Declining mortality among HIV-positive indigenous people at a Vancouver indigenous-focused urban-core health care centre

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Abstract

Objective To examine mortality rates among HIV-positive indigenous people and others after initiation of HIV care improvements based on the chronic care model to address high HIV-related mortality.

Design Retrospective cohort preintervention-to-postintervention evaluation study.

Setting Urban-core primary health care centre focused on indigenous people in Vancouver, BC.

Participants Individuals infected with HIV.

Intervention Adoption of the chronic care model to improve HIV care over time.

Main outcome measures All-cause mortality and HIV-related mortality rates, overall and from preintervention (2007 to 2009) to postintervention (2010 to 2012), by indigenous ethnicity, were calculated from clinical data linked with the provincial HIV treatment clinical registry.

Results Of the 546 eligible study patients, 323 (59%) self-identified as indigenous. Indigenous persons had higher all-cause mortality compared with other patients (14% vs 8%, $P=.035$; 6.25 vs 4.02 per 100 person-years [PYRs], $P=.113$), with an adjusted hazard ratio of 1.77 (95% CI 0.95 to 3.30). Indigenous persons also had higher HIV-related mortality (6% vs 2%, $P=.027$; 2.50 vs 0.89 per 100 PYRs, $P=.063$), with an adjusted hazard ratio of 2.88 (95% CI 0.93 to 8.92). Between 2007 to 2009 and 2010 to 2012, a significant decline was observed in all-cause mortality for indigenous patients (10.00 to 5.00 per 100 PYRs, $P=.023$) and a non-significant decline was observed in other patients (7.21 to 2.97 per 100 PYRs, $P=.061$). A significant decline in HIV-related mortality was also seen for indigenous patients (5.56 to 1.80 per 100 PYRs, $P=.005$).

Conclusion Despite the overall higher risk of death among indigenous patients compared with others, the decline in mortality in HIV-positive indigenous patients after the initiation of efforts to improve HIV care at the clinic further support HIV primary care informed by indigenous issues and the adoption of the chronic care model.

EDITOR'S KEY POINTS

- A decline over time in HIV-related and all-cause mortality was found for patients of indigenous ancestry in an urban-core health clinic. These significant decreases in HIV-related mortality are likely in part owing to the provision of culturally appropriate care that is informed by the historic traumas experienced by indigenous peoples in Canada, as well as owing to the adaptation of the chronic care model to HIV care at the clinic.
- Despite the declining HIV-related mortality rates demonstrated in this study, indigenous patients might still be at increased risk of dying compared with others, as shown by the significantly higher all-cause mortality.
- Infection with HIV is increasingly recognized as a socially determined yet manageable chronic illness in resource-rich countries. In addition to shifting to a chronic care model approach to HIV care for marginalized populations, providing primary care for indigenous patients that is informed by and focused on indigenous issues might be instrumental in decreasing the mortality rates of indigenous people.

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Baisse de la mortalité chez des Autochtones porteurs du VIH dans une clinique de santé du centre-ville de Vancouver axée sur les Autochtones

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Résumé

Objectif Examiner les taux de mortalité parmi des Autochtones porteurs du VIH et d'autres personnes après l'instauration d'améliorations aux soins pour le VIH en se fondant sur le modèle des soins chroniques pour tenter de régler le problème des taux élevés de mortalité due au VIH.

Conception Étude rétrospective de cohortes avant et après une intervention.

Contexte Une clinique de soins primaires axée sur les Autochtones située au centre-ville de Vancouver, C.-B.

Participants Des personnes infectées par le VIH.

Intervention L'adoption d'un modèle de soins chroniques pour améliorer avec le temps les soins pour le VIH.

Principaux paramètres à l'étude Les taux de mortalité toutes causes confondues et due au VIH ont été calculés dans l'ensemble, avant l'intervention (2007 à 2009) et après l'intervention (2010 à 2012), selon l'ethnicité autochtone, à partir de données cliniques reliées au registre clinique provincial des traitements pour le VIH.

Résultats Des 546 patients admissibles à l'étude, 323 (59%) se sont identifiés eux-mêmes comme étant autochtones. Les Autochtones accusaient des taux de mortalité toutes causes confondues plus élevés par rapport aux autres patients (14% c. 8%, $p = ,035$; 6,25 c. 4,02 par 100 personnes-années [PA], $p = ,113$), avec un risque relatif ajusté de 1,77 (IC à 95% de 0,95 à 3,30). Les personnes autochtones avaient aussi des taux de mortalité due au VIH plus élevés (6% c. 2%, $p = ,027$; 2,50 c. 0,89 par 100 PA, $p = ,063$), avec un risque relatif ajusté de 2,88 (IC à 95% de 0,93 à 8,92). Entre la période de 2007 à 2009 et celle de 2010 à 2012, une diminution considérable a été observée dans la mortalité toutes causes confondues chez les patients autochtones (de 10,00 à 5,00 par 100 PA, $p = ,023$) et une baisse non significative a été cernée chez les autres patients (de 7,21 à 2,97 par 100 PA, $p = ,061$). Un déclin significatif dans la mortalité due au VIH a aussi été observé chez les patients autochtones (de 5,56 à1,80 par 100 PA, $p = ,005$).

Conclusion En dépit du risque global plus élevé de décès chez les patients autochtones par rapport aux autres, la diminution dans la mortalité chez les Autochtones porteurs du VIH après l'instauration des efforts à la clinique pour améliorer les soins pour cette infection vient soutenir le bien-fondé des soins primaires pour le VIH qui tiennent compte des problèmes autochtones, de même que l'adoption d'un modèle de soins chroniques.

POINTS DE REPÈRE DU RÉDACTEUR

- Une diminution avec le temps de la mortalité due au VIH et toutes causes confondues a été observée chez des patients de descendance autochtone dans une clinique de santé du centre-ville. Ces baisses considérables dans la mortalité liée au VIH sont probablement en partie attribuables à la prestation de soins adaptés à la culture qui tiennent compte des traumatismes historiques vécus par les Autochtones au Canada, de même qu'à l'adoption du modèle des soins chroniques adapté à la clinique pour les soins aux porteurs du VIH.

- En dépit des taux à la baisse de la mortalité due au VIH cernés dans cette étude, les patients autochtones peuvent encore être à risque accru de mourir par rapport à d'autres personnes, comme le démontre la mortalité toutes causes confondues significativement plus élevée.

- L'infection au VIH est de plus en plus reconnue comme une maladie chronique socialement déterminée, mais quand même traitable dans les pays riches en ressources. Outre l'adoption d'un modèle de soins chroniques comme approche dans les soins pour le VIH, des soins primaires qui tiennent compte des problèmes autochtones et y accordent de l'importance pourraient jouer un rôle dans la diminution des taux de mortalité des Autochtones.

Cet article a fait l'objet d'une révision par des pairs.
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Expanding access to highly active antiretroviral therapy (HAART) has increased life expectancy and decreased mortality for people infected with HIV in Canada.[1] However, this success has not been equally distributed among all HIV-infected individuals. Indigenous people infected with HIV are affected by delayed uptake and decreased adherence to HAART, increased all-cause and HIV-related mortality,[2-4] and reduced life expectancy.[5] In British Columbia (BC), HIV-related mortality rates are substantially higher for indigenous people than for non-indigenous people: in Vancouver, BC, mortality rates are approximately 8 times higher for indigenous people,[4] while the life expectancy for indigenous persons taking HAART in BC is only three-fifths that of others taking HAART.[5]

Although indigenous people have universal access to HAART and a similar physiologic response to therapy as others do,[2,6] indigenous people seem to experience higher rates of virologic failure[6] and higher mortality rates,[2,7] especially indigenous women.[8] The greatest risk factor for nonadherence to HAART and increased mortality among indigenous people is a history of addiction and injection drug use.[6,7] These health outcome inequities might be attributed to the overrepresentation of indigenous people infected with HIV in hard-to-reach populations, including those with mental illness, addictions, and housing insecurity, and those without access to expert HIV care.[4] While the high mortality rate for urban indigenous people is driven to an extent by social determinants[9] and might be preventable by improving social circumstances,[10] further improvements to health services are needed.[2,7] The high mortality rate is furthered by the persistence of discrimination against indigenous people in the health system and the lack of culturally adapted health services,[11] and it might be reduced by interventions aimed at decreasing discrimination, improving the cultural fit of health services, and increasing the quality of these health services for indigenous peoples.[12]

The Vancouver Native Health Society (VNHS) Medical Clinic is a multidisciplinary comprehensive health care centre that was established in 1993 to meet the unique health care needs of people (both indigenous and non-indigenous) living in Vancouver's urban core. The VNHS Medical Clinic is distinct from other urban-core clinics in that it is overseen by an indigenous board of directors and directly involves the indigenous community, with an explicit organizational mandate to provide culturally safe and informed care.[12] Two-thirds of active VNHS clinic patients self-identify as indigenous (representing all indigenous peoples, including First Nations, Metis, and Inuit peoples). Some of the HIV-related chronic disease management quality improvements at the clinic have included increased disease screening, immunization, HAART uptake, and virologic suppression rates as described previously[12]; however, the associated mortality has not been analyzed. The objective of the study was to determine whether mortality for HIV-positive indigenous people at the clinic has declined during a 6-year period from 2007 to 2012, while these quality improvement efforts were implemented.

METHODS

Data sources

The study population consisted of those 18 years of age and older registered at the VNHS Medical Clinic between January 1, 2007, and December 31, 2012. We linked data of individuals identified as being clinic patients with data from the BC Centre for Excellence in HIV/AIDS Drug Treatment Program (DTP) database of all patients with HIV who were receiving HAART treatment in the province.[2] The DTP collects information on HAART dispensing history and basic laboratory and demographic information through drug request forms completed by physicians prescribing HAART. The DTP also conducted monthly linkages with the BC Vital Statistics Agency to accurately identify deaths among participants. Patients were excluded from this analysis if they had no medical record at VNHS, never had a recorded visit, or were missing provincial health identification numbers that were used for data linkages, or if their indigenous status recorded at VNHS was missing or unknown.

Definitions

Ethnicity was self-reported by each patient. Baseline was defined as the date of first visit at the VNHS Medical Clinic during the study period, with baseline CD4 cell count and viral loads defined as the most recent measures in the 3 months before the first visit. Participants were followed from their first visit after January 1, 2007, until death or their last visit before December 31, 2012. We classified cause of death using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision: categories B20 to B24 were defined as HIV-related causes of death and all other known causes were coded as non–HIV-related causes of death.

Data analyses

Patient characteristics recorded at baseline were compared by ethnicity using χ^2 and Fisher exact tests for categorical variables and the Wilcoxon rank sum test (normal approximation) for continuous variables.

The main outcomes in the study were all-cause mortality and HIV-related mortality. We examined the cumulative incidence curves stratified by indigenous or non-indigenous ethnicity by using a Kaplan-Meier survival plot. To investigate the overall relationship

between indigenous ethnicity and time to death, as well as time to HIV-related death, we used 2 Cox proportional hazards models. To further examine the trend over time in all-cause mortality and HIV-related mortality by indigenous ethnicity status, we used the Spearman rank correlation. Analyses were conducted using SAS, version 9.3. The study procedures were approved by the University of British Columbia Clinical Research Ethics Board and by the Vancouver Native Health Society Research Committee.

RESULTS

There were 712 HIV-positive patients registered with VNHS and linked to the medical clinic during the study period. Of these, 166 were excluded from the analysis: 122 did not have a recorded visit, 11 did not have a medical record, 18 did not have a personal health identification number that could be used for data linking, and 15 were missing ethnicity data. After applying study eligibility criteria, 546 individuals were included in the study population (**Box 1**), of whom 323 (59%) self-reported indigenous ethnicity.

Compared with the other patients at the clinic, indigenous patients were significantly more likely to be women (43% vs 24%, $P<.001$), to be younger (43 vs 47 years, $P<.001$), to have had HAART initiated at lower CD4 counts (300 vs 380 cells/μL, $P=.002$), and to have been taking HAART for a shorter duration (71 vs 95 months, $P=.010$) (**Table 1**). There was no difference in the proportions of participants who received HAART during the study period with respect to ethnicity (87% vs 89% for indigenous and non-indigenous participants, respectively, $P=.699$).

Overall, 63 patients (12%) died during this 6-year period, with an all-cause mortality of 5.39 per 100 person-years (PYRs). The all-cause mortality was higher among indigenous persons than among other patients (14% vs 8%, $P=.035$; 6.25 vs 4.02 per 100 PYRs, $P=.113$) (**Table 1**). The overall HIV-related mortality was also higher for indigenous persons compared with other patients (6% vs 2%, $P=.027$; 2.50 vs 0.89 per 100 PYRs, $P=.063$). Time to death by indigenous ethnicity status is shown in **Figure 1**. The associated adjusted hazard ratio (indigenous vs non-indigenous) was 1.77 (95% CI 0.95 to 3.30) in the Cox model, adjusted for age, sex, CD4 and viral load levels at first visit, and length of time taking HAART. Time to HIV-related death by indigenous ethnicity status is also shown in **Figure 1**. The associated adjusted hazard ratio (indigenous vs non-indigenous) was 2.88 (95% CI 0.93 to 8.92).

During the study, all-cause mortality declined for indigenous patients from 10.00 per 100 PYRs in 2007 to 2009 to 5.00 per 100 PYRs in 2010 to 2012 ($P=.023$) (**Figure 2**). All-cause mortality also declined for non-indigenous patients from 7.21 per 100 PYRs to 2.97 per 100 PYRs, but this did not achieve statistical significance ($P=.061$).

The HIV-related mortality also declined for indigenous patients during the study from 5.56 per 100 PYRs in 2007 to 2009 to 1.80 per 100 PYRs in 2010 to 2012 ($P=.005$). For non-indigenous patients the decline in HIV-related mortality from 1.48 per 100 PYRs to 0.59 per 100 PYRs was not statistically significant ($P=.247$).

Box 1. Derivation of study population

The following describes the criteria used to select the study population:

- 712 people with HIV registered at the clinic from 2007 to 2012 inclusive
- 166 were excluded from the analysis:
  - -122 never had a visit
  - -11 had no medical record
  - -18 had no health number for data linkage
  - -15 had no ethnicity data
- 546 were included in the final study population

DISCUSSION

We found a decline over time in HIV-related and all-cause mortality for patients of indigenous ancestry in an urban-core health clinic in Vancouver. This occurred during a 6-year period while chronic disease management quality improvements, which have been previously described,[12] were initiated to address high HIV-related mortality. These results are encouraging in that they suggest that clinical and health service interventions might directly affect important clinical outcomes for urban-core indigenous populations. We are unaware of any program in Canada or elsewhere that has demonstrated such findings of declining mortality rates in this population.

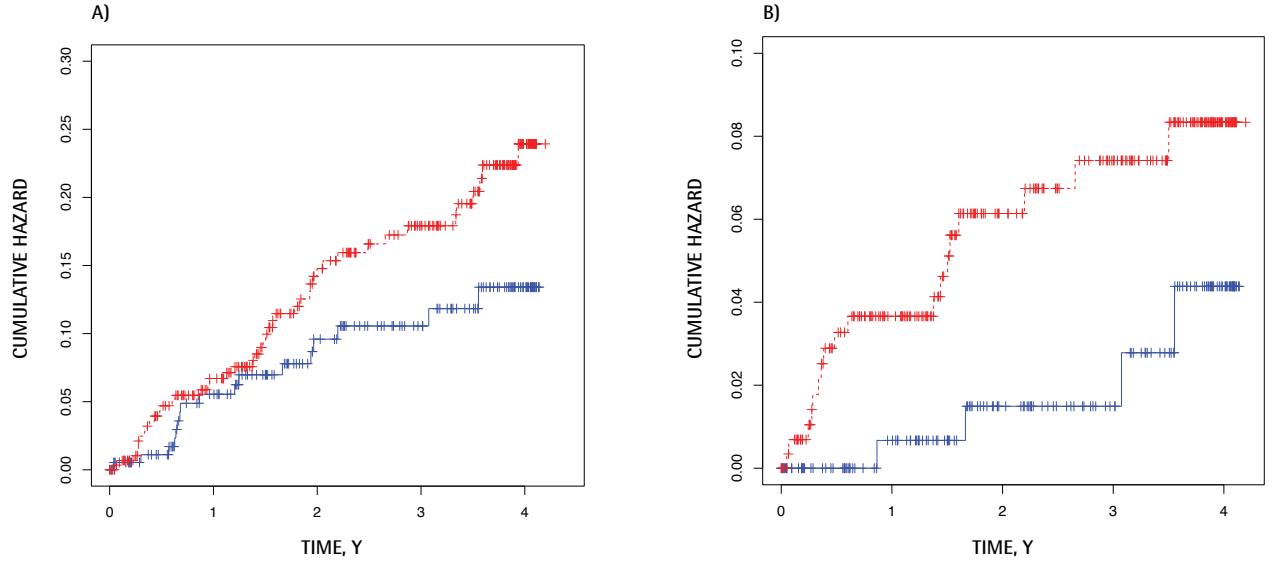
These significant decreases in HIV-related mortality are likely in part owing to the provision of culturally appropriate care that is informed by the historic traumas experienced by indigenous peoples in Canada, as well as owing to the adaptation of the chronic care model to HIV care at the urban-core clinic. This care preceded and continued through the study period, encouraging the adaptation of clinical guidelines, preparing care providers to proactively identify patients in need of intervention, and empowering patients to be more involved in self-care.[12] These improvements in mortality rates cannot be attributed to secular trends, as the mortality gap between indigenous and non-indigenous people persists for the whole of BC[4,5] and across Canada.[7]

Table 1. Patient characteristics and mortality by ethnicity: *N = 546.*

CHARACTERISTICS	ETHNICITY		*P* VALUE
	INDIGENOUS (N=323)	OTHER (N = 223)	
Men, n (%)	185 (57)	170 (76)	< .001
Median (IQR) age, y	43 (37-49)	47 (41-52)	< .001
Taking HAART while at clinic, n (%)	280 (87)	198 (89)	.699
Median (IQR) initial CD4 count, cells/μL	300 (170-450)	380 (220-530)	.002
Median (IQR) initial VL, HIV RNA copies/mL	196 (35-16 531)	133 (35-24 922)	.616
Median (IQR) time taking HAART while at clinic, mo	27 (10-46)	23 (5-45)	.109
Median (IQR) total time taking HAART, mo	71 (31-140)	95 (44-164)	.010
VL suppression within 1 y of HAART, n (%)	128 (40)	101 (45)	.314
Mortality			
• All-cause, n (%)	45 (14)	18 (8)	.035
-Incidence rate per 100 PYRs	6.25	4.02	.113
• HIV-related, n (%)	18 (6)	4 (2)	.027
-Incidence rate per 100 PYRs	2.50	0.89	.063

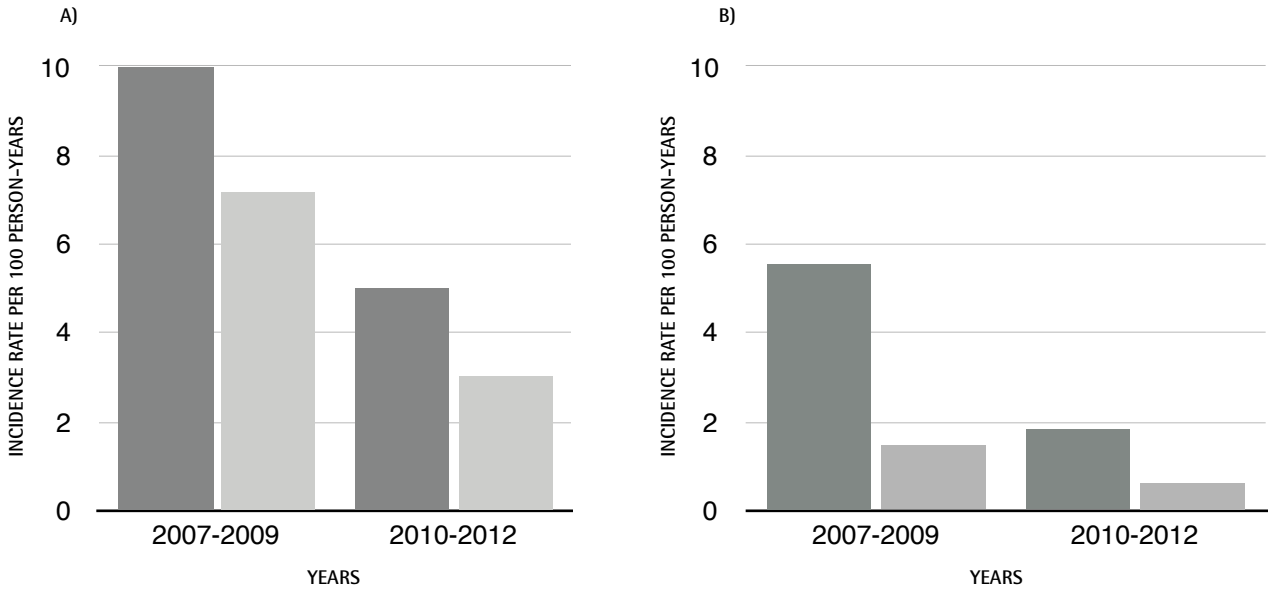
HAART—highly active antiretroviral therapy, IQR—interquartile range, PYRs—person-years, VL—viral load.

Figure 1. Kaplan-Meier plots by ethnicity: *The upper curve represents indigenous patients and the lower curve represents other patients. A) Time to death (P = .08). B) Time to HIV-related death (P = .05).*



Despite the declining HIV-related mortality rates demonstrated in this study, indigenous patients might still be at increased risk of dying compared with others, as shown by the significantly higher all-cause mortality. This high mortality rate in this study could be owing to differences between the 2 groups. For example, indigenous people are more likely to be younger, and thus possibly exposed earlier to the associated risks; they are more likely to be women, another known risk factor in this context[8]; and they are less likely to be taking HAART before coming to the clinic; other possible factors such as addiction are unaccounted for in this study. Addiction and injection drug use are important risk factors in this context,[6,7] and other studies have shown that opioid maintenance therapy for HIV-positive individuals who use illicit drugs can improve engagement in care and HIV treatment outcomes[13]; the same has been shown for indigenous people infected with HIV.[14] Opioid agonist therapy, such as methadone, is a standard of opioid addiction care at VNHS Medical Clinic; however, determining its direct effect on mortality was beyond the scope of this study.

Figure 2. All-cause and HIV-related mortality rate over time by ethnicity: *Indigenous people are represented by dark bars and other patients are represented by light bars. A) There was a significant decline in all-cause mortality for indigenous people (P = .023) and no significant difference for others (P = .061). B) There was a significant decline in HIV-related mortality for indigenous people (P = .005) and no significant difference for others (P = .247).*



The causes of health outcome disparities, such as the excessively high HIV-related mortality among indigenous persons, are rooted in the social, economic, cultural, and political inequities resulting from the history of colonialism, forced relocation of communities to reservations, and removal of children from their families to be placed into residential schools.[9,15,16] These health inequities are perpetuated by ongoing barriers faced by indigenous people in accessing health services. These barriers include poverty, homelessness, diminished educational attainment, addictions, poor mental health, lack of respectful and culturally sensitive services, racial discrimination, and mistrust of medical institutions.[4,11,12,17,18] Among this study population, stable housing has been previously shown to be associated with increased likelihood of survival.[12]

Limitations

This study has several limitations. The most important limitation is that the study was underpowered, although all eligible patients from the clinic were included, and in some cases we failed to demonstrate significant differences in mortality at the conventional level of a *P* value less than .05. However, the HIV-related mortality declined significantly for indigenous people, so differences in mortality would likely have been greater early in the study period before the implementation of the clinical quality improvements. Second, we excluded some participants who had registered at the clinic but did not have their ethnicity status coded; however, relative to the overall number of participants, this number was quite small. Also, deaths that occurred outside of BC might have been missed in our analysis; however, this number is also likely to be quite small. A quarter of all patients had a final visit in the last 6 months of the study period.

Conclusion

Infection with HIV is increasingly recognized as a socially determined yet manageable chronic illness in resource-rich countries. In addition to shifting to a chronic care model approach to HIV care for marginalized populations, providing primary care for indigenous patients that is informed by and focused on indigenous issues might be instrumental in decreasing the mortality rates of indigenous people.

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Contributors

Dr Klakowicz contributed to the conception and design of the study, acquisition of data, and analysis and interpretation of data; he also drafted the article. **Ms Zhang** and **Dr Moore** contributed to acquisition of data, and analysis and interpretation of data. **Mr Colley** contributed to acquisition of data and interpretation of data. **Dr Tu** contributed to the conception and design of the study, acquisition of data, and analysis and interpretation of data. All authors revised

the article critically for important intellectual content, gave final approval of the version to be published, and agreed to act as guarantors of the work.

Competing interests
None declared

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