

Improving post-tuberculosis care in Canada

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An estimated 155 million people, or 1 in 50 people globally, have survived tuberculosis (TB) disease.¹ In Canada, about 1700 people receive diagnoses of active TB disease each year and 2% of the 8 million migrants in Canada have a history of TB disease.² Thus, we estimate the number of TB survivors in Canada exceeds 100 000 people. People who survive TB have elevated rates of respiratory and cardiovascular disease, cancer, depression and all-cause mortality, despite completing effective TB therapy.³⁻⁶ A 2021 study found that immigrants to British Columbia who survived TB had a 69% higher risk of non-TB death from respiratory and cardiovascular disease, injury or poisoning, and cancer-related death than the general population.⁷ Elevated mortality and morbidity rates may be driven by sequelae of TB disease itself or may reflect unmeasured confounding by systemic, socioeconomic, medical or behavioural factors. Regardless of causation, collaborative and integrated actions to address the problem are needed. New international and Canadian standards for post-TB care have been outlined, but a combination of patient engagement, careful service coordination and better research will be needed to ensure that patients maintain optimal health after successful treatment for TB disease.

Post-TB lung disease — which refers to an overlapping spectrum of disorders including chronic obstructive pulmonary disease, bronchiectasis, restrictive lung disease and infectious pulmonary complications — results from the complex interplay between organism, host and environmental factors.⁸ Accumulating epidemiological evidence regarding the magnitude and burden of post-TB lung disease suggests that it contributes to a high burden of chronic disease worldwide.⁹ In British Columbia, people with pulmonary TB were shown to have a twofold higher risk of airway disease than people who had not had TB.¹⁰ However, post-TB lung disease is diverse in its clinical presentation and is likely under-recognized by health care providers in Canada; 1 recent Canadian study showed that only 14% of people with pulmonary TB underwent pulmonary function testing at any point after treatment completion.¹¹

A recent systematic review found an adjusted relative risk of 1.5 for major adverse cardiac events among TB survivors compared with people who had not had TB.³ Cardiovascular morbidity and deaths among TB survivors may be related to a high prevalence of smoking and other high-risk behaviours in this population, to socioeconomic factors or to chronic systemic inflammation from TB disease, which may play a role in the development of atherosclerosis, but further research is necessary to understand this relationship.

Key points

- People who survive tuberculosis (TB) disease have increased rates of morbidity and mortality from respiratory disease, cardiovascular disease, cancer and depression.
- The prolonged duration of TB therapy may be an opportunity to promote person-centred strategies to optimize long-term health and ensure good primary care follow-up after TB treatment.
- Patient engagement, service coordination and research can help to ensure that TB survivors maintain optimal health after treatment for TB.

Regarding mental health, TB may contribute to a high incidence of depression through altered inflammatory response, comorbidities, medication effects, stigma and isolation.⁵ The pooled prevalence of depression among people receiving TB treatment is estimated to be 45%,⁵ but the literature is sparse on programmatic interventions to address depression in this population.

Studies conducted in low- and middle-income countries have shown that the total cost of TB isolation and care is often catastrophic for patients and their families;¹² however, we are not aware of any Canadian investigation into the long-term financial impacts TB on individuals. Given that marginalized groups are disproportionately affected by TB in Canada, this issue requires further investigation.

National and provincial TB programs prioritize timely diagnosis, treatment and prevention of TB. This is reflected in the routinely collected programmatic metrics of treatment completion, failure, loss to follow-up and death during treatment. Although priority is placed on TB treatment outcomes, care of people with the disease often abruptly ends at treatment completion. Incorporating long-term indicators as part of routine care could help to ensure that long-term health outcomes are integral to the TB care cascade.

Recent international standards highlighted the need to assess and manage post-TB lung disease at the end of treatment.¹³ These standards include assessing every person who has completed pulmonary TB treatment for post-TB sequelae and offering pulmonary rehabilitation to patients with clinical and radiological signs and symptoms of post-TB lung disease. The 2022 Canadian TB Standards recommended pulmonary function testing for all people who have completed therapy for pulmonary TB.¹⁴

Isolated investigations, however, may not be enough to affect risk of death after TB treatment. In Canada, where colonialism underpins the epidemiology of TB to this day, Canadian-born Indigenous people and foreign-born people continue to be disproportionately affected by TB.¹⁵ Although foreign-born people make up the greatest number of people with TB in Canada, incidence is highest among Canadian-born Indigenous people, particularly in northern Canada. Populations affected by TB often face barriers to accessing care and impediments to navigating health care systems that are structurally racist.¹⁶ Since patients with TB are actively engaged with the health care system for the duration of TB treatment, this period may be an opportunity to promote person-centred strategies to optimize long-term health. The Canadian TB Standards emphasize the importance of making efforts to address comorbidities during TB treatment in partnership with primary care providers to improve overall quality and integration of patient care.¹⁴

In addition to the minimum action of engaging primary care and improving awareness of the long-term outcomes for people after TB disease, we also suggest that care navigation services be explored as an option to support individuals in overcoming systemic barriers and facilitate timely access to quality health care while transitioning out of TB care. Specialist programs could provide primary care providers with a summary sheet highlighting post-TB health concerns, complications and recommendations to consider age-appropriate screening for cardiovascular disease, lung cancer and depression. Furthermore, the recommended pulmonary function testing should occur after treatment.^{13,14}

People who have survived TB disease have also advocated for comprehensive and holistic care beyond treatment completion to increase their quality of life, particularly through mental health and social support.¹⁷ Involving TB survivors in discussions of how to move this agenda forward is central to developing appropriate person-centred models of care.

Although no easy solution will address the unique challenges that TB survivors face, it is vital to recognize that, for many, physical and psychological suffering continues long after TB treatment completion. Service coordination, advocacy, engagement, research and, ultimately, funding are needed to ensure that TB survivors receive appropriate support after their disease is considered cured.

References

- Dodd PJ, Yuen CM, Jayasooriya SM, et al. Quantifying the global number of tuberculosis survivors: a modelling study. *Lancet Infect Dis* 2021;21:984-92.
- Asadi L, Heffernan C, Menzies D, et al. Effectiveness of Canada's tuberculosis surveillance strategy in identifying immigrants at risk of developing and transmitting tuberculosis: a population-based retrospective cohort study. *Lancet Public Health* 2017;2:e450-7.
- Basham CA, Smith SJ, Romanowski K, et al. Cardiovascular morbidity and mortality among persons diagnosed with tuberculosis: a systematic review and meta-analysis. *PLoS One* 2020;15:e0235821.
- Romanowski K, Baumann B, Basham CA, et al. Long-term all-cause mortality in people treated for tuberculosis: a systematic review and meta-analysis. *Lancet Infect Dis* 2019;19:1129-37.
- Duko B, Bedaso A, Ayano G. The prevalence of depression among patients with tuberculosis: a systematic review and meta-analysis. *Ann Gen Psychiatry* 2020;19:30.
- Byrne AL, Marais BJ, Mitnick CD, et al. Tuberculosis and chronic respiratory disease: a systematic review. *Int J Infect Dis* 2015;32:138-46.
- Basham CA, Karim ME, Cook VJ, et al. Post-tuberculosis mortality risk among immigrants to British Columbia, Canada, 1985-2015: a time-dependent Cox regression analysis of linked immigration, public health, and vital statistics data. *Can J Public Health* 2021;112:132-41.
- Allwood BW, Byrne A, Meghji J, et al. Post-tuberculosis lung disease: clinical review of an under-recognised global challenge. *Respiration* 2021;100:751-63.
- Meghji J, Mortimer K, Agusti A, et al. Improving lung health in low-income and middle-income countries: from challenges to solutions. *Lancet* 2021;397:928-40.
- Basham CA, Karim ME, Cook VJ, et al. Post-tuberculosis airway disease: a population-based cohort study of people immigrating to British Columbia, Canada, 1985-2015. *EClinicalMedicine* 2021;33:100752.
- Basham CA, Cook VJ, Johnston JC. Towards a "fourth 90": A population-based analysis of post-tuberculosis pulmonary function testing in British Columbia, Canada, 1985-2015. [Internet]. *Eur Respir J* 2020;56:2000384.
- Tanimura T, Jaramillo E, Weil D, et al. Financial burden for tuberculosis patients in low- and middle-income countries: a systematic review. *Eur Respir J* 2014;43:1763-75.
- Migliori GB, Marx FM, Ambrosino N, et al. Clinical standards for the assessment, management and rehabilitation of post-TB lung disease. *Int J Tuberc Lung Dis* 2021;25:797-813.
- Johnston JC, Cooper R, Menzies D. Chapter 5: Treatment of tuberculosis disease. In: Menzies D, ed. *Canadian Tuberculosis Standards*. 8th ed. Ottawa: Canadian Thoracic Society; 2022. 66-76.
- Heffernan C, Ferrara G, Long R. Reflecting on the relationship between residential schools and TB in Canada. *Int J Tuberc Lung Dis* 2022;26:811-3.
- Turpel-Lafond ME. In plain sight: addressing Indigenous-specific racism and discrimination in B.C. health care. Vancouver: Province of British Columbia; 2020. Available: <https://engage.gov.bc.ca/app/uploads/sites/613/2020/11/In-Plain-Sight-Summary-Report.pdf> (accessed 2022 Oct. 10).
- Schoeman I, Sifumba Z. Tuberculosis care does not end at treatment completion — a perspective from tuberculosis survivors. *Lancet Infect Dis* 2021;21:896-7.

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