The Feasibility of Using an 'Opt-Out' Approach to Achieve Universal HIV Testing of Tuberculosis Patients in Alberta

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ABSTRACT

Objective: Universal HIV testing of tuberculosis (TB) patients, defined as testing greater than 80% of incident cases, has been recommended but not achieved in Canada. The objectives of this study were: i) to assess the success of an 'opt-out' approach, whereby HIV testing is routine unless the patient specifically chooses otherwise, and ii) to determine the risk factors for HIV in patients tested before and after this approach was implemented.

Methods: TB and HIV databases in the province of Alberta were cross-matched before HAART (highly active anti-retroviral therapy) was available (1991-1997), after HAART but before 'opt-out' testing was implemented (1998-2002), and after 'opt-out' testing was implemented (2003-2006), and the HIV status of TB patients in each time period was described. The demographic and clinical characteristics of HIV-positive and -negative TB patients aged 15-64 years were compared.

Results: HIV testing of TB patients increased from 11.5% before HAART, to 44.9% after HAART but before 'opt-out' testing, to 81.9% after 'opt-out' testing was implemented. Between 1991 and 2006, 50 TB patients were diagnosed with HIV co-infection, all in the age group 15-64 years. Among TB patients aged 15-64 years who were HIV tested, those testing positive were significantly less likely to be female and to have respiratory TB and significantly more likely to have both respiratory and non-respiratory TB. The prevalence of HIV positivity in HIV-tested TB patients aged 15-64 years was 7.4% in 2003-2006.

Conclusion: Universal HIV testing of TB patients is achievable through 'opt-out' HIV testing.

Key words: HIV; tuberculosis

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

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Among medical conditions that depress cellular immunity and facilitate progression of recent or remotely acquired tuberculosis (TB) infection to TB disease, none is more important than HIV.¹ For AIDS and HIV, the estimated risk of TB, relative to persons with no known risk factor, is 110-170 fold and 50-110 fold, respectively.²⁻⁵ HIV-attributable TB adds to the burden of TB through transmission to others regardless of their HIV status. A diagnosis of HIV in a TB patient impacts the treatment of TB and identifies the need for HIV treatment and prevention services.^{6,7} Screening for HIV has been determined to be cost effective when the prevalence of infection is 0.5% or greater.⁸

In 1989, the US Centers for Disease Control and Prevention recommended universal HIV testing of TB patients.⁹ In 1992 and 2002, Canadian respiratory and infectious disease societies and Health Canada jointly made similar recommendations.^{7,10} Despite these recommendations and the close biological and epidemiological links between the two pathogens, the policy of universal HIV testing of TB patients has not been implemented in Canada and the prevalence of HIV/TB co-infection is unknown.^{11,12} Poor compliance with recommendations for HIV testing of TB patients was understandable before the advent of highly active antiretroviral therapy (HAART) and in the context of discrimination, when informed consent and extensive pre- and post-test counselling were advised.¹³⁻¹⁵ However, poor compliance and the separation of counselling and testing from routine medical care are now difficult to defend, as is ignorance of the relationship between HIV and TB.

In Alberta, TB and HIV are reportable diseases and their testing is centralized. In 2003, an 'opt-out' approach to HIV testing of TB patients was implemented whereby testing became routine unless the patient specifically chose not to be tested. 'Opt-out' testing followed the basic tenets of informed consent.¹⁶ To assess the ability of 'opt-out' testing to achieve universal testing targets, TB and HIV databases were cross-matched. To assess the risks of HIV positivity in HIV-tested TB patients, the age, gender, ethnic group and dis-

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Table 1. HIV Status of TB Patients in Alberta by Demographic Group and Disease Site, 1991-1997 (before HAART*); 1998-2002 (after HAART but before 'opt-out' testing); 2003-2006 (after 'opt-out' testing)

	1991-1997			1998-2002			2003-2006		
	TB Cases	HIV Tested†	HIV Positive†	TB Cases	HIV Tested†	HIV Positive†	TB Cases	HIV Tested†	HIV Positive†
Total	1161	134 (11.5)	13 (9.7)	683	307 (44.9)	15 (4.9)	496	406 (81.9)	22 (5.4)
Age (yrs)									
0-14	85	4 (4.7)	0 (0.00)	33	2 (6.1)	0 (0.00)	19	10 (52.6)	0 (0.00)
15-34	318	51 (16.0)	5 (9.8)	166	87 (52.4)	4 (4.6)	144	131 (91.0)	6 (4.6)
35-64	401	61 (15.2)	8 (13.1)	273	143 (52.4)	11 (7.7)	198	168 (84.9)	16 (9.5)
> 64	357	18 (5.0)	0 (0.00)	211	75 (35.6)	0 (0.00)	135	97 (71.9)	0 (0.00)
Gender									
Male	568	81 (14.3)	9 (11.1)	358	183 (51.1)	15 (8.2)	251	210 (83.7)	14 (6.7)
Female	593	53 (8.9)	4 (7.5)	325	124 (38.2)	0 (0.00)	245	196 (80.0)	8 (9.5)
Ethnic Group*									
CBO	200	26 (13.0)	4 (15.4)	100	52 (52.0)	5 (9.6)	61	52 (85.3)	0 (0.00)
CBA	287	45 (15.4)	3 (6.7)	150	91 (60.7)	4 (4.4)	66	58 (87.9)	5 (8.6)
FBO	628	47 (7.5)	4 (8.5)	391	142 (36.3)	5 (3.5)	293	231 (78.8)	6 (2.6)
FBSSA	46	16 (34.8)	2 (12.5)	42	22 (52.4)	1 (4.6)	76	65 (85.5)	11 (16.9)
Disease Site									
Non-respiratory	380	29 (7.6)	7 (24.1)	192	63 (32.8)	3 (4.8)	172	144 (83.7)	6 (4.2)
Respiratory	694	88 (12.7)	4 (4.5)	442	218 (49.3)	7 (3.2)	283	229 (80.9)	7 (3.1)
Both	87	17 (19.5)	2 (11.8)	49	26 (53.1)	5 (19.2)	41	33 (80.5)	9 (27.3)

* Abbreviations: HAART Highly active anti-retroviral therapy; CBO Canadian-born 'other'; CBA Canadian-born Aboriginal; FBO foreign-born 'other'; FBSSA foreign-born sub-Saharan Africa

† Numbers in brackets are percentages

ease site of TB patients diagnosed between 1991 and 2006 were compared.

METHODS

Patients diagnosed with TB over the 16-year period from 1991-2006 were identified in the TB Registry of Alberta Health and Wellness. TB case patients were cross-matched with the Provincial Laboratory for Public Health (PLPH) HIV database (96.7% to 98.0% of all HIV testing in Alberta is performed in the PLPH; 100% of all HIV-positive test results in the province are confirmed in the PLPH). Confirmation of a cross-match required that at least two of three identifiers (name, date of birth, and health care number) be identical. HIV test results and the date of testing relative to the date of diagnosis of TB (the start date of anti-TB drugs) were recorded. TB patients were then divided into three groups: i) those diagnosed before HAART (1991-1997) when HIV testing of TB patients was largely 'semi-selective' on the basis of a reported risk factor for HIV, but effective treatment of HIV was not available; ii) after HAART and before 'opt-out' testing (1998-2002), when HIV testing was 'selective-plus' with most of those with and some of those without risk factors accepting/being offered testing, likely as a result of the availability of effective treatment of HIV; and iii) after 'opt-out' testing was implemented (2003-2006), when HIV testing was intended to be universal. HIV-tested and HIV-positive TB patients in each group were described according to age, gender, ethnic group and disease type (respiratory, non-respiratory, or both). Ethnic group was categorized as Canadian-born Aboriginal (First Nations, Métis, and Inuit), Canadian-born 'other', foreign-born sub-Saharan African (Canadian International Development Agency), and foreign-born 'other'.¹⁷

In the 'semi-selective' and 'selective-plus' testing years (1991-2002), the 'post-TB' HIV status of TB patients aged 15-64 who were 1) either HIV negative or HIV untested 'at the time of diagnosis of TB', and 2) retested any time before the end of 2007, were compared. HIV test results 'at the time of diagnosis of TB' include those reported from 6 months before and up to 9 months after the date of diagnosis of TB. Thus, the 'post-TB' period refers to 9 months after the date of diagnosis of TB until the end of 2007. In the years

Figure 1. Proportion of TB patients who were HIV tested, Alberta, 1991-2006

1. First CCDD advisory¹⁰

2. Introduction of highly active anti-retroviral therapy

3. Second CCDD advisory and introduction of "opt-out" HIV testing⁷

Table 2. Results of 'Post-TB' HIV Testing of Patients Aged 15-64 Who Were Either HIV Negative or HIV Untested at the Time of Diagnosis of TB, Alberta 1991-1997 (semi-selective testing years) and 1998-2002 (selective-plus testing years)*

HIV Status at Diagnosis of TB	No. of Patients	No. (%) with One or More 'Post-TB' Tests	No. (%) with More Than One 'Post-TB' Test	No. with First (or Subsequent) 'Post-TB' Positive†
Test				
HIV Negative				
1991-1997	99	27 (27.3)	12 (12.1)	3 (0)
1998-2002	215	51 (23.7)	14 (6.5)	0 (1)
Total	314	78 (24.8)	26 (8.3)	3 (1)
HIV Untested				
1991-1997	607	118 (19.4)	37 (6.1)	0 (1)
1998-2002	209	38 (18.2)	10 (4.8)	0 (0)
Total	816	156 (19.1)	47 (5.8)	0 (1)

* HIV test results at the time of diagnosis of TB include those reported up to 6 months before and up to 9 months after the date of diagnosis of TB; post-TB HIV test results include those reported up to the end of 2007.

† Numbers in brackets refer to patients who had a first 'post-TB' test that was negative and then a subsequent test – i.e., subsequent to the first 'post-TB' test – that was positive. The three first 'post-TB' HIV tests that were positive were performed 3.75, 5.17, and 8.67 years after the date of diagnosis of

1991-2006, the demographic and clinical characteristics of TB patients who were HIV positive and negative at the time of diagnosis of TB and aged 15-64 years, were compared.

Table 3. Demographic and Clinical Characteristics of HIV-negative and HIV-positive TB Patients, Aged 15-64 Years, Alberta, 1991-2006

	HIV Negative n=591	HIV Positive n=50	Univariate OR (95% CI)	Multivariate OR (95% CI)
Age (yrs)				
15-34	254	15	1.00	1.00
35-64	337	35	1.76 (0.94, 3.29)	1.96 (0.96, 4.01) ¶
Gender				
Male	322	38	1.00	1.00
Female	269	12	0.38 (0.19, 0.74) †	0.42 (0.21, 0.85) ‡
Ethnic Group*				
CBO	83	9	1.00	1.00
CBA	142	12	0.78 (0.32, 1.93)	0.69 (0.27, 1.78)
FBO	283	15	0.49 (0.21, 1.16)	0.48 (0.19, 1.20)
FBSSA	82	14	1.56 (0.64, 3.79)	2.14 (0.79, 5.84)
Disease Site				
Non-respiratory	167	16	1.00	1.00
Respiratory	375	18	0.50 (0.25, 1.01) §	0.44 (0.21, 0.92) ‡
Both	49	16	3.41 (1.59, 7.31) †	3.02 (1.34, 6.78) †

* Abbreviations: CBO Canadian-born 'Other', CBA Canadian-born Aboriginal, FBO Foreign-born 'Other', FBSSA Foreign-born sub-Saharan Africa

† p<0.01 ‡ p<0.05 § p=0.05 ¶ p=0.07

Clinical and laboratory features of HIV co-infected TB patients, as recorded in the TB Registry, the PLPH, the Capital and Calgary Health TB Clinics, and the HIV/AIDS Clinics of Northern and Southern Alberta, were described.

Statistical analysis

To compare the demographic and clinical characteristics of HIV-negative and -positive TB patients diagnosed between 1991 and 2006, odds ratios (OR) with their 95% confidence interval (95% CI) and p-values were estimated using logistic regression analysis. Multiple logistic regression analysis was used to determine adjusted odds ratios. The study was approved by the Health Research Ethics Board of the University of Alberta.

RESULTS

Over the 16-year period from 1991-2006, 2,340 patients were diagnosed with new active or relapsed TB in Alberta, 1,161 (49.6%) in 1991-1997, 683 (29.2%) in 1998-2002, and 496 (21.2%) in 2003-2006 (Table 1). For the three periods, respectively, the mean ($\pm$ SD) age of patients was 48.1 (23.6), 50.2 (22.2), and 48.2 (22.1) years, and the ratio of males to females was 0.96, 1.10 and 1.02. Between the first and last time period, the proportion of foreign-born TB patients increased from 58.1% to 74.4% and the proportion of foreign-born from sub-Saharan Africa from 6.8% to 20.6%. In each time period, the majority of Canadian-born TB patients were Aboriginal; 58.9%, 60.0%, and 52.0%, respectively.

In 1991-1997 (before HAART), 1998-2002 (after HAART but before 'opt-out' testing was implemented), and 2003-2006 (after 'opt-out' testing was implemented), respectively, HIV testing was performed at the time of diagnosis of TB in 11.5%, 44.9% and 81.9% of patients (Table 1 and Figure 1). Over the three time periods, a total of 50 TB patients were diagnosed with HIV co-infection, all in the age group 15-64 years. During the 'opt-out' testing years, 87.4% of TB patients aged 15-64 were HIV tested. During these years, the prevalence of HIV positivity in HIV-tested Canadian-born 'other', Canadian-born Aboriginal, foreign-born 'other' and foreign-born sub-Saharan African TB patients aged 15-64 years was 0.0%, 10.9%, 3.7 % and 18.0%, respectively, and the overall prevalence was 7.4% (data not shown).

Among TB patients aged 15-64 years who were diagnosed in the 'semi-selective' or 'selective-plus' testing years 1991-2002, 'post-TB'

HIV test results were as follows: of 156 patients who were untested at the time of diagnosis of TB and underwent one or more 'post-TB' HIV tests, all had a negative first test while 1 had a positive subsequent test; of 78 HIV-negative TB patients who underwent a 'post-TB' HIV test, 3 had a positive first and 1 had a positive subsequent test (Table 2). Assuming they remained in Alberta, the median duration of follow-up of TB patients who were never HIV tested (n=660) was 12.9 (range 5.0-17.0) years.

Among TB patients aged 15-64 who were HIV tested over the 16 years from 1991-2006, those testing positive were significantly less likely to be female and less likely to have respiratory TB alone (Table 3). Co-infected patients were significantly more likely to have both respiratory and non-respiratory TB than respiratory TB alone. The prevalence of HIV positivity among HIV-tested TB patients aged 15-64 years was 7.8%.

TB was culture positive in 49 of 50 HIV co-infected patients; 5 isolates were mono-resistant. HIV was discovered prior to and at the time of diagnosis of TB in 18 (36%) and 32 (64%) patients, respectively. CD4 counts were $< 200 \times 10^6/L$ in 34 of 47 (72.3%) HIV co-infected TB patients who had record of a CD4 count, averaging $141.0 \pm 118.2 \times 10^6/L$ and $155.1 \pm 199.7 \times 10^6/L$ in those diagnosed prior to and at the time of diagnosis of TB, respectively. HIV exposure categories were: heterosexual contact – 19 patients; injection drug use (IDU) – 15 patients; men who have sex with men (MSM) – 8 patients; MSM-IDU – 1 patient; 'other' – 1 patient; unknown – 6 patients.¹⁸ Seven patients (14%) died during the period of activity of TB.

INTERPRETATION

Over the 16-year period from 1991-2006, increasing proportions of TB patients in Alberta were HIV tested. Increased testing was temporally related to the availability of HAART and the implementation of 'opt-out' HIV testing (Figure 1). In the 'opt-out' years, HIV testing was considered universal, having met a recognized program performance target of testing more than 80% of TB patients.¹⁹ Over 16 years, HIV-TB co-infection was diagnosed in 50 patients, all in the age group 15-64 years. HIV-TB co-infected patients were significantly less likely to be female and less likely to have respiratory TB alone; they were significantly more likely to have both respiratory and non-respiratory TB than non-respiratory TB alone – differences that were not surprising given that HIV is more prevalent in males

in Canada, and TB is prone to disseminate in HIV co-infected patients.^{1,18} Most HIV co-infected TB patients had advanced HIV disease (CD4 count < 200 x 10⁶/L) at or before the diagnosis of TB. The prevalence of HIV co-infection in TB patients aged 15-64 years was 7.4% in the 'opt-out' testing years, similar to earlier Canadian (3.0-14.7%) and World Health Organization (8.7%) estimates.^{11,20-22}

HIV co-infection was more likely to have been missed during the 'semi-selective' testing years 1991-1997 (before HAART) when very few TB patients were HIV tested; two new HIV-positive patients are known to have been discovered during anonymous testing of TB patients in 1990-1994.²³ HIV co-infection was less likely to have been missed in the 'selective-plus' testing years 1998-2002 (after HAART but before 'opt-out' testing) when many more TB patients were HIV tested.

To the extent that 'selective' HIV testing is focused upon the HIV exposure categories of MSM (men who have sex with men) and IDU, it is predicted to fail to detect a significant number of those at risk for dual infection in the future.^{20,24,25} Many immigrants are now arriving from HIV-endemic countries in which heterosexual contact is the main HIV exposure category; IDU and/or heterosexual contact are increasingly the main HIV exposure categories in Aboriginal peoples.^{1,18,26} Young adults from all ethnic groups may, through lack of awareness, be at risk for sexually transmitted disease and HIV/AIDS. In addition, experience from other programs suggests that anything other than truly universal HIV testing will fail to identify some individuals who are HIV infected.²⁷ For these reasons, together with the fact that universal testing does not discriminate and is less likely to be perceived as stigmatizing, and the fact that TB is an AIDS-defining illness, we support the recommendation for universal HIV testing of TB patients. As in other clinical situations, a strong provider recommendation outlining the benefits of testing is likely to increase the uptake of testing.²⁸ For diagnostic and treatment purposes, HIV testing should ideally be performed within one or two months of the diagnosis of TB.¹⁹

Limitations of this study include its retrospective design and possible underreporting of HIV status. Patients whose HIV status had been assessed outside of Alberta may not have been registered in the PLPH database and TB patients diagnosed prior to 1993 may not have had a computerized record of their HIV status in the PLPH. However, in both instances it is unlikely that HIV-positive patients were missed; patients testing positive out-of-province are usually retested when accessing health care services in Alberta, and record of the HIV-positive status of TB patients is maintained in the TB Registry.

We conclude that it is feasible to implement a non-discriminatory 'opt-out' approach to HIV testing of TB patients – one that is very similar to that adopted for prenatal HIV testing – and that this approach can achieve universal testing targets.^{29,30} The relatively high rates of HIV in sub-Saharan African and Aboriginal TB patients in the age group 15-64 are of concern.

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RÉSUMÉ

Objectif : Le test de dépistage du VIH appliqué systématiquement chez les patients atteints de tuberculose, reconnu pour dépister plus de 80 % des nouveaux cas, a été recommandé au Canada, mais il n'a pas été fait. Les objectifs de cette étude étaient : 1) d'évaluer le succès d'une approche permettant de refuser le test, selon laquelle le dépistage du VIH est habituel à moins que le patient choisisse de le refuser, et 2) de déterminer les facteurs de risque pour le VIH chez les patients à qui on a fait passer le test de dépistage avant et après la mise en œuvre de cette approche.

Méthode : Les bases de données sur la tuberculose et le VIH dans la province de l'Alberta ont été croisées avant que le Traitement antirétroviral hautement actif (HAART) soit disponible (1991-1997), après la disponibilité du HAART, mais avant que le test de dépistage optionnel ne soit mis en place (1998-2002), et après la mise en œuvre du test de dépistage optionnel (2003-2006), et l'état du VIH chez les patients

atteints de tuberculose pour chaque période a été décrit. Les caractéristiques démographiques et cliniques des patients atteints de tuberculose et atteints du VIH ou non âgés de 15 à 64 ans ont été comparées.

Résultats : Le test de dépistage du VIH chez les patients atteints de tuberculose est passé de 11,5 % avant la disponibilité du HAART, à 44,9 % après la disponibilité du HAART, mais avant le test de dépistage optionnel, à 81,9 % après la mise en œuvre du test de dépistage optionnel. Entre 1991 et 2006, 50 patients atteints de tuberculose ont été diagnostiqués avec une infection au VIH; ces patients étaient tous âgés entre 15 et 64 ans. Parmi les patients atteints de tuberculose âgés de 15 à 64 ans qui ont été testés positifs pour le VIH, les patients testés positifs étaient beaucoup moins susceptibles d'être de sexe féminin et d'avoir la tuberculose respiratoire et beaucoup plus susceptibles d'avoir la tuberculose respiratoire et non respiratoire. La prévalence de la positivité au VIH chez les patients atteints de tuberculose testés positifs au VIH âgés entre 15 et 64 ans était de 7,4 % en 2003-2006.

Conclusion : Le test de dépistage du VIH appliqué systématiquement chez les patients atteints de tuberculose est réalisable si l'on offre la possibilité de le refuser.

Mots clés : VIH; tuberculose

Depuis 1910, l'Association canadienne de santé publique est le leader canadien en santé publique. L'ACSP :

- ☒ encourage la participation des citoyens à l'élaboration des politiques et des programmes de santé publique;
- ☒ rassemble divers particuliers et organismes, qui peuvent ainsi s'exprimer à l'unisson sur les enjeux de la santé publique au Canada et dans le monde; et
- ☒ se fait le maître d'œuvre d'un accès universel et équitable aux conditions fondamentales pour atteindre l'objectif de la santé pour tous.

Les membres de l'ACSP sont sa force et lui donnent sa crédibilité, ses orientations et son pouvoir. Pour continuer à être le porte-parole de la santé publique, l'ACSP a besoin de votre savoir-faire et de votre appui.

Unissez votre voix aux nôtres.

Joignez-vous à l'ACSP dès aujourd'hui.

Téléphonez-nous en composant le (613) 725-3769, poste 118,
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