

Impact of a Graduated Approach on Opioid Initiation and Loss of Earnings Following Workplace Injury

A Time Series Analysis

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Objective: The aim of this study was to explore the impact of the Ontario Workplace Safety and Insurance Board's (WSIB's) graduated approach to opioid management on opioid prescribing and disability claim duration. **Methods:** We studied patterns of opioid use and disability claim duration among Ontarians who received benefits through the WSIB between 2002 and 2013. We used interventional time series analysis to assess the impact of the WSIB graduated formulary on these trends. **Results:** After the introduction of the graduated formulary, initiation of short- and long-acting opioids fell significantly ($P < 0.0001$). We also observed a shift toward the use of short-acting opioids alone ($P < 0.0001$). Although disability claim duration declined, this could not be ascribed to the intervention ($P = 0.18$). **Conclusion:** A graduated opioid formulary may be an effective tool for providers to promote more appropriate opioid prescribing.

BACKGROUND

The association between high-dose opioid use and risks of abuse and overdose has been well established.^{1,2} However, despite a lack of evidence that opioids are effective when used long-term, some individuals who initiate opioids will become chronic users. Further, many will escalate to high-dose therapy, owing to the combined effects of physical dependence and opioid tolerance.³ This is particularly concerning among individuals injured in the workplace, as these injuries often involve fractures, trauma, and

musculoskeletal injuries that often lead to opioid initiation.^{4–6} Indeed, studies conducted in Australia and the United States have reported a high prevalence of opioid use among individuals receiving workers' compensation (WC), with considerable variation by jurisdiction and population characteristics, ranging between 3% among Australian workers with no early work disability⁴ and 52% among workers in Utah with low back pain receiving loss of earning (LOE) benefits.^{7,8}

In 2010, the Ontario Workplace Safety and Insurance Board (WSIB) introduced a graduated approach to opioid management designed to promote appropriate use of opioids among individuals receiving WC coverage for the management of chronic pain.⁹ Fundamental to this approach is that following an injury, prescriptions for short-acting opioids were permitted for a maximum of 12 weeks, and long-acting opioids were no longer allowed (with some exceptions such as severe and traumatic injuries). Following 12 weeks of ongoing opioid use, a clinical review by WSIB staff was required to determine the appropriateness of ongoing opioid use and potential initiation of a long-acting formulation, often done in discussion with the worker's prescriber.¹⁰

We evaluated the impact of the WSIB's graduated approach to opioid management in a WC population. Furthermore, we assessed whether this new approach was associated with measurable changes in ability to return to work following an injury.

METHODS

Setting

We conducted a population-based repeated cross-sectional study of all Ontarians with a workplace injury who received prescription drug coverage through the WSIB between January 1, 2002, and December 31, 2014. The WSIB provides no-fault insurance benefits, medical coverage (including prescription drug coverage), and wage loss benefits for individuals injured at eligible workplaces.⁵ In 2014, the WSIB provided insurance to approximately 300,000 employers and 4.4 million workers in the province.⁵

Data Sources

We used the WSIB Health Care Payment Drug Benefits database to identify all prescriptions dispensed to individuals sustaining a workplace injury and receiving drug coverage through WSIB. We used the Registered Claims database to identify demographic characteristics, injury date, and claim type. Finally, the Wage Loss Compensation database was used to identify all payments made for LOEs over follow-up. These databases were linked using unique claimant identifiers, and data were aggregated at the Workplace Safety and Insurance Board in Ontario.

Identification of the Cohort

We identified all individuals injured between January 1, 2002, and December 31, 2013, who were eligible for WSIB benefits. The date of injury served as the index date for each individual in the cohort. Severe and traumatic injuries and occupational diseases

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were excluded from the WSIB graduated approach to opioid management and therefore were not included in the study. Furthermore, individuals with past use of opioids covered by the WSIB as a result of a previous, unrelated injury in the prior year were excluded to focus our analysis on new opioid users within WSIB.

Patterns of Opioid Use

Each individual was followed forward from the index date for 1 year to identify the prevalence of initiating a long-acting or short-acting opioid that was covered by the WSIB. Opioids covered in the WSIB Drug Benefit Program have primarily included oral formulations of codeine, morphine, hydromorphone, meperidine, oxycodone, and tramadol, although tramadol was rarely covered after 2009. Workers were further characterized into one of four mutually exclusive groups based on the type of opioids dispensed within a year of injury: 1) treated with a short-acting opioid only; 2) treated first with a short-acting opioid followed by a long-acting opioid, 3) treated with a long-acting opioid only, and 4) initiated on both short-acting and long-acting opioids on the same day. Among individuals who initiated a long-acting opioid during follow-up, the time to long-acting opioid initiation was calculated as the number of days between injury (index date) and the first such prescription dispensed.

Disability Claim Duration

We measured the impact of the graduated approach on an individual's ability to return to work by estimating the total number of days with LOEs benefits in the year following injury. Among those individuals who were injured and initiated an opioid, we calculated the total number of individuals with at least one full day of LOE benefits. We also calculated the median benefit duration (number of days with LOE) over the 1-year follow-up among those individuals. We replicated this analysis among all WSIB clients to determine whether there was an overall trend in claim duration that might be attributable to other initiatives at WSIB.

Statistical Analysis

We examined patterns of opioid use and LOEs for each individual in the year following injury, and reported them on the basis of quarter of injury. We used interventional autoregressive integrated moving average (ARIMA) models to fit the time series data. We tested the immediate impact of the introduction of the WSIB's graduated formulary in Q1 2010 on the prevalence of long-acting and short-acting opioid initiation, the median time to initiating a long-acting opioid, and the median number of days with LOE among individuals initiating an opioid by including a step intervention function in the ARIMA model. In a sensitivity analysis, we used a ramp intervention function in the model to identify any gradual changes in outcomes following the WSIB's graduated formulary. If the intervention function was a significant parameter in the ARIMA model ($P \leq 0.05$), the intervention was deemed to significantly impact the outcome of interest. We assessed the autocorrelation, partial autocorrelation, and inverse autocorrelation correlograms for model parameter selection. Stationarity and seasonality were assessed using the augmented Dickey–Fuller unit root test, autocorrelation plots, and the Ljung–Box Chi-square test for white noise. All statistical analyses were performed at the Institute for Clinical Evaluative Sciences (www.ices.on.ca) using SAS software (SAS version 9.3; SAS Institute, Cary, NC) and a type 1 error rate of 0.05 as the threshold for statistical significance.

RESULTS

Over our 12-year study period, 2,320,090 new injuries were identified among 1,409,687 individuals. Of all new injuries, 48,265 (2.1%) initiated an opioid within 1 year, representing a total of 46,518 individuals (3.3%). On average, new opioid users were

42 years of age at time of injury (standard deviation = 11.5 years), and the majority ($N = 32,200$, 69.2%) were male. The most commonly initiated opioids were acetaminophen/codeine ($N = 28,257$, 60.7%) and acetaminophen/oxycodone ($N = 14,014$, 30.1%) combination products, followed by single-agent oxycodone ($N = 1343$, 2.9%) and hydromorphone ($N = 981$, 2.1%).

Before the introduction of the graduated approach to opioid management in Q1 2010, on average, 2.06% of injured workers initiated a short-acting opioid within a year of injury (Fig. 1). Although there was no immediate significant decline in the prevalence of initiation with a short-acting opioid ($P = 0.20$ in primary analysis), the rate lowered gradually following the WSIB's new graduated approach, falling to 1.44% ($N = 507$) by the end of our study period (Q4 2013; $P < 0.0001$ in sensitivity analysis). Similarly, before the graduated approach, 0.22% ($N = 76$) of injured workers initiated a long-acting opioid (Q4 2009), falling to only 0.06% ($N = 21$) by Q4 2013 (Fig. 1; $P < 0.0001$ in primary analysis).

Similarly, the pattern of opioid type initiated shifted considerably following the implementation of the graduated approach. In particular, among workers initiating at least one opioid over follow-up, the proportion who initiated a short-acting opioid with no subsequent long-acting opioid in the year following injury rose from 90.6% at the end of 2009 to 95.9% at the end of our study period (Fig. 2; $P < 0.0001$ in primary analysis). In contrast, the prevalence of workers who initiated a long-acting opioid [either alone ($P = 0.002$) or in combination with a short-acting opioid ($P = 0.013$)], and those who initiated a short-acting opioid and subsequently received a long-acting opioid in the year after injury ($P < 0.0001$) declined significantly following implementation of the graduated approach in our primary analysis (Fig. 3). In our sensitivity analysis using a ramp function to model opioid types initiated, the intervention was no longer statistically significant ($P > 0.05$ for all outcomes).

The proportion of injured workers who initiated opioids and did not receive any LOE benefits in the year following injury increased steadily over the study period, rising from 9.2% at the beginning of 2002 to 20.2% at the end of 2013 (supplemental appendix eFigure 1, <http://links.lww.com/JOEM/A376>). Among opioid users with at least 1 day of paid LOE in the year following injury, the median disability claim duration dropped following the introduction of the graduated approach (from 94 days in Q4 2009 to 85 days in Q4 2013, Fig. 4). However, this shift was not found to be associated with the introduction of the graduated approach in our models ($P = 0.184$ in primary analysis and $P = 0.996$ in sensitivity analysis). Instead, there was a significant reduction in the median disability claim duration before the graduated approach in Q1 2009 ($P = 0.002$). Finally, we observed a gradual decline in median disability claim duration in the overall WSIB population, falling from a median of 10 days in Q1 2002 to 7 days in Q4 2013.

DISCUSSION

In this study spanning 12 years, we found that introduction of a graduated approach for opioid management led to significant reductions in the initiation of opioids among individuals injured in the workplace. Furthermore, among individuals who initiated an opioid following an injury, we found that prescription trends shifted away from the use of long-acting opioid formulations (either as first-line or second-line therapy), and toward short-acting opioids alone. This aligns with the goals of the graduated approach, which focused on avoiding unnecessary initiation of long-acting opioid formulations by adding specific requirements for clinical review before their initiation. Hence, these results suggest that by delaying the initiation of long-acting opioids for at least 12 weeks, individuals are less likely to initiate a long-acting opioid at any point in the year following injury.

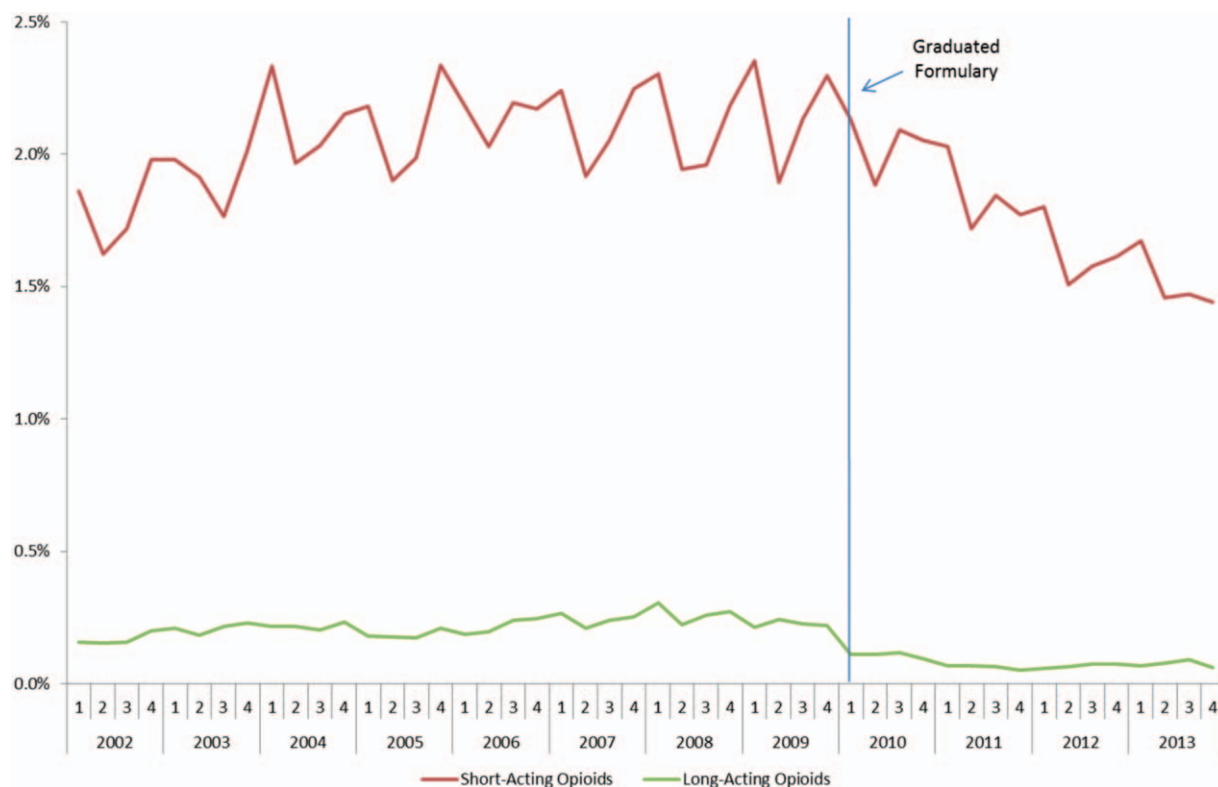


FIGURE 1. Prevalence of opioid initiation among WSIB clients within 1 year of injury, by opioid type.

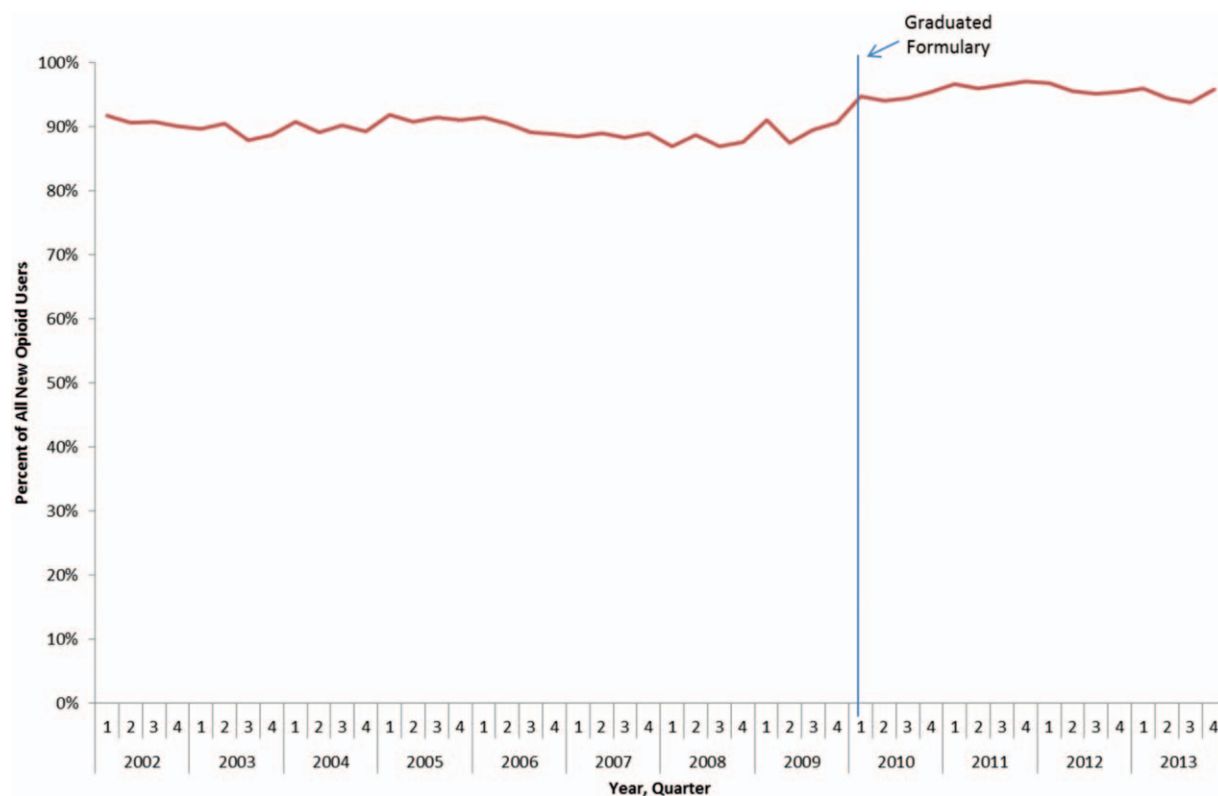


FIGURE 2. Prevalence of initiation of short-acting opioid with no subsequent long-acting opioid among individuals initiating an opioid within 1 year of injury.

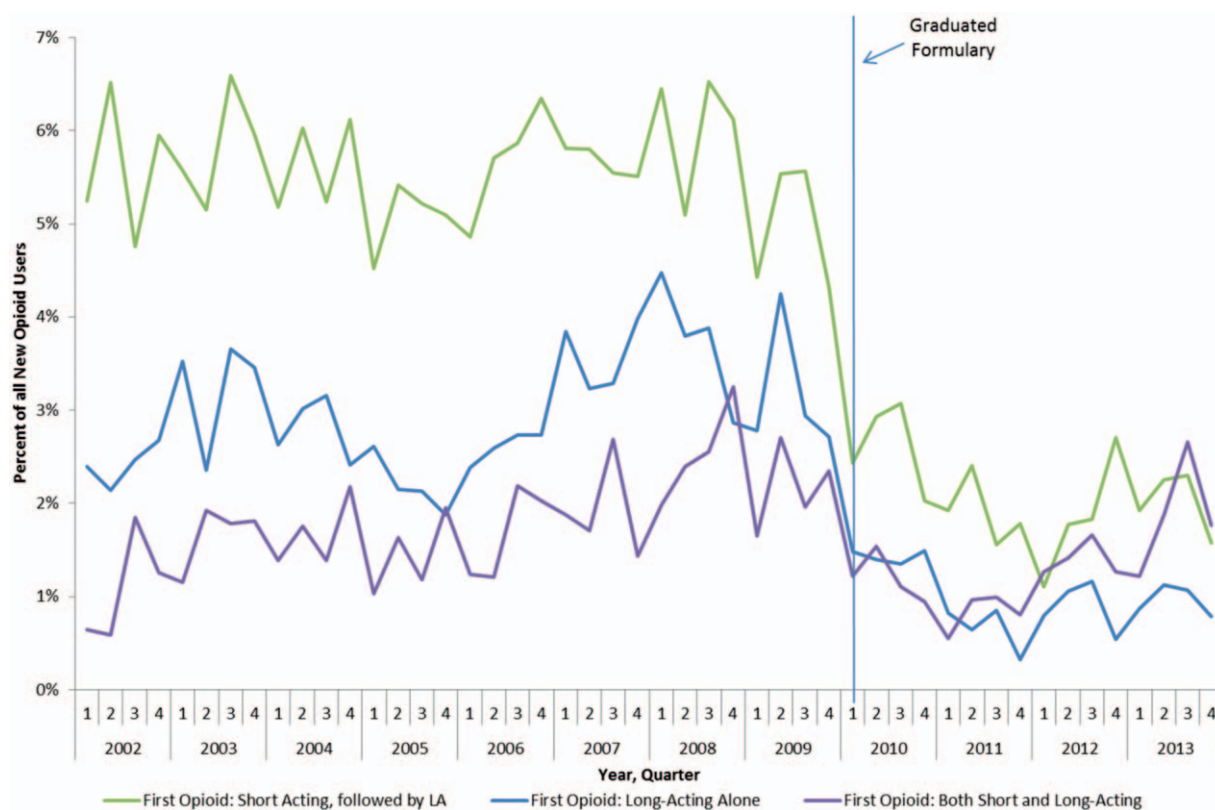


FIGURE 3. Patterns of opioid initiation among individuals commencing opioid therapy within 1 year of injury.

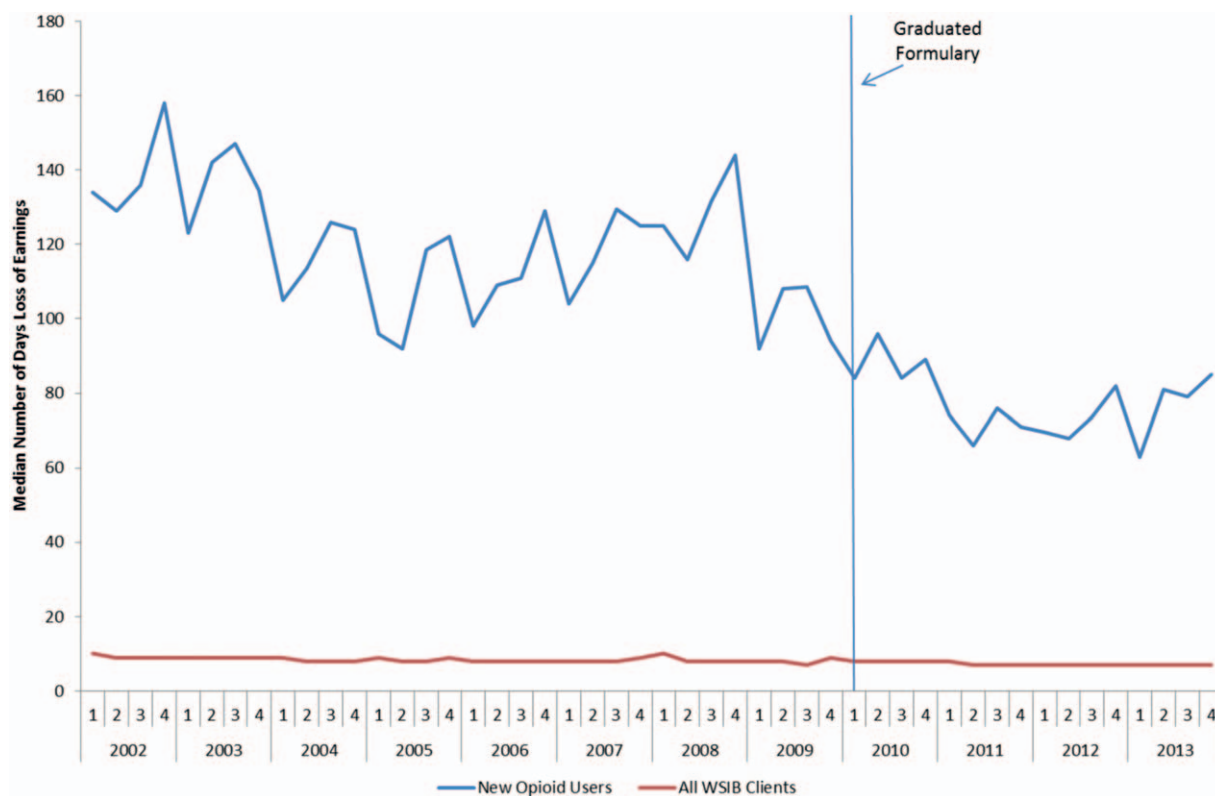


FIGURE 4. Median days with loss of earnings* within 1 year of injury among WSIB clients, overall, and among new opioid users.
*Median calculated among those with at least 1 day with loss of earnings benefits in the year following injury.

An important component of this study was to measure whether the WSIB's graduated approach led to changes in an individuals' ability to return to work. The median duration of workers' disability claim fell consistently over the follow-up period. This trend toward shorter claim durations is likely attributable to a combination of initiatives undertaken by the WSIB to improve client outcomes, such as a case management framework to address recovery obstacles impacting return to work. Although the graduated approach to opioids is one such initiative, we cannot determine the degree to which it impacted the ongoing trend of decreasing claim duration. However, our finding of no significant shift in these trends at the time of implementing the graduated approach suggests that the resulting changes in opioid prescribing patterns did not lead to longer disability duration, which would be suggestive of worsening individual outcomes.

These findings have important implications for policy-makers who may be considering restricted access to long-acting opioids as a way to improve appropriateness of opioid use. It also aligns with recently published findings in a cohort of workers with acute lower back pain that suggests early reimbursement for opioids prolonged disability duration.¹¹ Moreover, another study of the impact of policy changes on opioid-prescribing practices in a workers compensation setting in Washington state¹² demonstrated that the state's implementation of a guideline to promote more appropriate opioid prescribing, including recommendations surrounding upper dose thresholds, was associated with lowered levels of chronic and high-dose opioid use.¹² However, in their study, the observed shifts in opioid prescribing were delayed following the introduction of the guidelines, leading the authors to conclude that these changes might reflect other contemporaneous interventions and policy changes. In contrast, in Ontario, the rate of opioid prescribing has been relatively stable in recent years, with reductions in the volume of opioids prescribed not becoming apparent until late in 2015.¹³ This reinforces that suggestion that, in our study, the finding of immediate, statistically significant shifts in opioid prescribing is likely attributable to WSIB's graduated approach to opioid management.

Our study found that the incidence of opioid use in the Ontario WC population is lower than that reported in a comparable study in an Australian WC setting, where approximately 10% of the WC population initiated opioids within 1 year of injury, compared with only 3.3% in our study.⁴ These differences are likely attributable to a number of factors that distinguish the Australian workers compensation analysis from that in our study, including differences in the health care system, variability in types of opioids available in each jurisdiction (including a relatively high degree of tramadol use in the Australian study), and differences in client demographic characteristics and injury severity.⁴

Strengths of this study include its large size and consistency of implementation of the graduated formulary change across the study population, allowing us to evaluate its impact at a population-level. However, the study also has limitations that merit discussion. Workers may be prescribed opioids at their first health intervention, such as a visit to their family doctor, before the WC claim is registered. In these instances, WSIB does not have data on prescribed dose because these prescription claims are not captured electronically. We found that daily dose was not available for 37% of all opioid prescriptions, and therefore, we were unable to explore changes in patterns of dose prescribed. Second, we were limited to opioid prescriptions paid by the WSIB. Whether individuals had received opioids before becoming eligible for WSIB benefits or did not request opioid drug coverage from WSIB is unknown, which may lead to an under-estimate of opioid use. Third, it is possible that the graduated approach to opioid management was not consistently applied across all prescribers. However, the requirement for prescribers

to provide either a complex drug review or a completed Opioid Assessment Form when initiating their patients on an opioid likely led rapid alignment of clinical practice with these requirements. Finally, we were unable to measure other clinical outcomes over time, including quality of life, pain management, and risk of opioid dependence and/or addiction. Future research should further explore the impact of graduated formularies on other patient outcomes.

CONCLUSION

In this large, population-based study of 1.4 million workers in Ontario, we found that the introduction of a graduated approach to opioid management led to significant reductions in initiation of opioids postinjury and escalation to long-acting formulations over the subsequent year. These findings suggest that a graduated approach for opioid management may be an effective tool for drug insurance providers within workers compensation settings and more broadly to promote appropriate opioid prescribing. Future research should consider evaluating the broader impact of this approach on patient outcomes, including quality of life and risk of opioid addiction.

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