

Hepatitis C, Illicit Drug Use and Public Health

Does Canada Really Have a Viable Plan?

Benedikt Fischer, PhD^{1,3}

Kate Kalousek, HonBA^{1,3}

Jürgen Rehm, PhD^{1,2}

Jeff Powis, MD^{1,4}

Mel Krajden, MD^{5,6}

Jens Reimer, MD⁷

ABSTRACT

Some 300,000 individuals are infected with the hepatitis C virus (HCV) in Canada. HCV infection is associated with major morbidity, mortality and health care costs; these indicators are projected to rise over the next decade. The vast majority of prevalent and incident HCV infections in Canada are illicit drug use-related; thus, the HCV disease burden can only be addressed through interventions targeting this primary risk factor. Both preventive (e.g., needle exchange, methadone treatment) and therapeutic (e.g., the accessibility of HCV treatment for illicit drug users) interventions aimed at HCV in illicit drug users have been broadly expanded in Canada in recent years. However, evidence suggests that existing preventive measures only offer limited effectiveness in reducing HCV risk exposure. Also, due to restricted resources, treatment for HCV currently only reaches an extremely small proportion (i.e., <5%) of HCV-infected drug users. Thus, on the basis of current HCV incidence as well as given interventions and their impact, Canada is not achieving a net reduction in the prevalence of HCV-related to illicit drug use. In order to reduce the HCV disease burden, Canada needs to reconsider the scope, delivery and resourcing of both preventive and treatment interventions targeting the primary risk population of illicit drug users.

MeSH terms: Hepatitis C; public health; street drugs; policy; Canada

La traduction du résumé se trouve à la fin de l'article.

1. Centre for Addiction and Mental Health, Toronto, ON
2. University of Toronto, Toronto
3. Centre for Addictions Research of British Columbia, Victoria, BC
4. Toronto General Hospital, Toronto
5. B.C. Centre for Disease Control, Vancouver, BC
6. University of British Columbia, Vancouver
7. Centre for Interdisciplinary Addiction Research, Hamburg, Germany

Correspondence and reprint requests: Benedikt Fischer, CAMH/RS-2035, 33 Russell St., Toronto, ON M5S 2S1, Tel. 416-535-8501, ext. 4502, Fax. 416-260-4156, E-mail: Benedikt.Fischer@utoronto.ca

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In Canada – as in most other Western market economies – the combination of illicit drug use and hepatitis C virus (HCV) infection constitutes a major source of disease burden and costs.¹ Approximately 50-90% of street drug user populations are HCV-infected.²⁻⁴ The vast majority of the currently 300,000 prevalent HCV infection cases in Canada are illicit drug use-related; this risk factor is estimated to cause 75% of the approximately 6,000 or more new HCV infections per year.^{5,6} The subsequent disease and cost burden of the HCV epidemic is extensive, given that up to one in four HCV-infected persons will develop cirrhosis within twenty years of infection, and cirrhosis leads to substantive annual rates of liver failure (2-4%) and/or hepatocellular carcinoma (1-7%). At least one in eight HCV-infected persons are expected to die as a result of their infection.^{7,8} The annual economic costs of HCV-related disease have been crudely estimated to be up to \$500 million in Canada,^{9,10} with current indicators suggesting that HCV-related morbidity, mortality and costs will considerably increase in the next two decades.⁶ Hence, an effective strategy – while acknowledging the pivotal causal role of illicit drug use – is urgently needed to reduce the incidence of HCV infection and HCV-related morbidity and mortality in Canada.

While the HCV epidemic among illicit drug users has long been a neglected issue both in the hepatology and addiction fields, some general developments are reasons for optimism:

- illicit drug use is now acknowledged as a key risk factor for HCV in official strategy documents;^{1,11}
- prevention programs for high-risk drug users (e.g., needle exchange programs [NEPs], safer injection sites [SIS], 'safer crack use kits', opioid substitution treatment) are available in Canada;^{12,13}
- a series of recent studies has demonstrated the potential feasibility and effectiveness of state-of-the-art pharmacotherapy treatment for HCV with illicit drug user samples.^{14,15}

Yet, one must ask whether our collective good intentions are truly enough as a strategic approach to reverse the expansive trend of the HCV disease burden? In other words, is Canada taking effective and sufficient steps aimed at reducing the HCV

problem? Regretfully, a closer examination raises severe doubts. Recent epidemiological data suggest that, although preventive interventions for illicit drug users have been broadly expanded in Canada over the past decade, illicit drug user populations (e.g., VIDUS, SURV-IDU)^{2,4} have seen insignificant declines in HCV incidence at best. Declines observed have been assessed to be most likely “due to saturation ... of HCV” rather than accomplished by extrinsic interventions.^{2(p38)}

While the broad availability of preventive interventions for high-risk drug users may ideally suggest substantial protection against HCV transmission, the reality of their impact is far less encouraging. This discrepancy originates from the combination of the comparably high (e.g., compared to HIV) infectivity of the HCV as well as the actual utilization dynamics of preventive interventions.¹⁶ While the effectiveness of NEPs for reducing HIV incidence is widely proven, several recent studies have documented that, as a tool to prevent HCV, NEPs are “relatively ineffective” and “offer no protective benefits”.¹⁷⁻¹⁹ Key reasons for these shortcomings include that many drug injectors continue to share not only syringes but primarily other equipment, utilize NEPs only irregularly, and are likely to be HCV-infected already within months of injection uptake, so that HCV infection typically occurs faster than prevention resources can be utilized.^{1,16,20} The preventive prospects of safer injection sites (SIS) – amplified by the existence of only one such facility in Canada – against HCV transmission offer a similarly restricted picture. To date, no reduction of HCV incidence attributable to SIS has been empirically demonstrated. Moreover, data from three continents show that the vast majority of SIS clients utilize these facilities only sporadically (e.g., once a week or less), meaning that most injections continue to occur under unsafe conditions. Furthermore, baseline rates of HCV infection among SIS clients are typically already high.²¹⁻²³ New interventions – specifically ‘safer crack use kits’ (SCUK) – to prevent HCV transmission among the growing population of oral crack users currently operate on hypothetical grounds: there is no definitive evidence to date that HCV transmission is actually caused by crack use (as opposed to other risk factors concen-

trated among crack users). Furthermore, the efficacy of SCUK to prevent HCV transmission has not yet been conclusively investigated.^{24,25}

Considering addiction treatment, methadone maintenance treatment (MMT) is fairly widely available in Canada, reaching some 25-30% of estimated illicit opioid users.²⁶ Several studies have demonstrated MMT’s impact on lowering HIV as well as HCV risks in treatment samples.^{17,27} However, actual treatment realities reveal dilemmas similar to the above-described prevention efforts. The protective effect of MMT for HCV primarily hinges on clients’ strict treatment adherence (and consequently, the avoidance of risk behaviours related to illicit drug use). Regrettably, MMT evaluations commonly only report outcomes on patient subsamples effectively retained in treatment, leading to skewed conclusions regarding program effectiveness.²⁷⁻²⁹ In reality, most illicit drug users enter into MMT only after a lengthy injection history, and adhere to the treatment only for a short time or with interruptions.²⁹ Consequently, these lapses offer extensive opportunity for HCV exposure and subsequent infection if the client is not already infected.^{15,17,29}

Recent research on antiviral treatment as a therapeutic approach to reduce the HCV disease burden among illicit drug users has provided encouraging news. Several clinical trials have demonstrated the feasibility and effectiveness of pegylated interferon/ribavirin-based HCV therapy for illicit drug users, resulting in virus clearance or ‘cure’ rates similar to non-drug user treatment samples.^{1,14,15} In addition, guidelines have recommended the active consideration of illicit drug users for HCV treatment, and have therefore broken traditional barriers for inclusion.^{1,11} Yet contrary to these positive indicators, a variety of obstacles exist for extensive HCV treatment uptake by illicit drug users: first, two thirds or more of HCV-positive drug users in Canada are infected with a genotype 1 strain of the HCV virus,³⁰ which requires 48-week-long treatment and is characterized by relatively low treatment response rates (<50%) compared to genotype 2 or 3 strains.³¹ Second, HCV therapy is generally lengthy, expensive, and – especially for drug users’ distinct patient needs

– requires multidisciplinary expert care to ensure treatment adherence and completion, and subsequent positive treatment outcomes.^{14-16,32} Unfortunately, resources for such quality care in this vulnerable target population are extremely limited. Compounding the problem of resources, a large proportion of HCV-infected drug users are either not motivated for treatment, or deterred by treatment requirements or possible side effects.^{33,34} The following provides a concrete illustration of the limited reach of current treatment efforts. In the multi-site I-Track population, only 3.0% of HCV-positive IDUs had ever undergone HCV pharmacotherapy.³⁵ In British Columbia (BC), an estimated total of 5,000 HCV-infected persons have undergone treatment since January 2000. Assuming a cure rate of <50%, the effectively treated population translates into ~6% of the known HCV-infected population (41,000), or ~4% of the estimated HCV-infected population (60,000) in BC.¹⁰ On this basis, it must be assumed that the number of cases effectively treated for HCV is smaller than the number of incident HCV infections per year in Canada, not even leading to a net reduction in HCV prevalence.

Based on the above overview, we must conclude that an effective reduction of the illicit drug use-related HCV disease burden in Canada cannot be expected in the near future. What other steps should be considered? First, the enormous gap between HCV treatment intentions and realities for illicit drug users must be narrowed – i.e., more treatment must be delivered, especially to those individuals infected with HCV-genotypes (e.g., 3) promising a high chance of successful treatment outcome. This ought to happen through the provision of targeted resources and community-based treatment delivery (e.g., via GPs) to this population, as demonstrated to be effective for both HIV treatment and MMT delivery in recent years.^{36,37} The need for expanded HCV treatment for illicit drug users is encouraged by observed low re-infection rates as well as possible immuno-protective effects following treatment in this population, although more research is required on these issues.^{38,39} Second, currently neglected preventive potentials for HCV must be explored. A considerable minority of street drug users

in Canada – following more pronounced trends elsewhere, e.g., in Europe – practice non-injection forms of drug use, and thus face lessened HCV transmission risk exposure.^{3,40} While program initiatives exist,^{41,42} little is currently done domestically to actively prevent (especially young) drug users' transition to injection behaviours, or to encourage current injectors to revert to non-injection practices. Third, additional addiction treatment programming – including diversified opioid and non-opioid maintenance programs with high retention potential – must be considered to decrease high-risk behaviours for HCV transmission as a consequence of persistent illicit drug use.^{26,43} Finally, without an effective HCV vaccine on the horizon, the potential preventive utility of spontaneous clearance of HCV infection in illicit drug users must be better understood. Spontaneous clearance has been reported to occur in 20-50% of persons infected with HCV, and may subsequently provide protective immunity against HCV.⁴⁴ These processes may be modifiable and thus utilized for interventions to reduce HCV incidence.^{45,46}

REFERENCES

- Fischer B, Haydon E, Rehm J, Krajdenc M, Reimer J. Injection drug use and the hepatitis C virus: Considerations for a targeted treatment approach-The case study of Canada. *J Urban Health* 2004;81:428-47.
- Buxton J. Vancouver Drug Use Epidemiology. 1-50. 2003. Vancouver, Canadian Community Epidemiology Network on Drug Use.
- Fischer B, Rehm J, Brissette S, Brochu S, Bruneau J, el-Guebaly N, et al. Illicit opioid users in Canada: Comparing social, health and drug use characteristics of untreated users in five cities (OPICAN study). *J Urban Health* 2005;82:250-66.
- Roy E, Alary M, Morissette C. Épidémiologie de l'hépatite C chez les participants au réseau SurvUDI. 1-16. 2004. Montréal, SurvUDI.
- Zou S, Forrester L, Giulivi A. Hepatitis C update. *Can J Public Health* 2003;94(2):127-29.
- Remis R. A study to characterize the epidemiology of hepatitis C infection in Canada, 2002. Final report. 2004. Ottawa, Health Canada.
- Sulkowski MS, Thomas DL. Epidemiology and natural history of hepatitis C virus infection in injection drug users: Implications for treatment. *Clin Infect Dis* 2005;40(Suppl 5):S263-S269.
- Krahn M, Wong J, Heathcote J, Scully L, Seeff L. Estimating the prognosis of hepatitis C patients infected by transfusion in Canada between 1986 and 1990. *Medical Decision Making* 2004;24:20-29.
- El Saadany S, Coyle D, Giulivi A, Afzal M. Economic burden of hepatitis C in Canada and the potential impact of prevention: Results from a disease model. *Eur J Health Econ* 2005;6:159-65.
- Health Canada. Hepatitis C as a roadmap for integrated communicable disease prevention and control: A strategy for the renewal of the Health Canada/Canadian Institutes of Health Research (CIHR) research initiative on hepatitis C. 20-1-2005. Ottawa, Joint Advisory Committee Health Canada/CIHR Research Initiative on Hepatitis C.
- Reimer J, Schulte B, Castells X, Schafer I, Polywka S, Hedrich D, et al. Guidelines for the treatment of hepatitis C virus infection in injection drug users: Status quo in the European Union countries. *Clin Infect Dis* 2005;40(Suppl 5):S373-S378.
- Fischer B, Rehm J, Blitz-Miller T. Injection drug use and preventive measures: A comparison of Canadian and Western European jurisdictions over time. *CMAJ* 2000;162:1709-13.
- Wood E, Kerr T, Montaner JS, Strathdee SA, Wodak A, Hankins CA, et al. Rationale for evaluating North America's first medically supervised safer-injecting facility. *The Lancet Infect Dis* 2004;4:301-6.
- Backmund M, Reimer J, Meyer K, Gerlach JT, Reinhart Z. Hepatitis C virus infection and injection drug users: Prevention, risk factors, and treatment. *Clin Infect Dis* 2005;40(Suppl 5):S330-S335.
- Sylvestre DL. Treating hepatitis C virus infection in active substance users. *Clin Infect Dis* 2005;40(Suppl 5):S321-S324.
- Edlin BR, Kresina TF, Raymond DB, Carden MR, Gourevitch MN, Rich JD, et al. Overcoming barriers to prevention, care, and treatment of hepatitis C in illicit drug users. *Clin Infect Dis* 2005;40(Suppl 5):S276-S285.
- Pollack H, Heimer R. The impact and cost-effectiveness of methadone maintenance treatment in preventing HIV and hepatitis C. In: Jager J, Limburg W, Kretzschmar M, et al. (Eds.), *EMCDDA Monographs: Hepatitis C and Injecting Drug Use: Impact, Costs and Policy Options*. Luxembourg: EMCDDA, 2004;345-67.
- Pollack HA. Cost-effectiveness of harm reduction in preventing hepatitis C among injection drug users. *Medical Decision Making* 2001;21:357-67.
- Hagan H, McGough JP, Thiede H, Weiss NS, Hopkins SG, Alexander ER. Syringe exchange and risk of infection with hepatitis B and C viruses. *Am J Epidemiol* 1999;149:203-13.
- Garfein RS, Vlahov D, Galai N, Doherty MC, Nelson KE. Viral infections in short-term injection drug users: The prevalence of the hepatitis C, hepatitis B, human immunodeficiency, and human T-lymphotropic viruses. *Am J Public Health* 1996;86:655-61.
- Fischer B, Rehm J, Kim G, Robins A. Safer injection facilities (SIFs) for injection drug users (IDUs) in Canada: A review and call for an evidence-focused pilot trial. *Can J Public Health* 2002;93(5):336-38.
- Mattick R, Kimber J, Kaldor J, MacDonald M, Weatherburn D, Lapsley H. Final Report of the Evaluation of the Sydney Medically Supervised Injecting Centre. 2003. Sydney, MSIC Evaluation Committee.
- Kerr T, Tyndall M, Li K, Montaner JSG, Wood E. Safer injection facility use and syringe sharing in injection drug users. *The Lancet* 2005; early online publication, March 18, 2005.
- Haydon E, Fischer B. Crack use as a public health problem in Canada: Call for an evaluation of 'safer crack use kits'. *Can J Public Health* 2005;96(3):185-88.
- Tortu S, McMahon J, Pouget E, Hamid R. Sharing of noninjection drug-use implements as a risk factor for hepatitis C. *Subst Use Misuse* 2004;39:211-24.
- Fischer B, Rehm J, Kirst M, Casas M, Hall W, Krausz M, et al. Heroin-assisted treatment as a response to the public health problem of opiate dependence. *Eur J Public Health* 2002;12:228-34.
- Thiede H, Hagan H, Murrill C. Methadone treatment and HIV and hepatitis B and C risk reduction among injectors in the Seattle area. *J Urban Health* 2000;77:331-45.
- Hallinan R, Byrne A, Amin J, Dore GJ. Hepatitis C virus incidence among injecting drug users on opioid replacement therapy. *Austr N Z J Public Health* 2004;28:576-78.
- Fischer B, Rehm J, Kim G, Kirst M. Eyes wide shut? A conceptual and empirical critique of methadone maintenance treatment. *Eur Addict Res* 2005;11:1-12.
- Andonov A, Lin L, Wong G, Hill W, Boulos D, Tweed A, et al. Identification of Newly Acquired Hepatitis C Virus (HCV) Infection in British Columbia Based on Recent Seroconversion; Genotype Distribution for Years 2000-2003. 2nd Canadian Conference on Hepatitis C, Vancouver, Canada. 2004.
- Mangia A, Santoro R, Minerva N, Ricci GL, Caretta V, Persico M, et al. Peginterferon alfa-2b and ribavirin for 12 vs. 24 weeks in HCV genotype 2 or 3. *N Engl J Med* 2005;352:2609-17.
- Novick DM. The impact of hepatitis C virus infection on methadone maintenance treatment. *The Mount Sinai J Med* 2000;67:437-43.
- Strathdee SA, Latka M, Campbell J, O'Driscoll PT, Golub ET, Kapadia F, et al. Factors associated with interest in initiating treatment for hepatitis C virus (HCV) infection among young HCV-infected injection drug users. *Clin Infect Dis* 2005;40(Suppl 5):S304-S312.
- Fischer B, Vasdev S, Haydon E, Rehm J, Balianas D. Willingness for HCV treatment in a sample of Injecting Drug Users (IDUs) in Toronto, Canada. *La Presse Médicale* 2005;34:1207-10.
- I-Track: Enhanced Surveillance of Risk Behaviours among Injecting Drug Users in Canada (Pilot Survey Report). 2004. Ottawa, Surveillance and Risk Assessment Division, Centre for Infectious Disease Prevention and Control, Population and Public Health Branch, Health Canada.
- Bell J, Dru A, Fischer B, Levit S, Sarfraz MA. Substitution therapy for heroin addiction. *Subst Use Misuse* 2002;37:1149-78.
- Kitahata MM, Van Rompaey SE, Dillingham PW, Koepsell T, Deyo R, Dodge W, et al. Primary care delivery is associated with greater physician experience and improved survival among persons with AIDS. *J Gen Intern Med* 2003;18:95-103.
- Backmund M, Meyer K, Edlin B. Infrequent reinfection after successful treatment for hepatitis C virus infection in injection drug users. *Clin Infect Dis* 2004;39:1540-43.
- Dalgard O. Follow-up studies of treatment for hepatitis C virus infection among injection drug users. *Clin Infect Dis* 2005;40(Suppl 5):S336-S338.
- EMCDDA European Monitoring Centre for Drugs and Drug Addiction. Annual Report: State of the Drugs Problem in the European Union and Norway. 2004. Lisbon, EMCDDA.
- Dolan K, Clement N, Rouen D, Rees V, Shearer J, Wodak A. Can drug injectors be encouraged to adopt non-injecting routes of administration (NIROA) for drugs? *Drug and Alcohol Rev* 2004;23:281-86.
- Hunt N, Griffiths P, Southwell M, Stillwell G, Strang J. Preventing and curtailing injecting drug use: A review of opportunities for injecting and delivering 'route transition interventions'. *Drug and Alcohol Rev* 1999;18:441-51.
- Gonzalez G, Oliveto A, Kosten T. Combating opiate dependence: A comparison among the available pharmacological options. *Expert Opinion on Pharmacotherapy* 2004;5:713-25.
- Mehta S, Cox A, Hoover D, Wang XH, Mao Q, Ray S, et al. Protection against persistence of hepatitis C. *Lancet* 2002;359:1478-83.

45. Hoofnagle J. Therapy for acute hepatitis C. *N Engl J Med* 2001;345:1495-97.
46. Thimme R, Oldach D, Chang K, Steiger C, Ray S, Chisari F. Determinants of viral clearance and persistence during acute hepatitis C virus infection. *J Experimental Med* 2001;194:1395-406.

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RÉSUMÉ

Au Canada, quelques 300 000 personnes sont infectées par le virus de l'hépatite C (VHC). L'infection à VHC entraîne des coûts énormes sur le plan de la morbidité, de la mortalité et des soins de santé; on prévoit que ces indicateurs augmenteront durant la prochaine décennie. La grande majorité des infections à VHC courantes et incidentes au Canada est reliée à la consommation de drogues illicites; le seul moyen d'alléger le fardeau de l'hépatite C est donc d'intervenir en ciblant ce facteur de risque primaire. On a élargi ces dernières années au Canada les mesures de prévention (l'échange d'aiguilles, le traitement à la méthadone) et de traitement (l'accès aux traitements anti-VHC) axées sur les consommateurs de drogues illicites infectés par le virus. Par contre, des données laissent croire que les moyens de prévention existants ont une efficacité limitée en ce qui a trait à la réduction du risque d'exposition au VHC. De plus, les ressources étant limitées, seule une très petite partie (moins de 5 %) de la population des consommateurs de drogues illicites infectés a accès aux traitements anti-VHC. Donc, étant donné la fréquence actuelle d'infection par le VHC et le faible impact des mesures d'intervention, le Canada ne réussit pas à obtenir une réduction nette de la prévalence du VHC liée à la consommation de drogues illicites. Afin de réduire le fardeau de l'hépatite C, le Canada se doit de reconsidérer, de façon fondamentale, la portée, la distribution et les ressources attribuées aux interventions préventives et thérapeutiques visant la population la plus vulnérable, soit les consommateurs de drogues illicites.

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Pour être publiés dans le prochain numéro, les avis doivent parvenir à la rédaction avant le **30 novembre 2006** et être valables à compter du **31 décembre 2006**. Les avis reçus après le **30 novembre 2006** seront insérés si le temps et l'espace le permettent.

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