

Incidence of narcotic abuse during pregnancy in northwestern Ontario

Three-year prospective cohort study

Len Kelly MD MCISc FCFP FRRM John Guilfoyle MD CCFP FCFP Joe Dooley MD CCFP FCFP Irwin Antone MD CCFP FCFP
Lianne Gerber-Finn MD CCFP FCFP Roisin Dooley Nicole Brunton Kara Kakegamuck Jill Muilleboom
Wilma Hopman MA Helen Cromarty RN Barb Linkewich RN Jennifer Maki MSc

Abstract

Objective To document the incidence and outcomes of narcotic use during pregnancy in northwestern Ontario.

Design Three-year prospective cohort study.

Setting Sioux Lookout and surrounding communities in northwestern Ontario.

Participants A total of 1206 consecutive births in a catchment area of 28 000 First Nations patients.

EDITOR'S KEY POINTS

- Narcotic abuse is an ongoing, wide-spread issue among northwestern Ontario First Nations communities. Maternal narcotic use has risen to 28.6% of all pregnancies, including increases in both intravenous and daily use. Among infants born to narcotic users, the rate of neonatal abstinence syndrome fell significantly from 29.5% in 2010 to 18.0% in 2013 after the January 2012 institution of a narcotic weaning program ($P = .003$).
- Narcotic-exposed and nonexposed pregnancies had similar neonatal outcomes as measured by general birth parameters.
- The Sioux Lookout Meno Ya Win Health Centre, with its prenatal and obstetric program, is one of several institutions affording an effective generalist response to this social and medical dilemma in pregnancy. With sustained effort, developing community-based programs will hopefully decrease the incidence of opioid dependence with both prevention and early treatment.

This article has been peer reviewed.
Can Fam Physician 2014;60:e493-8

Main outcome measures Incidence of narcotic use, and maternal and neonatal outcomes.

Results Incidence of narcotic use in pregnancy has risen to 28.6% ($P < .001$) and incidence of neonatal abstinence syndrome has fallen to 18.0% of narcotic-exposed births ($P = .003$). Daily intravenous drug use is now a common pattern of abuse.

Conclusion Narcotic abuse in pregnancy has dramatically increased in northwestern Ontario. Neonatal outcomes have improved as a result of a family medicine-based prenatal and obstetric program that includes a narcotic replacement and tapering program.

L'abus de narcotiques durant la grossesse dans le nord-ouest de l'Ontario

Étude de cohorte prospective sur 3 ans

Len Kelly MD MCISc FCFP FRRM John Guilfoyle MD CCFP FCFP Joe Dooley MD CCFP FCFP Irwin Antone MD CCFP FCFP
Lianne Gerber-Finn MD CCFP FCFP Roisin Dooley Nicole Brunton Kara Kakegamuck Jill Muileboom
Wilma Hopman MA Helen Cromarty RN Barb Linkewich RN Jennifer Maki MSc

Résumé

Objectif Documenter l'incidence et les issues de l'utilisation de narcotiques durant la grossesse dans le nord-ouest de l'Ontario.

Type d'étude Étude de cohorte prospective d'une durée de 3 ans.

Contexte Sioux Lookout et les communautés des environs dans le nord-ouest de l'Ontario.

Participants Un total de 1206 naissances consécutives dans une circonscription hospitalière comprenant 28 000 patients des Premières Nations.

Principaux paramètres à l'étude L'incidence de l'usage de narcotiques et les issues maternelles et néonatales.

Résultats La consommation de narcotiques pendant la grossesse s'élève à 28,6% ($P < ,002$) alors que l'incidence du syndrome de sevrage du nouveau-né a chuté pour atteindre 18,0% des naissances exposées aux narcotiques ($P = ,003$). L'utilisation quotidienne de drogues par injection est maintenant un mode courant de consommation.

Conclusion La consommation de narcotiques durant la grossesse a augmenté de façon spectaculaire dans le nord-ouest de l'Ontario. Les issues néonatales se sont toutefois améliorées en raison d'un programme prénatal et obstétrical de médecine familiale basé sur un remplacement des narcotiques et un sevrage progressif.

POINTS DE REPÈRE DU RÉDACTEUR

- L'abus de narcotiques est un problème persistant et répandu dans les communautés des Premières Nations du nord-ouest de l'Ontario. L'usage intra-veineux de narcotiques et l'utilisation quotidienne de ces substances par la femme enceinte s'élèvent maintenant à 28,6% de toutes les grossesses. Par contre, le taux du syndrome de sevrage du nouveau-né a diminué significativement, passant de 29,5% en 2010 à 18,0% en 2013, grâce à l'instauration en 2012 d'un programme de sevrage aux narcotiques ($P = ,003$).
- D'après les paramètres généralement utilisés à la naissance, les grossesses avaient des issues semblables, avec ou sans exposition aux narcotiques.
- Le centre de santé Sioux Lookout Meno Ya Win, avec son programme obstétrical et prénatal, est une des nombreuses institutions en mesure d'offrir une réponse efficace des omnipraticiens à ce problème social et médical de la grossesse. Grâce à des efforts soutenus, le développement de programmes communautaires devrait diminuer l'incidence de la dépendance aux opiacés tant par la prévention que par un traitement précoce.

Cet article a fait l'objet d'une révision par des pairs.
Can Fam Physician 2014;60:e493-8

The epidemic of narcotic use in northwestern Ontario continues to be a substantial social and health problem.¹ Some communities have documented addiction rates as high as 70%, and health services and First Nations communities struggle to respond to this widespread issue in effective ways.² The Sioux Lookout Meno Ya Win Health Centre (SLMHC) provides obstetric services to a primarily First Nations population of 28 000 patients in a large geographic region encompassing 28 remote communities. Most on-reserve patients receive late pregnancy care and delivery in Sioux Lookout, unless they are referred earlier for prenatal complications, including opioid dependence. In 2010, the centre documented that up to 17% of pregnancies that year involved exposure to illicit narcotics.³ The purpose of this study is to document recent trends in narcotic use in pregnancy in northwestern Ontario over 3 years.

METHODS

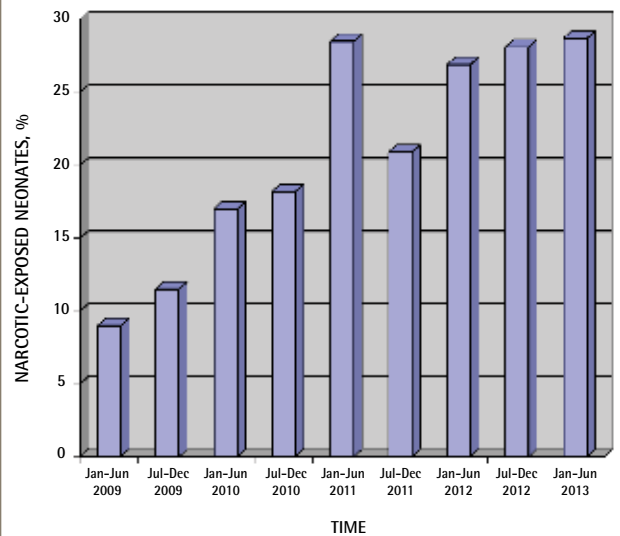
All 1206 births were prospectively studied from June 30, 2010, to June 30, 2013. Maternal attendance at routine daily prenatal clinics and twice-weekly specialized clinics in tapering narcotics in pregnancy was recorded. Specific prenatal information was documented, including amount and route of drug use, specific drug of abuse, and comorbidities. Birth outcomes including Apgar score, birth weight, length of term, gravidity, and length of stay were gathered, as were addiction-related outcome measures including Finnegan scores, presence of neonatal abstinence syndrome (NAS), and neonatal treatment. Ethics approval was granted by the SLMHC Research Review Committee.

Data were entered into an Excel spreadsheet and imported into SPSS, version 21.0 for Windows, for statistical analysis. Data were initially analyzed descriptively, using means and SDs for continuous data and frequencies and percentages for categorical data. Independent-sample *t* tests were used to compare the exposed and nonexposed mothers and infants for continuous data, and Pearson χ^2 tests were used to compare the 2 groups for categorical data. Univariate ANOVA (analysis of variance) was used to assess the incidence rates over time.

RESULTS

Incidence of narcotic use in the 1206 pregnancies studied reached 28.6% in 2013. Rates for every 6 months during the 3 years studied are recorded in **Figure 1**. Rates from our earlier retrospective study in 2010³ are included for comparison ($P < .001$). Overall, 300 pregnancies were exposed to narcotics.

Figure 1. Proportion of narcotic-exposed neonates during consecutive 6-month periods from January 1, 2009, to June 30, 2013: $P < .001$ when comparing the period from January 2009 to June 2010 and the period from July 2010 to June 2013.



Data for January 2009 to June 2010 from Kelly et al.³

Controlled-release oxycodone was the reported drug of abuse in 87.2% of narcotic exposures.

Neonatal abstinence syndrome occurred in 4.5% of all deliveries by 2013, concomitant with the development of a prenatal narcotic maintenance and tapering program. In the 300 narcotic-exposed pregnancies, the NAS rate was 18.0%. Higher Finnegan scores indicating a need for pharmacologic treatment of the neonate fell from 2.5% of all deliveries 18 months before instituting the narcotic tapering program in January 2012 to 1.5% 18 months after instituting the program; the difference was not significant ($P = .403$).

In all narcotic-using patients who attended the SLMHC integrated prenatal program, 66.0% either quit or decreased (22.3% and 43.7%, respectively) their narcotic use by the time of delivery.

Narcotic-exposed and nonexposed pregnancies shared similar maternal characteristics (**Table 1**) and neonatal outcomes, except for withdrawal measures (**Table 2**). Specifically, there were no significant neonatal differences in Apgar scores, birth weights, or gestational ages. There were 12 stillbirths, 3 in the exposed group of 300 pregnancies and 9 in the nonexposed group ($P = 1.0$).

Patient history correlated well with urine drug screening. Of the 849 self-reported non-users, all of their 131 random urine screening results were negative for oxycodone; 1 patient had positive results for tetrahydrocannabinol,

Table 1. Maternal characteristics: Significance tests for age, parity, and gestational age are based on t tests; the rest are based on χ^2 tests.

CHARACTERISTIC	TOTAL PREGNANCIES N = 1206	EXPOSED PREGNANCIES N = 300	P VALUE
Mean (SD) age, y	24.6 (5.9)	24.2 (4.7)	.088
Mean (SD) parity	2.8 (1.8)	2.9 (1.7)	.152
Mean (SD) gestational age, wk	38.9 (1.5)	38.9 (1.3)	.825
Smoking, n (%)	672 (55.7)	250 (83.3)	<.001*
Alcohol consumption, n (%)	225 (18.7)	39 (13.0)	.003*
Hypertension, n (%)	70 (5.8)	19 (6.3)	.657
Type 2 diabetes mellitus, n (%)	38 (3.2)	13 (4.3)	.184
Gestational diabetes, n (%)	90 (7.5)	20 (6.7)	.533
Cesarean section, n (%)	305 (25.3)	74 (24.7)	.774
Nonelective cesarean section, n (%)	193 (16.0)	51 (17.0)	.497
Out-of-hospital delivery, n (%)	36 (3.0)	4 (1.3)	.052
Postpartum hemorrhage, n (%)	112 (9.3)	28 (9.3)	.978

*Statistically significant difference between exposed and nonexposed pregnancies.

Table 2. Neonatal characteristics: Significance tests for birth weight, Apgar score, head circumference, length, and blood pH are based on t tests; the rest are based on χ^2 tests.

CHARACTERISTIC	TOTAL PREGNANCIES N = 1206	EXPOSED PREGNANCIES N = 300	P VALUE
Mean (SD) birth weight, g	3526.3 (556.1)	3420.8 (538.6)	<.001*
Mean (SD) Apgar score at 1 min	8.5 (1.1)	8.5 (1.3)	.794
Mean (SD) Apgar score at 5 min	9.0 (0.5)	8.9 (0.7)	.148
Mean (SD) head circumference, cm	35.0 (1.7)	34.8 (1.5)	.103
Mean (SD) length, cm	50.9 (3.2)	50.5 (3.2)	.011*
Mean (SD) arterial pH	7.24 (0.09)	7.25 (0.08)	.211
Mean (SD) venous pH	7.30 (0.24)	7.31 (0.08)	.254
Preterm birth (<37 wk), n (%)	54 (4.5)	16 (5.3)	.408
NAS, n (%)	54 (4.5)	54 (18.0)	<.001*
Finnegan score ≥ 8 , [†] n (%)	32 (2.7)	32 (10.7)	<.001*
Male sex, n (%)	596 (49.4)	136 (45.3)	.099
Transfers out, n (%)	18 (1.5)	8 (2.7)	.093
Stillbirths, n (%)	12 (1.0)	3 (1.0)	1.0

NAS—neonatal abstinence syndrome.

*Statistically significant difference between exposed and nonexposed pregnancies.

[†]Finnegan scores ≥ 8 indicate a need for pharmacologic treatment of the neonate for NAS.

1 had positive results for benzodiazepines, and 1 had positive results for opiates.

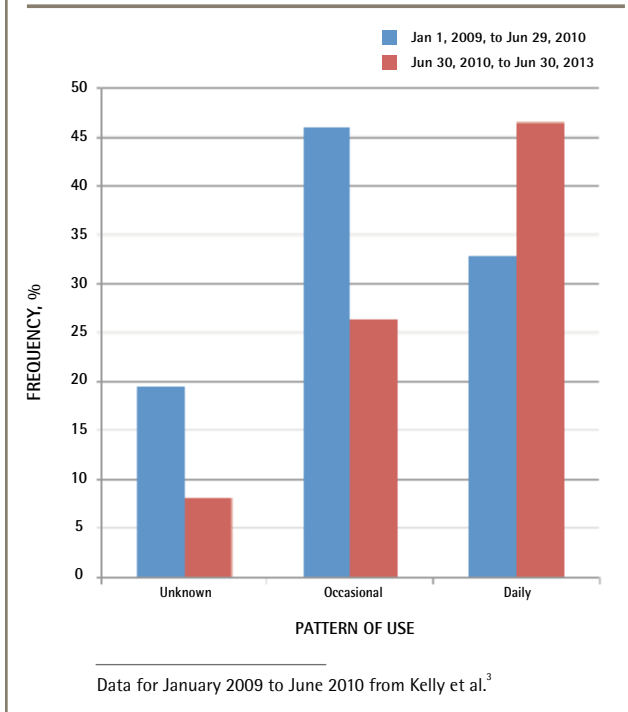
In narcotic-exposed pregnancies, most patients used narcotics daily (46.5%) by 2010 to 2013, whereas in 2009 to 2010 occasional use predominated (45.9%, $P < .001$) (Figure 2). Route of administration has also seen a dramatic shift toward intravenous use, which was quite rare in 2009 to 2010, but which is now the route of administration in 30.0% of cases ($P < .001$). Snorting still remains the most common route of abuse at 32.0%. Only 3 cases of hepatitis C infection were recorded and no cases of HIV infection were encountered.

Thirty male partners were also treated for narcotic use and attended the prenatal clinics. They were offered long-acting morphine weaning or maintenance on an individual basis.

DISCUSSION

The high rates of NAS experienced by neonates in our catchment area in 2010 was concerning, and our first clinical responsibility was to develop expertise in identifying and treating NAS.⁴ Subsequently, a prenatal

Figure 2. Patterns of use of narcotics in pregnancy:
 $P < .001$ when comparing the 2 time periods.



narcotic maintenance and tapering program was initiated in 2012 to stabilize the large number of women using narcotics in pregnancy and lessen the neonatal burden of opioid withdrawal.

Maternal narcotic use has risen to 28.6% of all pregnancies ($P < .001$), including increases in both intravenous and daily use. Among infants born to narcotic users, the rate of NAS fell significantly from 29.5% in 2010 to 18.0% in 2013 after the January 2012 institution of our narcotic weaning program ($P = .003$).³ Traditional methadone and more recent buprenorphine maintenance therapies do not typically include dose weaning; infants born to participants have NAS rates of more than 50%, and rates are often quoted as being close to 90%.⁵ Our program has achieved stable, low rates of NAS in the face of increased overall daily intravenous narcotic use by our pregnant patients. More important, the number of neonates whose Finnegan scores mandated pharmacologic treatment (2 consecutive values ≥ 8) has fallen from 2.5% of all births to 1.5% ($P = .403$). In view of the dramatic increase in daily and intravenous use, we see these outcomes as promising.

In our study, narcotic-exposed and nonexposed pregnancies had similar neonatal outcomes as measured by general birth parameters. Birth weight was lower in the narcotic-exposed group but the difference was not clinically meaningful, with a mean (SD) birth weight of 3420.8 (538.6) g. Although the SLMHC provides intrapartum services for 63.0% of the region's deliveries, all stillbirths in the

region came to our centre in the 3-year study period as a function of air ambulance service routes. The 12 stillbirths are therefore measured against the regional live birth totals of 1899, for a rate of 6.3 per 1000 live births. The Ontario stillbirth rate in the study period was 8.4 per 1000. Of the 12 stillbirths, 3 were in the exposed group of 300 pregnancies and 9 were in the nonexposed group ($P = 1.0$).

The dramatic increase in intravenous use of illicit opioids is concerning for the risk of communicable diseases. Despite this development, hepatitis C infection was only seen in 3 cases and HIV infection was not seen. This finding might be secondary to the many well developed needle exchange programs in northern communities.

OxyContin (controlled-release oxycodone) manufacture ceased March 1, 2012, and its substitutes were no longer supported by federal or provincial drug subsidy programs (Non-Insured Health Benefits and the Ontario Drug Benefit Program).⁶⁻⁸ Surprisingly, it continues to be a common drug of abuse in our region, lessening the likelihood that *prescription drug abuse* is an accurate description of this narcotic abuse problem.⁹

The 2012 Ontario NAS clinical practice guidelines recognized that while methadone maintenance therapy is generally recommended, our region, with limited resources over a vast geographic area, might need to explore alternative options, including other opioids or opioid tapering.^{10,11} Our narcotic maintenance and tapering program uses more easily prescribed long-acting morphine preparations such as twice-daily MS Contin or daily Kadian. This approach seems to be effective in our population, with good birth outcomes and low rates of NAS. A recent Cochrane review also found that "oral slow-release morphine seemed superior to methadone for abstinence from heroin use during pregnancy ([relative risk] 2.40, 95% CI 1.00 to 5.77)."¹² A 1999 Finnish open randomized study of 48 opiate-addicted pregnant women found slow-release morphine to be equivalent to methadone in treatment and birth outcomes.¹³

Self-reporting seems reliable in our setting. Of 131 random drug screening tests done on self-reported non-users, all had negative results for oxycodone, while 1 patient had positive results for tetrahydrocannabinol, 1 had positive results for benzodiazepines, and 1 had positive results for opiates. It might be that the widespread nature of narcotic abuse in our region has lessened the stigma associated with self-reporting.¹ Advances in cross-cultural care at the SLMHC and a welcoming interdisciplinary prenatal program that commonly deals with narcotic use might also be factors.¹⁴

Also, rural populations might differ from urban ones. In a subanalysis¹⁵ of the MOTHER (Maternal Opioid Treatment: Human Experimental Research) study,¹⁶ Baewert et al noted regional disparities, with rural American newborns having shorter NAS treatment duration than European or urban American participants.

They concluded the results “revealed significant intergroup differences with regard to sociodemographic and clinical/substance abuse characteristics,”¹⁵ suggesting that women in urban areas were more severely affected.

The SLMHC prenatal narcotic tapering clinics are managed by generalist rural family physicians working in a multidisciplinary team. These family physicians are capable of treating male partners, managing narcotic use, and delivering obstetric services and postnatal maternal and neonatal care. This is done in conjunction with nurses who have a broad scope of practice, a social worker, and a lactation consultant. Having a concentrated core of health care professionals who can move between critical functions is vital in a rural setting. Four family physicians are currently involved, 3 of whom provide cesarean sections when needed.


The psychological and cultural dimensions of drugs, withdrawal, and recovery are supported by outpatient and inpatient social and addictions workers in Sioux Lookout and the surrounding communities.¹⁷ In addition, community visits by addiction specialists have been useful in establishing remote community-based programs.¹⁸

Limitations

A 3-year study in a busy clinical setting will have incomplete data. We did not order universal urine drug screening. We have looked at the rates of both maternal narcotic use and NAS in comparison to an earlier retrospective study and, despite similar methods, some inaccuracies might be inherent in this comparison. Finnegan scoring by obstetric physicians and nurses is subjective, but we now have 5 years of experience and believe our practice has become clinically standardized.

Conclusion

Narcotic abuse is an ongoing widespread issue among northwestern Ontario First Nations communities. Almost 30% of pregnancies are now affected. Effective community-based programs, many using narcotic maintenance and tapering therapy, are being developed by creative partnerships between health care providers, Health Canada, the Ontario Ministry of Health and Long-Term Care, and First Nations community leadership.

The SLMHC, with its prenatal and obstetric program, is one of several institutions affording an effective generalist response to this social and medical dilemma in pregnancy. With sustained effort, developing community-based programs will hopefully decrease the incidence of opioid dependence with both prevention and early treatment. 

Dr Kelly is Professor in the Division of Clinical Sciences at the Northern Ontario School of Medicine and a rural physician and clinical researcher in Sioux Lookout, Ont. **Drs Guilfoyle, Dooley, Antone, and Gerber-Finn** are assistant professors at Northern Ontario School of Medicine and rural family physicians in Sioux Lookout. **Ms Dooley** is a medical student at the University of British Columbia in Prince George. **Ms Brunton** is a research intern at the Sioux Lookout Meno Ya Win Health Centre (SLMHC). **Ms Kakegamuck** is a medical student at the University of Ottawa in Ontario. **Ms Muileboom** is a research intern at the SLMHC. **Ms Hopman** is an

epidemiologist at Kingston General Hospital and in the Department of Community Health and Epidemiology at Queen's University in Kingston, Ont. **Ms Cromarty** was Special Advisor in First Nations Health at the SLMHC at the time of the study. **Ms Linkewich** was Vice President of Patient Services and Clinical Research at the SLMHC at the time of the study. **Ms Maki** is Vice President of Quality and Clinical Support Services at the SLMHC.

Acknowledgment

This study was supported by the Northern Ontario Academic Medicine Association Clinical Innovation Opportunities Fund.

Contributors

Dr Kelly was the research lead, with responsibility for study design and writing all of the drafts. **Drs Guilfoyle, Dooley, Antone, and Gerber-Finn** were involved in the prenatal and obstetric program, attended regular clinical and research meetings, and gave overall direction to the project. **Ms Dooley, Ms Brunton, Ms Kakegamuck, and Ms Muileboom** gathered the data and contributed to data analysis. **Ms Hopman** provided advice on data gathering and did the extensive data analysis. **Ms Cromarty, Ms Linkewich, and Ms Maki** oversaw the research process from the hospital perspective and contributed to the drafts of the manuscript. **Ms Cromarty** was also the Special Advisor in First Nations Health for this project. All of the co-authors have approved the final draft.

Competing interests

None declared

Correspondence

Dr Len Kelly, Northern Ontario School of Medicine, Division of Clinical Sciences, Box 489, Sioux Lookout, ON P8T 1A8; telephone 807 737-3803; fax 807 737-1771; e-mail lkelly@mcmaster.ca

References

- Bell S. Cat Lake chief pleads for drug abuse help. *Wawatay News Online* 2012 Feb 2. Available from: www.wawataynews.ca/archive/all/2012/2/2/cat-lake-chief-pleads-drug-abuse-help_22346. Accessed 2013 Aug 31.
- Garrick R. Shibogama addresses prescription drug abuse. *Wawatay News Online* 2012 Dec 20. Available from: www.wawataynews.ca/archive/all/2012/12/20/shibogama-addresses-prescription-drug-abuse_23892. Accessed 2013 Aug 21.
- Kelly L, Dooley J, Cromarty H, Minty B, Morgan A, Madden S, et al. Narcotic-exposed neonates in a First Nations population in northwestern Ontario. Incidence and implications. *Can Fam Physician* 2011;57:e441-7. Available from: www.cfp.ca/content/57/11/e441.full.pdf.html. Accessed 2014 Sep 4.
- Kelly L, Minty B, Madden S, Dooley J, Antone I. The occasional management of narcotic exposure in neonates. *Can J Rural Med* 2011;16(3):98-101.
- Kaltenbach K, Holbrook AM, Coyle MG, Heil SH, Salisbury AL, Stine SM, et al. Predicting treatment for neonatal abstinence syndrome in infants born to women maintained on opioid agonist medication. *Addiction* 2012;107(Suppl 1):45-52.
- Purdue Pharma Canada [website]. *Purdue Pharma Canada statement on generic OxyContin*. Pickering, ON: Purdue Pharma Canada; 2012. Available from: www.purdue.ca/en/media-room/archives#2012. Accessed 2013 Aug 31.
- Health Canada [website]. *Updates to the Drug Benefit List—fall-winter 2012*. Ottawa, ON: Health Canada; 2012. Available from: www.hc-sc.gc.ca/fniah-spnia/pubs/mihb-ssna/_drug-med/2012-additions-winter-ajouts-hiver/index-eng.php. Accessed 2013 Aug 31.
- Ontario Drug Benefit Program. *Important reminder regarding the funding status of oxycodone controlled release tablet—OxyNEO*. Toronto, ON: Ministry of Health and Long-Term Care; 2012. Available from: www.health.gov.on.ca/en/pro/programs/drugs/opdp_eo/notices/exec_office_odb_20121004.pdf. Accessed 2013 Aug 31.
- Dhalla IA, Mamdani MM, Sivilotti ML, Kopp A, Qureshi O, Juurlink DN. Prescribing of opioid analgesics and related mortality before and after the introduction of long-acting oxycodone. *CMAJ* 2009;181(12):891-6. Epub 2009 Dec 7.
- Neonatal Abstinence Work Group. *Neonatal abstinence syndrome (NAS) clinical practice guidelines*. Toronto, ON: Provincial Council for Maternal and Child Health; 2012. Available from: <http://pcmch.on.ca/publications-resources/clinical-practice-guidelines>. Accessed 2014 Sep 4.
- Dow K, Ordean A, Murphy-Oikonen J, Pereira J, Koren G, Roukema H, et al. Neonatal abstinence syndrome clinical practice guidelines for Ontario. *J Popul Ther Clin Pharmacol* 2012;19(3):e488-506. Epub 2012 Nov 23.
- Minozzi S, Amato L, Bellisario C, Ferri M, Davoli M. Maintenance agonist treatments for opiate-dependent pregnant women. *Cochrane Database Syst Rev* 2013;(12):CD006318.
- Fischer G, Jagsch R, Eder H, Gombas W, Etzersdorfer P, Schmidl-Mohl K, et al. Comparison of methadone and slow-release morphine maintenance in pregnant addicts. *Addiction* 1999;94(2):231-9.
- Walker R, Cromarty H, Kelly L, St Pierre Hansen N. Achieving cultural safety in Aboriginal health services: implementation of a cross-cultural safety model in a hospital setting. *Divers Health Care* 2009;6(1):11-22.
- Baewert A, Jagsch R, Winklbaur B, Kaiser G, Thau K, Unger A, et al. Influence of site differences between urban and rural American and Central European opioid-dependent pregnant women and neonatal outcome characteristics. *Eur Addict Res* 2012;18(3):130-9. Epub 2012 Feb 21.
- Jones HE, Kaltenbach K, Heil SH, Stine SM, Coyle MG, Arria AM, et al. Neonatal abstinence syndrome after methadone or buprenorphine exposure. *N Engl J Med* 2010;363(24):2320-31.
- Kiepek N, Hancock L, Topozzini D, Cromarty H, Morgan A, Kelly L. Facilitating medical withdrawal from opiates in rural Ontario. *Rural Remote Health* 2012;12:2193. Epub 2012 Oct 23.
- Katt M, Chase C, Samokhvalov AV, Argento E, Rehm J, Fischer B. Feasibility and outcomes of a community-based taper-to-low-dose-maintenance suboxone treatment program for prescription opioid dependence in a remote First Nations community in northern Ontario. *J Aborig Health* 2012;9(1):52-9.