Risk factors associated with dropout and readmission among First Nations individuals admitted to an inpatient alcohol and drug detoxification program

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Abstract

Background: There is a need for clinically relevant research into treatment for substance abuse among Aboriginal people. In this study, I aimed to provide a predictive model of dropout from and readmission to an inpatient detoxification program in a large treatment sample of Aboriginal patients.

Methods: I reviewed the medical charts of all self-reported First Nations people (n = 877) admitted to an inpatient detoxification centre in British Columbia, between Jan. 4, 1999, and Jan. 30, 2002, and used binary logistic regression models to identify predictors of dropout from and readmission to the program. Each of these models was validated using an independent subset of the treatment sample.

Results: Overall, 254 (29.0%) people dropped out of the program, and 219 were readmitted. Statistically significant predictors of treatment dropout were a preferred drug other than alcohol (odds ratio [OR] 1.67, 95% confidence interval [CI] 1.12–2.50) and self-referral (OR 1.89, 95% CI 1.28–2.80). Statistically significant predictors of readmission to inpatient detoxification within a 1-year period were a previous history of detoxification treatment (OR 3.52, 95% CI 2.16–5.75) and residential instability (OR 1.82, 95% CI 1.11–2.99).

Interpretation: Although factors were identified that are associated with each of treatment dropout or readmission for detoxification, only the latter can be reliably predicted by them.

Although substance abuse remains the leading self-reported threat to health and quality of life for many Aboriginal people,[1–3] relatively few peer-reviewed studies have provided clinically relevant research on appropriate treatment for First Nations individuals.[4–10] Identification of factors related to dropout from substance abuse treatment and readmission serves as an important step in the provision of appropriate interventions and continuing care regimens for those most at risk.

In British Columbia, a total of 8391 patients were admitted to inpatient detoxification programs in the fiscal year 1999/2000,[11] but the characteristics, service use patterns and treatment outcomes of First Nations patients admitted to such programs remain unclear. For those studies reporting results from drug and alcohol detoxification programs similar to that of the study site, severity of drug use and medical problems,[12] younger age, a shorter history of

cocaine use and being an opiate-dependent patient treated with clonidine[13] were predictive of discharge against medical advice or failure to transfer to longer-term substance abuse treatment. Relatively few studies of detoxification have examined issues of relapse or readmission,[14–17] and even fewer have detailed such patterns among Aboriginal people.[18] In general, post-treatment studies of detoxification are weakened by small samples, low response rates and short time intervals between treatment and post-treatment measures. This study examines the patterns of dropout and readmission among a sample of First Nations individuals who were admitted consecutively over a 3-year period to an inpatient medical detoxification program in northern British Columbia. I aimed to provide a predictive model of dropout from inpatient detoxification and readmission for detoxification among Aboriginal patients.

Methods

The sample consisted of 877 First Nations individuals (334 women), accounting for 1764 consecutive inpatient admissions and readmissions to the Nechako Adult Detox/Assessment Unit at Prince George Regional Hospital, Prince George, BC, between Jan. 4, 1999, and Jan. 30, 2002. First Nations ancestry was a self-chosen ethnic category. About 30% of the First Nations patients (n = 272) reported their primary residence as "on-reserve." Ethics approval for this study was given by the Prince George Regional Hospital Research Review Committee.

The Detox/Assessment Unit offers a 20-bed detoxification program for both alcohol and drugs. The unit offers the same short-term (3–30 days) inpatient medical detoxification program to Aboriginal and non-Aboriginal people residing primarily in northern BC. Although the detoxification program is not specifically designed for Aboriginal patients, the unit does provide a formal full-time Aboriginal Liaison staff position in order to accommodate the needs of First Nations individuals during the process of admission, treatment and discharge. Patients can gain admission through drop-in or referral from a physician or a social service or mental health care provider.

Medical opiate detoxification treatment included methadone tapering and α_2-agonists (clonidine), and phenobarbitol as an adjunct if needed, along with simple pain relief medication as warranted. Nonbenzodiazepine sleep medication was prescribed as necessary. Patients with alcohol dependence received a barbiturate protocol (usually phenobarbitol) during the withdrawal stage. For clients who were withdrawing from benzodiazepines, an individual protocol was provided, using decreasing doses of phenobar-

bitol commensurate with the daily intake of benzodiazepines before admission. For cocaine detoxification, the medical protocols were dictated by the symptomatic withdrawal response of the client. As part of the standard medical discharge procedure, a discharge plan was tailored for each individual, focusing on continuing care regimens, appropriate referrals to mental health and medical services, housing programs and relapse prevention.

At admission, a registered nurse completed a standard general physical assessment of the patient usually within 30 minutes after the initial intake interview. The nurse would also confirm the demographic and drug use information given by the patient. For severely intoxicated patients, the general physical assessment could only reliably record physiological or observational measures, not pertinent self-reported medical history or drug use history. If a patient stayed for more than a 24-hour period, a registered nurse gathered any incomplete information from the general physical assessment and also verified any seemingly incongruent information gained at the initial intake interview. A physician would meet with the patient within 24 hours of admission and assign a detoxification diagnosis and medication protocol (if needed).

A registered nurse assigned "treatment complete" status after the discharge interview with the patient. The nurse's assessment of treatment complete status was based upon the functioning of the patient during the discharge interview, and upon the unit's guidelines for the standard detoxification period associated with each detoxification diagnosis and the physician's length-of-stay recommendation noted in the detoxification diagnosis protocol.

When a patient was admitted multiple times, only treatment data from the earliest admission during the study period were used. After the data were entered, I used standard data-cleaning techniques to spot possible data entry errors.[19]

χ^2 analyses were used to examine differences in categorical variables, whereas Student's t-test was used to evaluate differences across treatment-complete and treatment-dropout groups on continuous variables. Variables shown to be significantly different ($p < 0.05$) across treatment-complete/treatment-dropout and readmission/nonreadmission groups were entered into separate stepwise (backward Wald) logistic regression equations predicting treatment dropout and readmission. In both the treatment dropout and readmission logistic models, a value of $p > 0.10$ was used as the criterion for removal of a predictor at each step in the model. In order to avoid including censored cases, only individuals admitted before Jan. 30, 2001, were included in the multivariate logistic procedure predicting readmission for detoxification.

The logistic regression model of detoxification dropout was developed in a 2-stage process: first, I used a random subset (about 70% of the sample, $n = 612$) to generate the regression model and, then, I tested the accuracy of this model on the remaining holdout (or validation) sample (about 30% of the target sample, $n = 265$) not used in the initial model-building phase. Likewise, the logistic regression model of detoxification readmission (within a 1-year period) was developed in a 2-stage process: first, a random subset (about 70% of the target sample, $n = 438$) was used to generate the regression model of readmission and, then, this model was validated on the remaining holdout sample (about 30% of the target sample, $n = 195$). A receiver operating characteristic (ROC) curve was plotted to determine the cutoff classification point maximizing sensitivity (true-positive) and minimizing 1-specificity (false-positive) values for the logistic regression models of dropout and readmission.[20]

Table 1: Characteristics of patients who either completed or dropped out of detoxification treatment

Characteristic	No. (and %) of patients*		
	Completed treatment $n = 623$	Dropped out of treatment $n = 254$	p value
Female sex	229 (36.8)	110 (43.3)	0.23
Mean age (and SD), yr	37.3 (11.1)	34.7 (10.9)	0.002
Unemployed	519 (83.3)	228 (89.8)	0.019
Single†	298 (47.8)	127 (50.0)	0.60
Residential instability‡	127 (20.4)	69 (27.2)	0.030
Self-referred§	235 (37.7)	137 (53.9)	< 0.001
Alcohol is primary drug of choice¶	411 (66.0)	119 (46.9)	< 0.001
Current injection drug use**	88 (14.1)	75 (29.5)	< 0.001
Polydrug use (≥ 3 problematic drugs)	170 (27.3)	68 (26.8)	0.86
Previous history of detoxification treatment at T1	312 (50.1)	155 (61.0)	0.006
Length of inpatient stay (and SD), h	112.0 (70.3)	38.9 (31.1)	< 0.001

Note: SD = standard deviation, T1 = patient's first admission during the study period (Jan. 4, 1999, to Jan. 30, 2002).
*Except where noted otherwise.
†Marital status was collapsed into 2 categories (single/never married v. other: common-law relationship, married, divorced, separated, widowed).
‡Defined as lacking a fixed address at admission.
§Referral source (self/other).
¶Two-category variable (alcohol/other).
**Within the previous 2 months.

Results

Overall, 254 (29.0%) people dropped out of the program, and 219 (35.1%) were readmitted, 137 of whom had previously completed detoxification treatment.

Individuals in the treatment-dropout group reported higher rates of a preferred drug of choice other than alcohol, residential instability, unemployment, current injection drug use, previous detoxification treatment at the unit and self-referred status; they were also significantly younger and had a shorter length of stay at the unit (Table 1). After adjustment for age, primary residence location, primary drug of choice, referral source, current injection drug use and previous history of detoxification treatment, multiple logistic regression analysis showed that patients whose preferred drug was other than alcohol were more likely to drop out of treatment than patients whose preferred drug was alcohol (adjusted odds ratio [OR] 1.67, 95% confidence interval [CI] 1.12–2.50). Similarly, multiple logistic regression analysis showed that self-referred patients were more likely to drop out of treatment than patients referred by a physician or a social service or mental health care provider (adjusted OR 1.89, 95% CI 1.28–2.80). The variable marking a previous history of detoxification treatment (adjusted OR 1.41, 95% CI 0.95–2.1) did not reach conventional statistical significance ($p = 0.09$), but it was included in the final prediction model because of its clinical relevance (Table 2). Using an optimal cutpoint, the logistic regression model (Table 2) yielded a sensitivity of 74.8%, specificity of 43.8% and an overall classification accuracy of 53.7%. When the logistic regression model was used to classify patients as detoxification "completers" or "dropouts" in the holdout (or validation) sample (about 30% of the total sample, $n = 251$), the model showed similar accuracy (sensitivity 63.6%, specificity 25.7%, overall accuracy 43.0%).

To ensure that each patient had at least a 1-year follow-up period, patients admitted after Jan. 30, 2001, were omitted from the analyses concerning readmission to the detoxification program. Of the 631 patients admitted between Jan. 4, 1999, and Jan. 30, 2001, 34.7% ($n = 219$) were readmitted

within a 1-year period (mean time to readmission 126.1 [standard deviation 102.8] days). The treatment readmission group included a greater number of males and a higher rate of residential instability, unemployment, injection drug use, self-referred status, previous detoxification treatment at the unit, alcohol as the primary self-reported drug of choice and treatment discharge against medical advice at Time 1, that is, a patient's first admission during the study period occurring between Jan. 4, 1999 and Jan. 30, 2001) (Table 3). After adjustment for primary drug of choice, marital status, a dependent child, current injection drug use, unemployment, previous history of detoxification treatment, primary residence location, referral source and residential instability, multiple logistic regression analysis showed that a previous history of detoxification treatment at Time 1 of the study (adjusted OR 3.52, 95% CI 2.16–5.75) and residential instability (adjusted OR 1.82, 95% CI 1.11–2.99) were significant predictors of readmission within a 1-year period. In addition, 3 other variables nearly reached conventional significance and, given the importance of these predictors in previous substance abuse treatment research examining symptom exacerbation and readmission to treatment,[21,22] they were included in the final predictive model: alcohol as the primary self-reported drug of choice (adjusted OR 1.60, 95% CI 0.94–2.71), current injection drug use (OR 1.75, 95% CI 0.93–3.27) and being unemployed (adjusted OR 1.78, 95% CI 0.91–3.48) (Table 4). Using an optimal cutpoint, the multiple logistic model (Table 4) yielded a sensitivity of 66.0%, specificity of 64.4% and an overall classification accuracy of 65.0%. In addition, when this regression model was used to classify patients in the validation sample (about 30% of the total sample, $n = 185$), the model also manifested similar discrimination (sensitivity 60.6%, specificity 60.5%, overall accuracy 60.5%).

Interpretation

In light of the recent call for clinically relevant research in the area of treatment for substance abuse among Aboriginal people,[3] this study provides a predictive model

Table 2: Multiple logistic regression model of variables associated with dropout from a detoxification program

Variable	OR (and 95% CI)	
	Unadjusted	Adjusted*
Preferred drug other than alcohol (yes v. no)	1.89 (1.31–2.67)	1.67 (1.12–2.50)
Self-referral to detoxification treatment (yes v. no)	2.04 (1.44–2.90)	1.89 (1.28–2.80)
Previous detoxification treatment (yes v. no)†	1.53 (1.07–2.17)	1.41 (0.95–2.10)

Note: OR = odds ratio, CI = confidence interval.
*Adjusted for age (3 categories: < 31, 31–41, > 41 yr), primary drug of choice (alcohol/other), referral source (self/other), current injection drug use (yes/no), previous history of detoxification treatment (yes/no), residential instability (yes/no) and employment (yes/no).
†$p = 0.09$.

of dropout from and readmission to an inpatient detoxification program in a large treatment sample of Aboriginal patients. Self-referral and a preferred drug of choice other than alcohol were only weakly associated with dropout from the detoxification program. For readmission to the detoxification program, however, the predictive accuracy of the regression model compares well with other clinically useful measures of relapse and/or readmission to hospital-based substance abuse treatment.[23,24] A previous history of admission to the Detox/Assessment Unit remained the strongest predictor of readmission during the course of the study. This finding is consistent with an often-seen pattern in detoxification, the "revolving door," whereby a minority of inpatient detoxification clients account for a disproportionately high number of admissions.[25–28] In addition, earlier studies have demonstrated that residential instability not only increases the risk of symptom exacerbation after treatment[20] but also the risk of readmission to inpatient detoxification.[23] Thus, it may be helpful for detoxification services to view residential stability as an imperative of continuing aftercare regimens.

Even though care was taken to ensure the veracity of patient self-reports, through subsequent interviews, clinical observation or review of previous medical records, this study did rely upon the self-reports of many patients under the influence of drugs or who were experiencing the effects of drug withdrawal. In addition, patient reports of their primary preferred drug of choice were not confirmed through the use of urinalysis, but rather through clinical observations of withdrawal symptoms. In addition, information about the duration, frequency and intensity of primary drug use and other problematic drug use was not collected. Thus, it is difficult to assess the severity of addiction for the primary drug of choice or the severity of use of other currently problematic drugs reported by the patient. Nonetheless, previous research has shown that patients' self-reports of drug use are reasonably reliable and valid, especially when events are recent and patients do not face negative consequences for their answers.[29,30]

Further research may be able to increase the predictive accuracy of models of detoxification dropout through the collection of more detailed drug use and psychiatric information not available in the current study. The model of readmission identified significant predictors of readmission, and it compares favourably with other often-cited measures of relapse and/or readmission to inpatient substance abuse treatment.[23,24] It is as yet unclear whether the predictors in this model will continue to serve as useful screening items for First Nations patients drawn from more urban areas. Future research will continue to refine this index and examine how this screening tool might be used for the assignment of appropriate treatment resources and continuing care regimens to those most at risk of readmission.

Table 3: Characteristics of patients who were either readmitted or not readmitted to detoxification treatment

	No. (and %) of patients*		
Characteristic	Readmitted n = 219	Not readmitted n = 412	p value
Female sex	70 (32.0)	167 (40.5)	0.034
Mean age (and SD), yr	37.3 (10.5)	35.6 (11.1)	0.06
Unemployed	200 (91.3)	340 (82.5)	0.003
Single†	107 (48.9)	188 (45.7)	0.44
Residential instability‡	74 (33.8)	78 (18.9)	< 0.001
Self-referred§	110 (50.2)	159 (38.6)	0.005
Alcohol is primary drug of choice¶	146 (66.6)	235 (57.0)	0.030
Current injection drug use**	54 (24.7)	74 (18.0)	0.046
Polydrug use (≥ 3 problematic drugs)	57 (26.0)	114 (27.7)	0.66
Previous history of detoxification treatment at T1	168 (76.7)	212 (51.5)	< 0.001
Detoxification completion at T1	137 (62.6)	295 (71.6)	0.021

*Except where noted otherwise.
†Marital status was collapsed into 2 categories (single/never married v. other: common-law relationship, married, divorced, separated, widowed).
‡Defined as lacking a fixed address at admission.
§Referral source (self/other).
¶Two-category variable (alcohol/other).
**Within the previous 2 months.

Table 4: Multiple logistic regression model of variables associated with readmission to a detoxification program

	OR (and 95% CI)*	
Variable	Unadjusted	Adjusted†
Previous detoxification treatment at T1 (yes v. no)	4.01 (2.50–6.43)	3.52 (2.16–5.75)
Residential instability (yes v. no)‡	2.43 (1.55–2.01)	1.82 (1.11–2.99)
Alcohol as primary drug of choice (yes v. no)	1.32 (0.86–2.01)	1.60 (0.94–2.71)
Current injection drug use (yes v. no)§	1.54 (0.95–2.49)	1.75 (0.93–3.27)
Unemployed (yes v. no)	2.01 (1.07–3.78)	1.78 (0.91–3.48)

*The risk (i.e., predicted probability) of readmission for each patient can be calculated using this logistic regression model;[20] a scoring key is available from the author.
†Adjusted for primary drug of choice (alcohol/other), current injection drug use (yes/no), unemployment (yes/no), previous history of detoxification treatment (yes/no), referral source (self/other), residential instability (yes/no) and sex.
‡Defined as lacking a fixed address at admission.
§Within previous 2 months.

References

1. *1991 Aboriginal Peoples Survey: language, tradition, health, lifestyle and social issues.* Ottawa: Statistics Canada; 1993. Cat no 89-533.
2. British Columbia First Nations Chiefs' Health Committee. *Our nations on the edge of a new century: BC First Nations Regional Health Survey.* Vancouver: the Committee; 2000. Available: www.fnchc.ca/publications.html# (accessed 2003 Feb 24).
3. Health Canada. *A second diagnostic on the health of Canada's First Nations and Inuit people.* Ottawa: Health Canada; 1999. Available: www.hc-sc.gc.ca/fnihb/cp/publications/second_diagnostic_fni.pdf (accessed 2003 May 16).
4. Jacobs K, Gill K. Substance abuse in an urban aboriginal population: social, legal and psychological consequences. *J Ethnicity Subst Abuse* 2002;1(1):7-25.
5. Jacobs K, Gill K. Substance abuse among urban Aboriginals: association with a history of physical/sexual abuse. *J Ethnicity Subst Abuse* 2002:1(2):19-39.
6. McKenzie D. *Aboriginal substance use: research issues proceedings of a joint research advisory meeting.* Ottawa: Canadian Centre for Substance Abuse; 1994.
7. Lyness K. Alcohol problems in Alaska Natives: risk, resiliency, and Native treatment approaches. *J Ethnicity Subst Abuse* 2002;1(3):39-55.
8. Hesselbrock V, Segal B, Hesselbrock M. Alcohol dependence among Alaska Natives entering alcoholism treatment: a gender comparison. *J Stud Alcohol* 2000;61:150-6.
9. Parks C, Hesselbrock M, Hesselbrock V, Segal B. Gender and reported health problems in treated alcohol dependent Alaska Natives. *J Stud Alcohol* 2001;62:286-93.
10. Nixon S, Phillips M, Tivis R. Characteristics of American-Indian clients seeking inpatient treatment for substance abuse. *J Stud Alcohol* 2000;61:541-7.
11. Ministry for Children and Family Development. *Addiction information management system (AIMS): fiscal year 1999/2000 report.* Victoria (BC): Ministry for Children and Family Development; 2000.
12. Franken I, Hendriks V. Predicting outcome of inpatient detoxification of substance abusers. *Psychiatr Serv* 1999;50:813-7.
13. Armenian S, Chutuape M, Stitzer M. Predictors of discharge against medical advice from a short-term hospital detoxification unit. *Drug Alcohol Depend* 1999;56:1-8.
14. Gossop M, Green L, Phillips G, Bradley B. Lapse, relapse and survival among opiate addicts after treatment: a prospective follow-up study. *Br J Psychiatry* 1989;154:348-53.
15. Broers B, Giner F, Dumont P, Mino A. Inpatient opiate detoxification in Geneva: follow-up at 1 and 6 months. *Drug Alcohol Depend* 2000;58:85-92.
16. Chutuape M, Jasinski D, Fingerhood M, Stitzer M. One-, three-, and six-month outcomes after brief inpatient opioid detoxification. *Am J Drug Alcohol Abuse* 2001;27:19-44.
17. Tomasson K, Vaglum P. The role of psychiatric comorbidity in the prediction of readmission for detoxification. *Compr Psychiatry* 1998;39:129-36.
18. Kivlahan D, Walker R, Donovan D, Mischke H. Detoxification recidivism among urban American Indian alcoholics. *Am J Psychiatry* 1985;142:1467-70.
19. Tukey J. *Exploratory data analysis.* Reading (MA): Addison-Wesley; 1977.
20. Hosmer D, Lemeshow S. *Applied logistic regression.* 2nd ed. New York: John Wiley and Sons; 2000.
21. Moos R, Nichol A, Moos B. Risk factors for symptom exacerbation among treated patients with substance use disorders. *Addiction* 2002;97:75-85
22. Moos R, Moos B, Finney J. Predictors of deterioration among patients with substance-use disorders. *J Clin Psychol* 2001;57:1403-19.
23. Yates W, Booth B, Reed D, Brown K, Masterson B. Descriptive and predictive validity of a high-risk alcoholism relapse model. *J Stud Alcohol* 1993;54:645-51.
24. Booth B, Yates W, Petty F, Brown K. Patient factors predicting early alcohol related readmission for alcoholics: role of alcoholism severity and psychiatric co-morbidity. *J Stud Alcohol* 1991;52:37-43.
25. Rossow I, Skretting A. *The revolving door: on the current trends and characteristics of current patients in residential detoxification of alcohol abusers.* Proceedings of the Alcohol Epidemiology Symposium of the Kettil Bruun Society; 2001 June; Toronto, Canada.
26. McCarty D, Caspi Y, Panas L, Krakow M, Mulligan D. Detoxification centers: Who's in the revolving door? *J Behav Health Serv Res* 2000;27:245-56.
27. Richman A, Neumann B. Breaking the "Detox-loop" for alcoholics with social detoxification. *Drug Alcohol Depend* 1984;13:65-73.
28. Richman A, Smart R. After how many detoxifications is rehabilitation probable? *Drug Alcohol Depend* 1981;7:233-8.
29. Zanis D, McLellan A, Randall M. Can you trust patient self-reports of drug use during treatment? *Drug Alcohol Depend* 1994;35:127-32.
30. Darke S. Self-report among injecting drug users: a review. *Drug Alcohol Depend* 1998;51:253-63.

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