimants at claim closure.

The largest number of claimants was between the ages of 40 and 59 years with a median age of 44.8 years (Fig. 1). In general, the indemnity costs were higher than medical costs for the majority of the population, excluding the claimants who were younger than 29 years and older than 69 years.

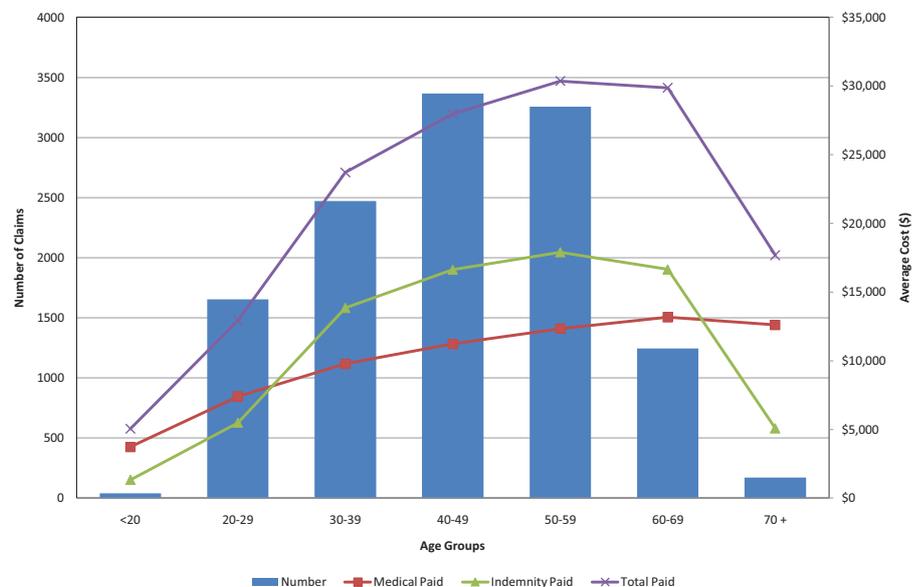
Table 2 indicates that 39% of the claimants were not prescribed any drugs, 34% were prescribed nonopioid drugs, and 27% were prescribed opioids (25% SA and 2% LA opioids) during the course of their treatment, a proportion similar to what others who have studied workers' compensation claims in the State of Michigan have found.<sup>17,18</sup>

Further segmentation of the study population by type of prescription indicated a difference in the total amounts paid (Table 2). Opioids (SA and LA) were associated with higher medical as well as indemnity claim costs in comparison with claims not having opioid scripts. As seen in Table 2, only a small proportion of overall claim and medical expenses are related to payments for opioid and other

**TABLE 1.** General Information of Closed Michigan Indemnity Claims Under Study (January 1, 2006 to February 28, 2011)

Sex	No. Workers	Mean Age, yr	Mean Open Duration (d)	Mean Lost Time (d)	Mean Medical Paid, \$	Mean Indemnity Paid, \$	Mean Total Paid, \$
Female	4,160	45.8	304.6	101.8	9,164	9,893	19,127
Male	8,066	44.3	304.5	118.3	11,790	17,126	29,023
Total	12,226	44.8	304.5	112.7	10,896	14,665	25,566
<i>P</i> *		<0.0001	0.9864	<0.0001	<0.0001	<0.0001	<0.0001

\*General linear model *t* test.



**FIGURE 1.** Average costs by age group.

**TABLE 2.** Average Claim Cost by Opioid Script Involvement

Prescription Involvement	No. Claims	Percent of Claims	Mean Pharmacy Cost, \$	Pharmacy Cost as a Percentage of Medical Cost, %		Mean SA Opioid Cost, \$	Mean LA Opioid Cost, \$	Mean Opioid Cost, \$	Opioid Cost as a Percentage of Medical Cost, %	Medical Cost, \$	Indemnity Cost, \$	Total Cost, \$
				Pharmacy Cost, %	Medical Cost, %							
No Prescription	4,794	39	0	0.00						6,212	7,050	13,295
Other Scripts	4,156	34	171	2.20						7,759	9,119	16,918
SA Only Scripts	3,063	25	374	1.97	55	55		55	0.29	19,006	28,511	47,742
Ever LA Script	213	2	3,769	6.19	585	585	1,235	1,820	2.99	60,898	95,139	156,748

SA, short-acting; LA, long-acting.

medications. Only 0.3% of overall medical care costs were related to payments for SA opioids and approximately 3% of payments were related to LA opioids.

The study population was further analyzed for the presence of legal actions on the claim when initiated by the injured worker. Approximately 13% of the claims were associated with legal involvement (Table 3). If an attorney was involved in a claim, the costs of medical care was 4.05 times as high (\$7740 vs \$31,311) and the indemnity payments were 17.64 times as high (\$4543 vs \$80,138).

Figure 2 indicates that both medical and indemnity costs on closed claims increased as the amount of lost time increased. Total expenses for a claim of less than 180 days of lost time averaged \$54,250, increasing to over \$200,000 if more than 720 days of lost time were incurred. This analysis also indicates that indemnity expenses outpaced that of medical expenses after the first year.

Increased cost in association with claims linked to opioids may be confounded by the propensity to prescribe these types of drugs in association with more complex injuries. Nevertheless, when analyzing the impact of opioids on claim costs using the number of ICD-9 codes per claim, as a proxy for severity, we found that the difference in costs between opioid use and nonuse persisted (Fig. 3).

To access the effect of opioids alone on the ultimate cost of a claim, we controlled for the confounding factors of sex, age, time lost from work, number of distinct ICD-9 codes per claim, and legal involvement. The presence of LA opioids on a claim is almost 3.9 (95% confidence interval: 2.35 to 6.89) times more likely than a claim without any prescription to have a final cost of \$100,000 or more. Claims with only an SA opioid had an odds ratio of 1.76 (95% confidence interval: 1.23 to 2.51) to ultimately have a final claim cost of \$100,000 or more compared with claims without any medication prescribed. In the logistic regression model, there was no significant risk to exceed \$100,000 found for claims with nonopioid prescriptions compared with the same reference group ( $P > 0.05$ ) (Fig. 4).

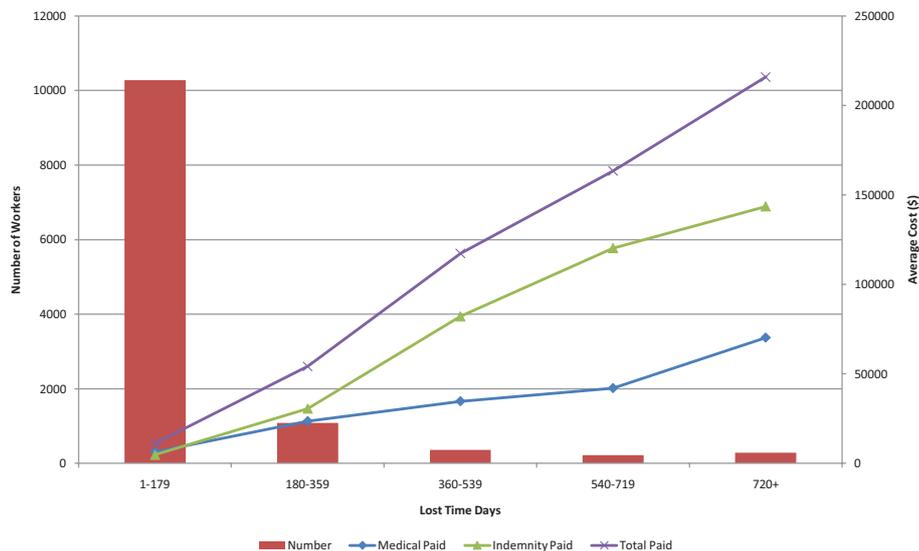
### Discussion

Our study of workers' compensation claims in the State of Michigan revealed a number of interesting findings, some of which have been described by others, and do not seem to be unique to this jurisdiction. For example, the average cost of a claim was found to increase with the age of the claimant. This has been previously attributed to the higher prevalence of comorbid conditions in the older than 50 years working populations such as cerebral vascular, cardiovascular, pulmonary, and muscular skeletal diseases<sup>19</sup> resulting in greater impairment and cost than for similar injuries incurred by younger workers.<sup>20</sup> The higher cost of claims in the older population of workers has also been linked to the indemnity costs associated with higher levels of compensation related to employed persons older than 50 years of age.<sup>21</sup> Presumably, the decrease in claim cost that we observed in individuals 70 years of age and older is related to a higher prevalence of part-time workers in this population and, therefore, lower indemnity payments.<sup>22</sup>

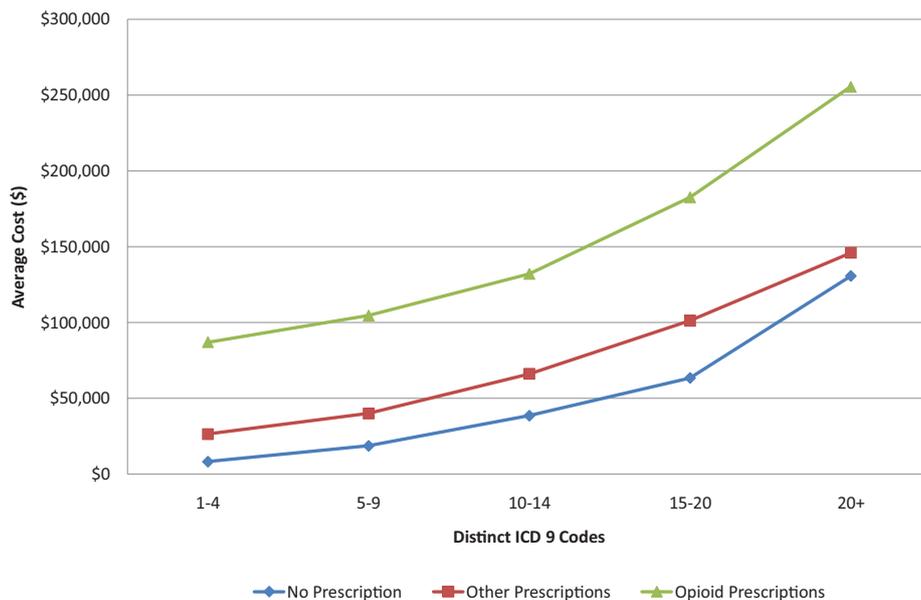
We also noticed a striking increase in medical, indemnity, and total claim costs the more time an injured worker was out of work. This observation is both intuitive and well-documented.<sup>14,23-25</sup>

**TABLE 3.** Average Claim Cost by Legal Involvement

Legal Involvement	No. Claims	Medical Paid, \$	Indemnity Paid, \$	Total Paid, \$
No	10,589	7,740	4,543	12,295
Yes	1,637	31,311	80,138	112,080
Total	12,226	10,896	14,665	25,656
Ratio (yes:no)	0.13	2.87	5.46	4.37



**FIGURE 2.** Claim number and average claim cost by lost time.



**FIGURE 3.** Average claim cost by prescription involvement adjusted for case mix complexity. ICD-9, *International Classification of Diseases–Ninth Revision*

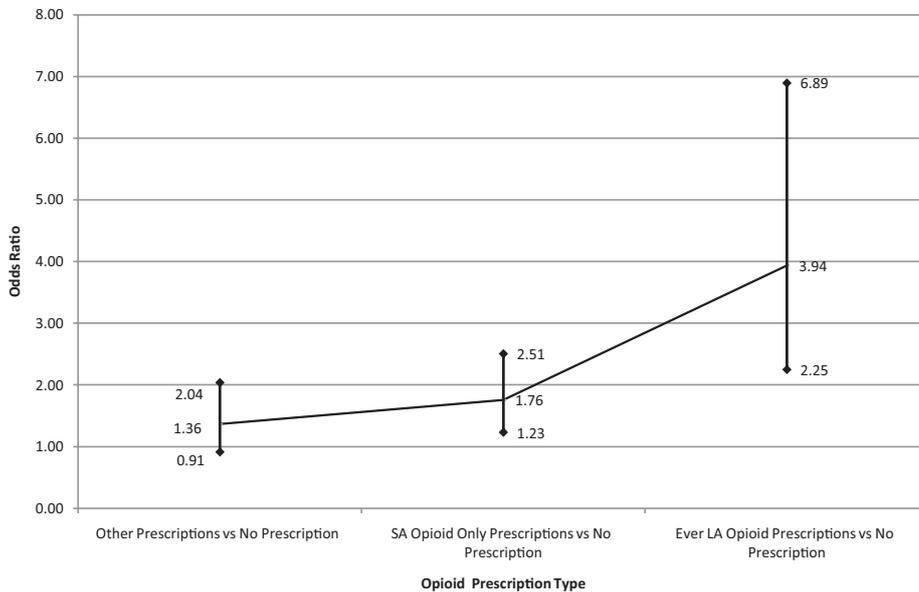
The strong correlation between claim costs and attorney or legal involvement was also observed in this study. This relationship has also been described by the current authors and others studying this relationship.<sup>12,16,26,27</sup> In previous studies,<sup>12,16,28</sup> attorney involvement was found to be a risk factor independent of injury severity for the adverse claim development.

Lastly, the hypothesis tested was that opioid use was associated with higher medical and indemnity costs. The analyses centered around establishing whether the presence of opioids alone accounted for the cost increases or whether opioids were associated with other factors (identified as cost drivers) such as legal involvement, injury severity, and others, that typically lead to high claim costs. Indeed, controlling for these factors, opioid use, particularly LA opioid use, was an independent predictor of catastrophic claim costs ( $\geq \$100,000$ ). Although similar relationships have been observed, the magnitude of this relationship has not been previously described.<sup>29,30</sup>

Opioid medication cost alone was a minor contributor to the overall medical or total claim cost. In the case of claims associated with an SA opioid, opioid cost was 0.3% of overall medical costs and in the case of LA opioids, approximately 3% of overall medi-

cal costs. The costs of SA opioids were 0.1% of the overall claims costs and the cost of LA opioids, 1.2% of the overall claim costs. Although opioid medication cost is substantial, the costs are small in comparison with the overall costs of the claim. More research is needed to determine the influence of opioids on the injured worker and the link to extended time out from work, delayed healing, and prolonged medical treatment. Therefore, opioid use and not the cost of opioids seem to be the major driver of associated workers' compensation claim costs. This is confirmed by a study<sup>31</sup> that indicated that insured members who were prescribed opioids were found to have 8.7 times higher mean annual direct health care cost compared with individuals not prescribed opioids (\$15,884 vs \$1830, respectively,  $P < 0.01$ ). Claims associated with users of LA opioids were 9.3 times more expensive than claims associated with nonusers, whereas claims associated with users of SA opioids were 2.8 times more expensive than claims associated with nonusers.<sup>31</sup>

Can the results of this Michigan study be generalized to other states? There are large interstate variations in the use of narcotics to treat injured workers. Michigan has the second-lowest average morphine equivalent dose of opioid prescribed per claim.<sup>3</sup> Among



**FIGURE 4.** Odds ratios and 95% confidence intervals of opioid prescriptions associated with final cost of \$100,00 or more. Multivariate logistic regression controlling for age, sex, lost time, distinct *International Classification of Diseases–Ninth Revision* codes, and legal involvement. SA, short-acting; LA, long-acting.

nonsurgical cases with narcotics, the average amount of the narcotics per claim in Michigan was 38% lower than the 17-state median. Michigan was the second lowest on this measure, next to Iowa. Michigan's lower amount of opioid use per claim was the result of fewer prescriptions written for fewer pills per claim as well as less frequent use of stronger, Schedule II Controlled Substances. On average, injured workers in Michigan who did not have surgery but received opioids for pain relief filled 3.2 prescriptions for 142 pills per claim for opioids, 21% to 24% lower than the 17-state median.<sup>3</sup> Although the study only utilized Michigan data and Michigan is lower in amount of opioid use than most other states, it is unlikely that this trend is unique and could not be applied to other jurisdictions. Previous studies<sup>28,32</sup> in the State of Louisiana have reported similar results. The State of Louisiana is among the highest in terms of workers' compensation opioids use and cost.<sup>3</sup> As in this study, the authors of previous study conducted in Louisiana found that LA opioid use was a significant driver of cost and claim duration.

There are a number of limitations in this study that are worth mentioning. First, the study focuses on the number of prescriptions written, not the amount of medication utilized by the claimant. The potential exists that the number of pills and dosage prescribed is different than the actual amount used by the claimant. Second, we used the number of distinct ICD-9 groups as an indicator of injury severity. We reasoned that an increasing number of distinct ICD-9 codes would correlate with higher severity of the clinical illness or injury. Because diagnoses are synonymous with clinical problems and are required for billing purposes, this seems to be an acceptable solution for approximating injury complexity. We acknowledge that there is variability within ICD-9 codes and this approach may not be a perfect proxy for estimating severity. Nevertheless, it is unlikely that the variability in injury severity within an ICD-9 group would differ substantially between groups, particularly in claimants using opioids or no opioids at all.

A legitimate concern of insurers and State Workers' Compensation Commissions is the possible ill effects of opioid medications on health outcomes of medical care funded under the workers' compensation system. There is evidence that the average level of opioids prescribed for injured workers is associated with death and disability. A retrospective analysis<sup>29</sup> of workers' compensations claims in 2007 suggests that the use of opioids for the management of acute disabling low back pain may actually be counterproductive to recovery. Franklin, et al,<sup>30</sup> found that prescription opioids for more

than 7 days for workers with acute back injuries are a risk factor for long-term disability. A 2010 study<sup>33</sup> argues that patients receiving higher doses of prescribed opioids are at increased risk for overdose particularly when morphine equivalent dosage exceeds 100-mg/d threshold. This risk of exceeding 100 mg/d is escalated in the presence of controlled-release opioids because many users supplement SA opioids with controlled-release opioids to achieve a personal level of comfort and pain relief. Another study<sup>32</sup> in the State of Louisiana indicated that workers' compensation claimants who were placed on LA opioids exceed 100 mg/d at approximately 1 year after injury. Given the relationship of opioid use and poor medical outcomes, we will utilize the same claim and prescription database to study the amount of opioid used to address this significant issue.

## CONCLUSION

The use of opioids for the treatment of nonmalignant chronic pain in workers' compensation is a significant driver of medical and indemnity expenses. Furthermore, the cost associated with the medication itself is a small part of the overall medical and total claim cost. To control costs, efforts must be made to rationalize the use of opioids in workers' compensation claimants, particularly the use of LA opioids. A resource for accomplishing this is evidence-based guidelines, which have been shown to control medication utilization as well as improve outcomes among workers' compensation claimants.<sup>34,35</sup>

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