

TUBERCULOSIS SURVEILLANCE PROTOCOL FOR ONTARIO HOSPITALS

Developed by the Ontario Hospital Association and the
Ontario Medical Association
Joint Communicable Diseases Surveillance Protocols Committee
In collaboration with the Ministry of Health and Long-Term Care

Approved by:
The OHA and The OMA Board of Directors
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This protocol was developed jointly by the Ontario Hospital Association and the Ontario Medical Association, in collaboration with the Ministry of Health and Long-Term Care, to meet the requirements of the *Public Hospitals Act 1990*, Revised Statutes of Ontario, Regulation 965.

The protocol is based on current scientific and medical knowledge and a desire to ensure maximum cost effectiveness of programs while protecting health care workers. It is intended as a minimum practical standard for Ontario hospitals. However, hospitals may adopt additional strategies when indicated by local conditions.

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Rationale for Tuberculosis Surveillance Protocol

Globally, tuberculosis (TB) continues to be a major health problem with an estimated 32% of the world's population infected with *Mycobacterium tuberculosis*. Although Canada continues to enjoy one of the lowest reported incidence rates of TB in the world (4.7 per 100,000 in the year 2007), changes in epidemiology, HIV co-infection and emerging drug-resistant strains of TB continue to keep TB control and management a challenge.

There has been a major change in the epidemiology of tuberculosis in Canada in the past twenty years, with an increased proportion of foreign-born TB cases in Canada, noted to be highest in immigrants from Africa and Asia. The majority of TB cases in Ontario are now foreign-born. TB is also an urban disease and a disease affecting the under-housed and homeless. Toronto and surrounding area, Ottawa and Hamilton are the Ontario cities most affected. A substantial proportion of the reported foreign-born TB cases in a given year are diagnosed within the first few years of arrival in Canada. HIV co-infection with *Mycobacterium tuberculosis* was reported as 4.2% of the cumulative AIDS cases reported in Canada by the end of 1996. Worldwide, TB is the most common cause of death among HIV-infected individuals, accounting for approximately one-third of AIDS deaths annually.

The emergence of drug-resistant TB is a major challenge. The Canadian Tuberculosis Laboratory Surveillance System found that 9.5% of all TB isolates submitted in 2009 were resistant to at least one first-line drug and 1.4% were identified as multidrug-resistant TB (MDR-TB; defined as resistance to at least isoniazid and rifampin). Four extensively drug resistant TB (XDR-TB: defined as MDR-TB with additional resistance to any fluoroquinolone and to at least one of capreomycin, kanamycin and/or amikacin) have been identified by this surveillance system from 1999 to 2009, 3 of the 4 in Ontario. In Ontario, 2.3% of TB isolates were MDR-TB in 2009. This data must be considered in the development of surveillance protocols for health care workers (HCWs).

All health care facilities must have a tuberculosis management program. The program must be supported at the highest administrative level. Health care facilities should establish policies and procedures in collaboration with local public health authorities to develop a comprehensive regional TB program. Transmission of tuberculosis to other patients or HCWs remains a potential risk in Canadian health care institutions where patients with active tuberculosis are admitted.

In the screening and surveillance of HCWs as part of a TB management program, the facility should determine if the annual rate of acquiring infection with *M. tuberculosis* in HCWs exceeds the annual rate of acquiring infection in an average Canadian community (i.e., no more than one tuberculin skin test (TST) negative HCW in 1,000 (0.1%) would develop a positive TST per year). Surveillance of HCWs for TB depends both on knowledge of baseline skin test status and a high level of compliance with the program. Frequency of screening depends on the incidence of active TB cases in the hospital site, and the likelihood of a health care worker's exposure, dependent on the type of work done by the HCW.

Routine chest X-rays are not recommended for TB surveillance as they are relatively ineffective in detecting tuberculous infection. The emphasis is on the need for dependable baseline data, including accurate, reliable, consistent recording of TST results in millimetres of induration, the use of a two-step TST where appropriate and aggressive follow-up of tuberculosis contacts.

Mycobacterium tuberculosis infection is acquired through the respiratory route and anyone found to be infectious may already have infected others. At the time of patient diagnosis, health care workers and patients who may have been exposed to the infected patient must be identified and monitored for development of infection by the Occupational Health Service (OHS). HCWs who were previously skin-test negative are best monitored with the Mantoux skin test. For this screening to be useful, the occupational health nurse must know whether the person was truly positive or negative in the past. This protocol continues to emphasize the use of the two-step Mantoux test for initial testing. The two-step test provides reliable baseline data so that later conversion can be confidently diagnosed. For a more detailed discussion of the rationale and method of doing a two-step test, refer to the Bibliography and Glossary.

There are now blood tests which measure interferon- γ that can be used to diagnose latent TB infection, particularly in persons who have been previously BCG-vaccinated in whom a TST may be difficult to interpret. These tests may be used to confirm a positive TST in a health care worker who is thought to have a low probability of TB infection. These tests should be used in consultation with a physician with experience and expertise in diagnosis and management of TB. These tests are not yet widely available in Ontario. The tuberculin skin-test remains the standard for use in Occupational Health Services in hospitals.¹

Individuals who are skin-test positive are likely to have some degree of immunity to infection with tuberculosis from an outside source. Their greatest risk of development of active disease is from reactivation of their own inactive tuberculosis infection, but reinfection is possible. They should be educated about the symptoms that might indicate active disease, and be advised to seek prompt medical attention if these occur.

The term “latent tuberculous infection” (LTBI) now replaces “tuberculous infection” and “treatment of latent tuberculous infection” replaces “chemoprophylaxis” and “preventive treatment”. Treatment of LTBI is started only after tuberculous disease (i.e., active TB) has been excluded.

A surveillance program is only part of a hospital-wide infection prevention and control program to prevent transmission of tuberculosis. **Hospitals must emphasize proper patient care techniques (e.g., proper isolation of recognized or suspected tuberculosis cases) and worker education about significant symptoms that should be communicated to the occupational health services, rather than depending solely on results of routine skin tests.** Regular evaluation and reporting of the effectiveness of the surveillance program is essential.

¹Updated Recommendations on Interferon Gamma Release Assays for Latent Tuberculosis Infection, Canadian Tuberculosis Committee, Public Health Agency of Canada, Canada Communicable Disease Report 34:ACS-6, 2008.

Tuberculosis Surveillance Protocol for Ontario Hospitals

Developed by The Ontario Hospital Association and The Ontario Medical Association
Published November 1990, Reviewed and Revised May 2010

I. Purpose

The purposes of this protocol are:

- i. To provide direction to hospitals in conducting a surveillance program with respect to tuberculosis based on risk for the institution and for the workers, in accordance with Public Health Agency of Canada Guidelines;
- ii. To identify those persons who may be or may become infectious with tuberculosis; and
- iii. To establish a system that would allow for the identification and prevention of tuberculosis through evaluation and follow-up of close contacts of active cases, in order to identify secondary cases and to provide therapy for latent tuberculous infection (LTBI).

The infected person's personal physician and the local Medical Officer of Health are responsible for follow-up investigation, care and therapy.

II. Applicability

This protocol applies to all persons carrying on activities in the hospital, including employees, students, volunteers, medical house staff, physicians, contract workers and any others who, as part of their daily activity, have direct patient contact (See Glossary). This protocol **does not** apply to patients of the facility, or to visitors.

When hiring contract workers or training students, the hospital must inform the supplying agency/school that the agency/school is responsible for ensuring that their personnel are screened and managed according to this protocol.

This protocol is for use by the occupational health service (OHS) in hospitals.

III. Preplacement

The following investigations should be done either preplacement/pre-appointment, or within 14 days of that time to provide an accurate baseline:

- (a) Health care workers (HCWs) whose tuberculin status is unknown, and those previously identified as tuberculin negative, require a baseline two-step Mantoux skin test with PPD/5TU, (See Glossary), **unless they have:**
- documented results of a prior two-step test,² or
 - documentation of a negative PPD within the last 12 months³, or
 - 2 or more documented negative PPD at any time but the most recent was >12 months ago³,

in which case a single-step test may be given.

Interpretation of Size of Tuberculin Skin Test (TST)

TST Reaction Size (mm induration)	Situation in which reaction is considered positive
0-4	HIV infection with immune suppression AND the expected likelihood of TB infection is high (e.g. patient is from a population with a high prevalence of TB infection, is a close contact of an active contagious case, or has an abnormal X-ray)
5-9	HIV infection Close contact of active contagious case Children suspected of having tuberculous disease Abnormal chest X-ray with fibronodular disease Other immune suppression: TNF-alpha inhibitors, chemotherapy
≥ 10	All others

- (b) A history of BCG vaccine **is not** a contraindication to tuberculin testing. HCWs who have had previous Bacille Calmette-Guerin (BCG) vaccine may still be at risk of infection. HCWs with a history of BCG vaccine who are tuberculin skin test negative should be evaluated as in (a) above.

Note: BCG vaccination is an unlikely explanation of a positive TST if BCG was given in infancy.²

- (c) Contraindications to tuberculin testing are:
- history of severe blistering reaction or anaphylaxis following the test in the past
 - documented active TB
 - clear history of treatment for TB infection or disease in the past
 - extensive burns or eczema over the testing site

² Canadian Tuberculosis Standards, 6th ed., Public Health Agency of Canada & The Lung Association, 2007.

³ CDC Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health Care Settings, 2005, MMWR 54:RR-17

- major viral infection (persons with a common cold may be tested)
- live virus vaccine in the past month

NOTE: Pregnancy is NOT a contraindication for performance of a Mantoux skin test.

- (d) Tuberculin testing should be administered by trained staff in a setting where the HCW can be observed for 15 minutes and staff are prepared to deal with anaphylactic reactions with epinephrine 1:1000 available.⁴

For HCWs who are known to be tuberculin positive, or for those who are tuberculin skin test positive when tested in (a) or (b) above, or for whom tuberculin skin testing is contraindicated as in (c) above, further assessment should be done by the Occupational Health Service (OHS) under the direction of a physician, or by the HCW's personal physician.

- (e) Chest X-rays should be taken on HCWs who have:
- never been evaluated for a positive Mantoux skin test or for tuberculosis;
 - had a previous diagnosis of tuberculosis but have never received adequate treatment for tuberculosis; or
 - pulmonary symptoms that may be due to tuberculosis. In this situation, 3 sputum specimens should be sent for Acid Fast Bacilli (AFB) and TB culture.

If the X-ray suggests pulmonary TB, the HCW should be evaluated to rule out the possibility of active tuberculous disease and documentation of the results of this evaluation should be in place before s/he is cleared for work.³

All tuberculin positive HCWs should be advised to report any symptoms of pulmonary tuberculosis (See Glossary) to the OHS, and should be managed using current guidelines.

Certain medical conditions predispose persons infected with *Mycobacterium tuberculosis* to develop active disease (See Glossary). Consider treatment of LTBI in individuals with these conditions who are skin test positive and have not had previous treatment of LTBI. **Active tuberculous disease must be ruled out before treating LTBI.**

Active cases of tuberculous disease and tuberculin skin test converters (see section VI) are reportable to the local Medical Officer of Health. Some local Public Health Units may want all positive tuberculin skin tests reported; this should be ascertained from the local Public Health Unit. Occupationally acquired active tuberculous disease and LTBI are reportable to the Ministry of Labour and Workplace Safety and Insurance Board (WSIB).

³ CDC, *Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health Care Settings*, 2005. **MMWR, 2005;54:RR-17**

⁴ Serious allergic reactions following tuberculin skin tests, *CMAJ* 173:34, 2005

- (f) As part of a comprehensive respiratory protection program, HCWs who may, in the course of their duties, provide direct care to patients with active pulmonary tuberculosis must receive fit testing for an N95 respirator and instruction in its use, including doing a seal check with each use. HCWs who cannot be fit tested may not be able to provide care for patients with active pulmonary tuberculosis.

IV. Continuing Surveillance

Routine surveillance chest X-rays are not recommended for tuberculin positive or negative individuals. The necessity for chest X-rays in those testing positive will depend on the presence of symptoms that may be due to tuberculosis (See Glossary).

The frequency of ongoing TB skin test surveillance for tuberculin negative individuals depends on the health care facility's risk (that is, the number of patients with TB seen annually (See Glossary)), and the person's activity risk within the facility.⁴

FREQUENCY OF ONGOING HEALTH CARE WORKER SURVEILLANCE FOR TB

Activity Risk	Health Care Facility Risk (site specific*)	
	Medium	Low
	> 200 beds and ≥ 6 patients with TB admitted annually or < 200 beds and ≥ 3 patients with TB admitted annually	> 200 beds and < 6 patients with TB admitted annually or < 200 beds and < 3 patients with TB admitted annually
High	annually and post-exposure	annually and post-exposure
Intermediate	annually and post-exposure	post-exposure
Low	post-exposure	post-exposure

* In health care facilities with more than one physical site, the risk should be assessed separately for each site.

High-risk activities include the activities of health care workers involved with cough-inducing procedures (e.g., bronchoscopy, respiratory therapy, physiotherapy), autopsy, morbid anatomy and pathology examinations, bronchoscopy and designated mycobacterium laboratory procedures (manipulation of mycobacterial cultures.)

Intermediate risk activities include the activities of health care workers who have regular direct patient contact and work on units with patients with tuberculous disease, including support personnel (e.g., housekeepers, clerks, receptionists, dietary, maintenance).

⁵ *Canadian Tuberculosis Standards, 6th ed.*, Public Health Agency of Canada & The Lung Association, 2007.

Low risk activities include the activities of health care workers who have minimal patient contact (e.g., health records), or regular patient contact with patients unlikely to have TB (e.g., obstetrical, nursery or neonatal workers).

Follow individuals for whom tuberculin skin testing is contraindicated clinically as per the table.

V. Contact with a Patient with Active Tuberculous Disease

Potential for transmission must be assessed on a case-by-case basis, and is highest from an individual with active respiratory tuberculosis, whose sputum shows acid fast bacilli on smear, and who has been treated with appropriate chemotherapy for less than two weeks, or for more than two weeks without clinical response, or is undergoing a cough inducing procedure. TB patients who are smear negative but who are coughing may also transmit. TB patients who are also infected with Human Immunodeficiency Virus (HIV) or who have a drug resistant strain of *M. tuberculosis* may transmit for longer. Transmission may also occur during surgical or other wound irrigation of tuberculous lesions.

Any HCW who has had unprotected contact with a patient with active tuberculous disease, i.e. without a fit-tested, seal-checked N95 respirator, in hospital must be actively investigated by the OHS.

In the case of a contract worker or student having unprotected contact with a potential transmitter within the hospital, the OHS will notify the supplying agency/school of the exposure and of the need for follow-up by the supplying agency/school and the Medical Officer of Health. The OHS will also notify the Medical Officer of Health of the exposure. In the case of a contract worker with no supplying agency, the OHS will inform the worker and the Medical Officer of Health of the exposure and the need for follow-up.

- (a) Mantoux negative persons should have a skin test immediately and a repeat test 8 weeks after contact.
- (b) Mantoux positive persons should be assessed for symptoms of TB and the need for additional investigation, e.g. chest X-ray. They should be advised of the symptoms of TB by OHS under the direction of a physician, or by the individual's personal physician and advised to report to OHS if symptoms develop.

Note: There is no indication for two-step PPD testing in the setting of a contact investigation. Skin test conversion can occur as early as 2 weeks after the exposure and it will be impossible to differentiate true conversion and booster reaction in the setting of a contact investigation. Therefore, any change in skin test reactivity must be considered a true conversion.⁵

VI. Persons who Convert to Mantoux Positive

A converter is defined as an individual whose tuberculin test changes from

⁵ *Canadian Tuberculosis Standards, 6th ed.*, Public Health Agency of Canada & The Lung Association, 2007.

"negative" (usually induration of zero to four millimetres in diameter) to "positive" (usually induration of 10 or more millimetres in diameter) within 24 months. For persons with previously documented induration between five and nine millimeters, any increase of at least six millimetres in induration diameter is considered a skin test conversion. (See also section III for interpretation of TST in particular clinical circumstances.)

When testing is done as a result of a known contact with a potential transmitter, a person with no previous induration with a new reaction of five millimetres or more should be considered to have acquired latent tuberculous infection, and be considered for treatment of LTBI. Treatment of LTBI is started only after active tuberculous disease has been excluded.⁶

Cases of conversion should be reported by the OHS to the local Medical Officer of Health and if the conversion was occupationally acquired to the Ministry of Labour and WSIB. The individual should be referred for assessment and treatment in accordance with current guidelines, preferably to a physician with knowledge and experience in TB management.

For conversion after contact with a potential transmitter of drug resistant *M. tuberculosis*, consultation with a respirologist or infectious diseases physician experienced in TB management should be sought.

VII. Evaluation of Program

Ongoing evaluation of the surveillance program is essential to ensure effectiveness. Surveillance data should be analyzed and presented on an annual basis to the hospital's Infection Prevention and Control Committee and Joint Health and Safety Committee. Evaluation might include the following:

- (a) Compliance with screening:
 $(\# \text{ screened} / \# \text{ eligible for screening}) \times 100$
- (b) Results of baseline screening:
 $\# \text{ positive} / \# \text{ tested}$
- (c) Conversion rate of susceptibles:
 $(\# \text{ of converters} / \# \text{ of persons with known previous negative skin test screened in that interval}) \times 100$
- (d) Compliance with treatment of LTBI:
 $\# \text{ of staff completing a course of treatment of LTBI} / \# \text{ of staff for whom treatment of LTBI is recommended}$

Each conversion should be investigated to establish the source of infection and identify any breakdown in infection control measures. Conversions can identify high risk areas in the hospital which require screening of staff at regular intervals. All cases of staff with tuberculous disease should be investigated for source and contacts. Cases and conversions should be evaluated in a timely fashion by the Infection Prevention and Control Committee and the Joint Health and Safety Committee.

⁶ *Canadian Tuberculosis Standards, 5th ed.*, Public Health Agency of Canada & The Lung Association, 2007.

Glossary

1. ***Direct Patient Contact***

Tuberculosis is an airborne disease, with face-to-face contact considered significant in its transmission.

When deciding whether a person has had a significant exposure to a potential transmitter, consideration should be given to the following:

- the frequency of patient contact;
- the proximity to patients involved;
- the duration of face-to-face contact;
- the use of personal respiratory protective devices (i.e., fit-tested, seal-checked N95 respirator);
- the number of air changes per hour in the area of exposure, and
- infectiousness of the contact patient:
 - pulmonary or laryngeal tuberculosis
 - cavitory or extensive pulmonary disease
 - presence of Acid Fast Bacilli on direct sputum examination
 - presence of coughing
 - cough inducing procedures (e.g., sputum induction, bronchoscopy)
 - open suctioning of intubated patients
 - wound irrigation.

2. ***Two-Step Skin-Test***

An initial tuberculin skin test (Mantoux, 5TU PPD) is given. If this test result is 0 - 9 mm of induration, a second test is given in the opposite arm at least one week and no more than four weeks after the first. The results of the second test should be used as the baseline test in determining treatment and follow-up for these individuals.

3. ***Symptoms of Tuberculous Disease***

A diagnosis of TB may be considered for any individual who has a persistent cough (for example, lasting ≥ 3 weeks), bloody sputum, night sweats, weight loss, anorexia or fever. Immunosuppressed individuals may have an atypical presentation.

4. Health Care Facility Risk⁷

Health care facility risk of transmission of TB can be assessed by determining the number of patients admitted to the hospital annually with tuberculous disease and the number of hospital beds. A **medium risk hospital** is a hospital > 200 beds that admits ≥ 6 cases of active tuberculous disease annually **or** is a hospital < 200 beds and admits ≥ 3 cases of active tuberculous disease. A **low risk hospital** is a hospital > 200 beds that admits < 6 cases of tuberculous disease annually, **or** is a hospital < 200 beds that admits < 3 cases of tuberculous disease annually. In health care facilities with more than one physical site, the risk should be assessed separately for each site.

5. Conditions Predisposing to Active TB

The following conditions predispose individuals infected with *M. tuberculosis* to develop active disease: infection with HIV, immunosuppressive therapy, haematological or reticuloendothelial malignant disease, corticosteroid therapy, treatment with tumor necrosis factor (TNF) -alpha inhibitors, silicosis, diabetes mellitus, chronic renal failure requiring hemodialysis, carcinoma of the head and neck, conditions associated with nutritional deficiency and substantial weight loss intravenous drug abuse, cigarette smoker.⁸

6. Latent Tuberculous Infection (LTBI)

Infection with *M. tuberculosis* has occurred, but active tuberculous disease is not present.

⁷ *Canadian Tuberculosis Standards, 6th ed.*, Public Health Agency of Canada & The Lung Association, 2007.

⁸ *Canadian Tuberculosis Standards, 6th ed.*, Public Health Agency of Canada & The Lung Association, 2007.

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