

Case report

## Fentanyl use among street drug users in Toronto, Canada: Behavioural dynamics and public health implications

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### Abstract

Prescription opioids (POs) are playing an increasingly central role in street drug use and related harms in North America. One distinct PO substance of interest is Fentanyl (Duragesic<sup>®</sup>), a potent opioid analgesic designed for transdermal time-release application. Studies from Europe and North America have documented the sizeable overdose and mortality burden associated with the non-medical use of this drug. This study explores practices and risk dynamics associated with Fentanyl abuse, also considering public health implications. Semi-structured interviews were conducted with 25 regular street-entrenched illicit PO users in Toronto, Canada, a sub-sample of which were recent Fentanyl users. Results showed that while relatively rare on the illicit PO market in Toronto, Fentanyl is a highly desired, sought after and relatively expensive PO drug among street users. In addition, the new ‘matrix’ patch technology implemented for Fentanyl since 2005 is a limited safeguard against abuse as simple extraction methods are utilized by street users. Finally, distinct risk behaviours relevant for public health emerge due to the high black market costs of Fentanyl and the extraction techniques applied, potentially facilitating high risks for infectious disease (e.g., HCV, HIV) transmission and/or overdose. Consequently, prevalence and practices of Fentanyl use by street users require closer monitoring, targeted interventions and further research regarding risks and outcomes.

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In the context of substantial increases in the medical use of prescription opioid (PO) analgesics in North America over the past decade, simultaneous increases in non-medical PO use and harm outcomes in both general and high-risk populations have occurred (Compton & Volkow, 2006; Hurwitz, 2005). Specifically, both the prevalence of non-medical PO use in general adult, student and youth populations, as well as related ER-mentions and fatal drug poisonings have increased dramatically in the US (Compton & Volkow, 2006; Gilson, Ryan, Jonsson, & Dahl, 2004; Paulozzi, Budnitz, & Xi, 2006; Sung, Richter, Vaughan, Johnson, & Thom, 2005). There is also evidence of POs playing an increasingly central role in

high-risk (e.g., street) drug user populations in both Canada and in the US, often replacing the main traditional opiate drug of choice, heroin (Fischer & Rehm, 2007; Havens, Walker, & Leukefeld, 2007). A recent multi-site Canadian study showed that among illicit opioid and other drug users in seven cities, opioid use profiles in five sites virtually only consisted of PO, (e.g., Hydromorphone, Morphine, Oxycodone), as opposed to heroin, use (Fischer, Rehm, Patra, & Firestone Cruz, 2006). Currently, existing evidence is insufficient to determine the public health implications of these shifts in opioid use patterns, despite the fact that such evidence is crucially needed for interventions development.

One specific and distinct PO substance of interest is Fentanyl, a highly potent opioid analgesic available since the early 1990s, designed for transdermal time-release application, and manufactured under the trade name Duragesic<sup>®</sup> (Lehmann & Zech, 1992). Both global Fentanyl produc-

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tion and its consumption in Canada – one of the world's top consumer countries of the drug on a per capita basis – has substantially increased over the past few years; the latter almost tripled between 2001 and 2005 alone (*International Narcotics Control & Board*, 2006). A few studies from Europe and North America have documented the sizeable overdose and mortality burden associated with the drug (Kronstrand, Druid, Holmgren, & Rajs, 1997; Kuhlman, McCaulley, Valouch, & Behonick, 2003; Reeves & Ginifer, 2002; Tharp, Winecher, & Winston, 2004). In Ontario, Canada 112 cases of Fentanyl-related deaths were reported between 2002 and 2004 – constituting 7.2% of all drug-related overdose (OD) deaths in that period – of which Fentanyl was considered the primary cause in almost half (Fischer, Popova, Rehm, & Ivsins, 2006; Martin, Woodall, & McLellan, 2006). In 2005, the manufacturers of Fentanyl released a new patch formulation, in which the active drug is contained in a polymer matrix instead of a gel-filled reservoir and which is much smaller and thinner than the original patch. The new polymer matrix-technology was designed to increase safety and adherence, and decrease side-effects as well as misuse of the old-style (gel-reservoir based) patch.

This small exploratory (interview-based) qualitative study conducted in Toronto aimed to examine the influences, behaviours and risks that surround the non-medical use of different POs, including Fentanyl. Eligibility criteria for the overall study included age 18 or older and reporting a history of injection of (any) PO in the past month. Study participants were recruited from local street drug user populations with the help of community-based service provider and peer contacts in downtown Toronto, and interviewed based on informed consent between March and June 2007. The total study sample consisted of 25 participants, specifically 15 males and 10 females, ages ranging from 18 to 50 years. Over half ( $N = 14$ ) of the sample specifically reported a history of Fentanyl injection within at least the past 3 months, in addition to the use of a variety of other drugs. Data reported here are based on this sub-sample of recent Fentanyl users.

The study generated several key results. First, respondents revealed that while relatively rare on the generally abundant illicit PO market in Toronto, Fentanyl is a highly desired, sought after and relatively expensive PO drug among street users, with non-medical availability limited to few sources. Second, users illustrated that the new matrix technology did not present consistent safeguards against the non-medical use of the drug in the study sample. As several respondents testified, it is widely known among street users that the opioid material can easily be extracted from the Fentanyl matrix patch by adding vinegar and water, and either soaking, heating or microwaving the patch, and then retrieving the emerging liquid solution. Given this extraction technique in combination with the drug's high costs and desirability in street drug use settings, distinct risk behaviours emerge. Fentanyl matrix patches are often only accessible and/or affordable to groups of several (e.g., 4–6) street users. The extracted solution is often captured in a single container (e.g.,

spoon), from which all users then load their syringes for subsequent injection, and so share the extracted Fentanyl from common paraphernalia in this manner, producing high-risk conditions for the transmission of infectious disease (e.g., HCV, HIV) (Mathei et al., 2006; Thorpe et al., 2002). Furthermore, respondents acknowledged that due to the different quantity and time-release formulation in conjunction with the extraction techniques applied, the potency and effects of the Fentanyl solution eventually injected – also compared to other POs which come in oral capsule formulation – is hard to gauge and hence presents a high risk for overdose. Respondents recognized the risk of “going under” from extracted Fentanyl use as very high, yet accepted this due to the drug's highly desired effects compared to other opioid substances available on street markets.

Our exploratory study findings suggest that practices related to Fentanyl injection pose distinct risk behaviors in the wider context of the growing problem of non-medical PO use. The new Fentanyl matrix patch formulation appears to be limited in preventing the use of this drug among street users, yet importantly may potentially amplify risk practices in conjunction with the high demand for and black market costs of the drug, the outcomes of which require close monitoring. Given the overall rising prevalence and potential harm outcomes associated with non-medical PO use in general (Fischer, Gittins, & Rehm, in press; Fischer & Rehm, 2007; Gilson et al., 2004; Paulozzi et al., 2006), systematic monitoring, research on risks and outcomes and preventive interventions for the distinct phenomenon of Fentanyl users, among street drug users in Canada need to be implemented.

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## References

- Compton, W. M., & Volkow, N. D. (2006). Major increases in opioid analgesic abuse in the United States: Concerns and strategies. *Drug and Alcohol Dependence*, *81*, 103–107.
- Fischer, B., Gittins, J., & Rehm, J. (in press). Characterizing the ‘awakening elephant’ of prescription opioid misuse in North America: Epidemiology, harms, interventions. *Contemporary Drug Problems*.
- Fischer, B., Popova, L., Rehm, J., & Ivsins, A. (2006). Drug use related overdose mortality in British Columbia and Ontario, 1992–2002. *Canadian Journal of Public Health*, *95*, 384–387.
- Fischer, B., & Rehm, J. (2007). Illicit opioid use in the 21st century: Witnessing a paradigm shift. *Addiction*, *102*, 499–501.
- Fischer, B., Rehm, J., Patra, J., & Firestone Cruz, M. (2006). Changes in illicit opioid use profiles across Canada. *Canadian Medical Association Journal*, *175*, 1–3.

- Gilson, A., Ryan, K., Jonsson, D., & Dahl, J. (2004). A reassessment of trends in the medical use and abuse of opioid analgesics and implications for diversion control. *Journal of Pain and Symptom Management*, 28, 176–188.
- Havens, J., Walker, R., & Leukefeld, C. (2007). Prevalence of opioid analgesic injection among rural nonmedical opioid analgesic users. *Drug and Alcohol Dependence*, 87, 98–102.
- Hurwitz, W. (2005). The challenge of prescription drug misuse: A review and commentary. *Pain Medicine*, 6, 152–161.
- International Narcotics Control Board. (2006). *Narcotic drugs: Estimated world requirements for 2007: Statistics for 2005*. New York: INCB.
- Kronstrand, R., Druid, H., Holmgren, P., & Rajs, J. (1997). A cluster of fentanyl-related deaths among addicts in Sweden. *Forensic Science International*, 88, 185–195.
- Kuhlman, J. J., McCaulley, R., Valouch, T. J., & Behonick, G. S. (2003). Fentanyl use, misuse and abuse: A summary of 23 postmortem cases. *Journal of Analytical Toxicology*, 27, 499–504.
- Lehmann, K. A., & Zech, D. (1992). Transdermal fentanyl: Clinical pharmacology. *Journal of Pain and Symptom Management*, 7, S8–S16.
- Martin, T. L., Woodall, K. L., & McLellan, B. A. (2006). Fentanyl-related deaths in Ontario, Canada: Toxicological findings and circumstances of death in 112 cases (2002–2004). *Journal of Analytical Toxicology*, 30, 603–610.
- Mathei, C., Shkedy, Z., Denis, B., Kabali, C., Aerts, M., & Molenberghs, G. (2006). Evidence for a substantial role of sharing of injecting paraphernalia other than syringes/needles to the spread of hepatitis C among injecting drug users. *Journal of Viral Hepatology*, 13, 560–570.
- Paulozzi, L., Budnitz, D., & Xi, Y. (2006). Increasing deaths from opioid analgesics in the United States. *Pharmacoepidemiology and Drug Safety*, 15, 618–627.
- Reeves, M. D., & Ginifer, C. J. (2002). Fatal intravenous misuse of transdermal fentanyl. *Medical Journal of Australia*, 177, 552–553.
- Sung, H. E., Richter, L., Vaughan, R., Johnson, P. B., & Thom, B. (2005). Nonmedical use of prescription opioids among teenagers in the United States: Trends and correlates. *Journal of Adolescent Health*, 37, 44–51.
- Tharp, A. M., Winecher, R. E., & Winston, D. (2004). Fatal intravenous fentanyl abuse: Four cases involving extraction of fentanyl from transdermal patches. *American Journal of Forensic Medical Pathology*, 25, 178–181.
- Thorpe, L. E., Ouellet, L. J., Hershov, R., Bailey, S. L., Williams, I. T., Williamson, J., et al. (2002). Risk of hepatitis C virus infection among young adult injection drug users who share injection equipment. *American Journal of Epidemiology*, 155, 645–653.