

# Infection Control Measures in the Management of TB

## Airborne Precautions

Thorough infection control may prevent outbreaks in the community and nosocomial infection within facilities. Refer to the **2012 NWT Infection Prevention & Control Manual** for detailed infection prevention control direction.

TB is largely transmitted by aerosolized droplets, in minute droplets of airborne moisture, creating “droplet nuclei.” The droplet nuclei are extremely small, allowing them to remain suspended in the air or transported through air ducts or elevator shafts. They are not filtered by surgical masks or by covering the mouth when coughing. Personal protective equipment is part of the airborne precautions protocol.

All patients with suspected or confirmed active (infectious) TB should be directly admitted to the health care facility, bypassing the ER and immediately be put on airborne precautions in a negative pressure airborne isolation room.

## Infection Control Practitioner (ICP)

Personnel designated as responsible for the facility’s infection control practices should receive timely notification whenever an individual with suspected or confirmed infectious TB is receiving treatment in the health care facility.

The ICP designated will:

- Educate HCPs about TB infection prevention and control measures at the time of hiring and periodically thereafter
- Provide education for HCPs relevant to their duties. This should include awareness of epidemiologic and medical risk factors for TB, signs and symptoms of active TB disease (respiratory and non-respiratory) and mechanisms of transmission
- Provide education for all HCPs, including orderlies, housekeeping and maintenance staff, with respect to signage and to understand the importance of administrative, environmental and personal protection controls in the prevention of transmission
- Screen staff who have contact with TB patients with annual TST. The ICP will also screen staff if in contact with an active case
- Encourage patients and health care provider adherence to airborne precautions
- Ensure that occupational health personnel are notified so that contact follow-up of exposed HCPs may be initiated, and
- Notify the OCPHO of any admissions for suspect TB or active TB

## Admission to Facility

See **Table 7.1** for risk assessment criteria for admission to a facility. The following isolation precautions should be implemented for patients with suspected or confirmed infectious TB admitted to a facility:

- Directly admit patient (avoid assessment in ER) to the ward when there is a differential diagnosis of TB
- Place patient in a negative pressure room as per CSA standards (see **Figure 7.4**)
- Put signage on the door of the isolation room to alert other patients, visitors, and staff of the need for airborne precautions, including N95 respirators. Refer to **2012 NWT Infection Prevention and Control Manual** for specific signage for airborne precautions
- Ensure that the patient remains in the airborne isolation room (the patient should only leave the room for essential procedures)
- The patient should wear a N95 mask if he/she must leave the isolation room
- Keep the door and window to the isolation room closed to maintain negative pressure
- Limit the number of people entering the room
- Ensure that all persons entering the room wear a N95 mask
- Instruct patients, visitors, and HCPs about the importance of adhering to TB isolation precautions
- Equipment should be dedicated to patient use or disinfected afterwards, and
- Staff should perform hand hygiene before and after contact with patient or patient’s environment

Figure 7.4: CSA Standard Criteria for Negative Pressure Rooms

Criteria for Negative Pressurized Room, as Recommended by the Canadian Standards Association (CSA):
<ul style="list-style-type: none"><li>• The room must have a door.</li><li>• There must be negative pressure between room and corridor.</li><li>• The room must have 12 air exchanges per hour.</li><li>• Air must be discharged outside the building, away from public places.</li><li>• Construction of new isolation rooms should comply with the principles outlined in the Canadian Ventilation Standards which includes an anteroom.</li><li>• Air exhaust grills must be located at floor level.</li><li>• Electronic monitoring must be established to provide continuous information about the efficacy of the inward directional airflow system and rate of air change.</li><li>• An alarm system must be installed so activation will occur when airflow is not meeting ventilation standards.</li></ul>

Table 7.1: Risk Assessment – Admission to Health Care Facility

High Risk Patient	Medium Risk	Low Risk TB patient
<ul style="list-style-type: none"> <li>• TST converter (if known)</li> <li>• Recent contact with known active case</li> <li>• Cough greater than 2 weeks</li> <li>• Other associated signs and symptoms c/w TB (weight loss, night sweats, fever, bloody sputum)</li> <li>• Abnormal CXR suggest TB as primary diagnosis</li> <li>• High risk groups below elevate probability for active TB but not a mandatory criteria for this classification</li> <li>• Homeless or correctional facilities</li> <li>• Health care practitioner</li> <li>• Aboriginal</li> <li>• Immigrant from high TB-endemic area</li> <li>• Alcoholic, IDU or other addictions</li> <li>• Elderly</li> <li>• Chronic disease (diabetes, cancer, renal failure, autoimmune)</li> <li>• HIV or immunocompromised</li> <li>• Malnourished</li> <li>• Pediatric population</li> <li>• Prior history of active TB</li> </ul> <p><b>What to do</b></p> <ol style="list-style-type: none"> <li>1. Admit to Negative Pressure Isolation Room ONLY</li> <li>2. Sputum collection Qhr x 3 in negative pressure</li> <li>3. Discharge patient only if all 3 sputa are collected and all 3 smears are negative AND if cleared by Internal Medicine</li> </ol>	<ul style="list-style-type: none"> <li>• Positive TST</li> <li>• No recent contact with active case</li> <li>• Cough greater than 2 weeks</li> <li>• Some associated signs and symptoms of TB but not primary diagnosis</li> <li>• Abnormal CXR and other etiology</li> <li>• At least 1 high risk group factor for active TB</li> </ul> <p><b>What to do</b></p> <ol style="list-style-type: none"> <li>1. Admit to private room if no respiratory isolation room available               <ol style="list-style-type: none"> <li>a. Use airborne precautions including N95 mask for visitors and patient</li> </ol> </li> <li>2. Spontaneous sputum collection outdoors or in ISOPORT qhr x 3</li> <li>3. Discharge patient only if all sputa are collected and are negative</li> </ol>	<ul style="list-style-type: none"> <li>• If known, positive TST &gt;2 years</li> <li>• No recent contact with active case</li> <li>• Cough lasts greater than 2 weeks</li> <li>• No associated signs and symptoms of TB</li> <li>• Admitted or seen in ER/clinic for unrelated diagnosis</li> <li>• CXR with no active disease</li> <li>• At least 2 high risk group factors</li> </ul> <p><b>What to do</b></p> <ol style="list-style-type: none"> <li>1. No special precautions</li> <li>2. If recent TST status is not known, please test if possible</li> <li>3. If TST negative, discontinue sputum collection</li> <li>4. Spontaneous sputum collection outdoors or in ISOPORT qhr x 3 if patient is to be admitted. If patient is seen in ER/clinic, collect one spontaneous sputum OR</li> <li>5. Sputum induction in ISOPORT x 1</li> <li>6. May discharge patient from hospital/ER or clinic if TST negative OR               <ol style="list-style-type: none"> <li>a. After 1 spontaneous sputum collection and patient is able to submit remaining 2 samples to Public Health OR</li> <li>b. May discharge after 1 sputum induction</li> <li>c. Please notify Public Health for follow up &amp; possible treatment</li> </ol> </li> </ol>
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. According to Health Canada's definition, Stanton Territorial Hospital would be currently classified as a high-risk facility for TB transmission. "A facility is considered high risk if it has six or more individuals seen with active TB annually"</li> <li>2. TB screening/ contact follow-up is done primarily on an outpatient basis with sputum induction in ISOPORT when needed. If done in ER/clinic, obtain one sputum with follow-up with Public Health</li> <li>3. Sputum Induction for TB testing ALWAYS takes place in a negative pressure environment. When rooms are available, place patients in private room for low risk admissions and negative pressure rooms for intermediate risk admissions</li> </ol>		

## Special Considerations

**Intensive care unit (ICU):** Every patient with suspected or confirmed respiratory TB disease who requires care in an ICU should be placed in an appropriately ventilated airborne isolation Room within the ICU. If this is not available, arrangements should be made to transfer the patient to a negative pressure isolation room with specialized one on one nursing care if applicable or moved to another facility with airborne infection isolation room (AIIR) ICU rooms. For patients requiring intubation and mechanical ventilation, an appropriate bacterial filter should be placed on the endotracheal tube to prevent contamination of the ventilator and the ambient air, when endotracheal suctioning is performed a closed suction apparatus should be used.

**Emergency department:** A high index of suspicion for TB is required when assessing patients presenting with signs and symptoms of respiratory TB disease. Such patients should be immediately transferred to an AIIR. If such a room does not exist within the emergency department but exists elsewhere in the hospital, patients should be promptly transferred to this room until respiratory TB disease has been excluded.

**Surgery:** Surgery should either be postponed (if feasible) until the TB patient is no longer considered infectious or scheduled to allow adequate ventilation of the room after surgery. Surgery is sometimes required in patients with multidrug-resistant or extensively drug-resistant TB, or to drain tuberculous abscesses. Because of the presence of infectious mycobacteria (and anaesthesia gases), the air supplied to the operating room should be exhausted to the outside and not exit the room to other patient care areas. HCPs should wear appropriate respirators (N95). Post-operative recovery of the patient with suspected or confirmed respiratory TB disease should take place in the operating room or in an AIIR.

Figure 7.5: Risk Categories for Activities Performed by HCPs

High-risk Activities	Intermediate-risk Activities	Low-risk Activities
<ul style="list-style-type: none"> <li>• Cough-inducing procedures (such as sputum induction)</li> <li>• Autopsy</li> <li>• Morbid anatomy and pathology examination</li> <li>• Bronchoscopy</li> <li>• Mycobacteriology laboratory procedures, especially handling cultures of <i>M. tuberculosis</i></li> </ul>	<ul style="list-style-type: none"> <li>• Work requiring regular direct patient contact on units (such as emergency departments) where patients with respiratory TB disease may be present*</li> <li>• Work in pediatric units where patients with TB may be admitted†</li> <li>• Cleaning of patients' rooms with respiratory TB disease</li> </ul>	<ul style="list-style-type: none"> <li>• Work requiring minimal patient contact (such as clerical, reception and administration)</li> <li>• Work on units where patients with respiratory TB disease are unlikely to be present‡</li> </ul>

\* This includes work done by all HCPs in these units.

† Pediatric patients with respiratory TB disease should be considered infectious until infectiousness is ruled out by radiography and negative acid-fast bacteria sputum smears in patient and caregivers.

‡ Classification of such units as low risk may be inaccurate if the population they are serving has a high incidence of TB (e.g. patients born or previously residing in countries with a high TB incidence or other at-risk populations). Some of the longest delays in diagnosis may occur in such settings.

## Undergoing Procedures

For patients with suspected or confirmed infectious TB undergoing procedures, the following precautions should be implemented:

- Ensure that procedures are performed in a treatment or procedure room with appropriate engineering controls. This is especially important when cough-inducing procedures (i.e. sputum induction, aerosol treatments and bronchoscopy) are being performed
- Some facilities may use portable (ISOPORT) negative pressure closets to ensure procedures can be done safely
- Instruct patients to cover mouth and nose with tissues when coughing or sneezing
- Ensure that all persons present during the procedure wear a N95 mask
- Ensure that people enter or leave the procedure room during the procedure only if absolutely necessary (keep the door to the procedure room closed)
- Ensure that patients remain in the procedure room until coughing subsides, thereby limiting exposure of other individuals who are in the general waiting or recovery areas
- Ensure that patient wears a N95 mask when leaving the procedure room
- Allow one hour or a minimum of 12 air changes between patient procedures so the air will be free of droplet nuclei, or place a notice on the procedure room advising HCPs who must enter the room that N95 masks should be worn for specified time
- Perform procedures at the end of the staff schedule, whenever possible to allow time for cleaning and ventilation of the procedure room
- Alert environmental cleaning staff of the need for airborne precautions when cleaning

Table 7.2: Recommended Air Exchanges per Area (Health Care Facilities)

AREA	NUMBER OF RECOMMENDED AIR EXCHANGES PER HOUR	
	CTS* (2013)	Direction of air movement
Autopsy suite	12	Inward
Bronchoscopy room Sputum induction/ pentamidine aerosol	6–12	Inward
Emergency department (waiting rooms) Trauma	2	Inward
Radiology waiting rooms	2	Inward
Operating room or surgical room	15	Outward
Airborne infection isolation rooms - Existing buildings - New buildings	6 9	Inward
General patient care/non-isolation rooms	2	N/A

\* Canadian Tuberculosis Standards, 7<sup>th</sup> Edition

Table 7.3: Time Needed (by Number of Air Changes per Hour) to Remove Airborne Microorganisms After Generation of Infectious Droplet Nuclei has Ceased

CSA Standards	Air changes per hour	Minutes required for removal of airborne microorganisms	
		99% removal	99.9% removal
	6	46	69
	12	23	35

## Patient Transport

Patients on airborne precautions may be transported to ancillary departments for diagnostic or therapeutic procedures when medically indicated. The preparation and transportation of these patients is a multi-disciplinary responsibility which requires collaboration. The patient must wear a N95 mask when leaving their room and for the duration of the time outside of the room. However, a surgical mask is an acceptable alternative only in the rare circumstance that a N95 is not tolerated.

- The individual requesting the test or procedure that requires the patient to leave his/ her room should indicate on the requisition that the patient is on airborne precautions
- If the patient is being taken to surgery or the operating room, staff there must be alerted to use airborne precautions
- The ICP should be consulted
- Notification is the responsibility of nursing personnel prior to transport of the patient

## Waste Removal

Waste removal from the rooms of patients on airborne precautions is managed the same as for patients on routine precautions, in accordance with the hospital's regulated and non-regulated waste policies.

## Emergency Situations

Evacuation of patients on airborne precautions during a fire or other emergency where there is an immediate threat to life or limb takes precedence over managing the isolation procedures. When evacuation has involved a patient on airborne precautions, notify the ICP as soon as it is practical to do so. Notify the staff as well if any follow-up needs to be done for patients and/ or personnel who may have been exposed to the case/patient during the evacuation.

In managing medical emergencies for patients on airborne precautions for suspected or confirmed TB, all responding personnel should put on an N95 mask before entering the room. If a staff member acts hastily and forgets to put on a mask or respirator, the ICP should be consulted.

## Food and Nutrition

Disposable dishware and trays are not required for patients on airborne precautions. Food service personnel are not to enter patient's room. Nursing staff will deliver and remove meal trays and nourishments to patient's room.

In the rare event that dishes, utensils, or food trays are contaminated with blood or body drainage, return the items to Central Supply Room (CSR) for reprocessing, using the following procedure:

- Place the items in a designated container
- Place in a biohazard red container, and take to CSR for reprocessing

## Criteria for Discontinuing Airborne Precautions for TB

The Internal Medicine Specialist, Chief Public Health Officer, or the Infection Control Practitioner, may terminate airborne precautions when the following criteria for discontinuation of airborne precautions have been met:

### Suspect TB Cases

A patient admitted for **suspect TB** will remain on airborne isolation until:

- Three successive sputum specimens (spontaneous or induced) are negative on smear unless TB is still strongly suspected and no other diagnosis has been made.

**Note:** Specimens can be collected within 1 hour of each other on the same day, and early morning collection is not considered necessary, but is optimal to yield better sensitivity. In patients who are no longer able to spontaneously produce a sputum specimen, sputum induction is useful and appropriate.

### Confirmed TB Cases

Although the degree and duration of infectiousness of patients after initiation of effective therapy remains unclear, it is known that effective therapy (i.e. therapy with two or more drugs to which the TB organisms are susceptible) will rapidly reduce cough and the number of viable bacteria in the sputum.

**Note:** DST results are usually available within 3 weeks in either a smear-negative, culture-positive case or a smear-positive case and these susceptibilities will confirm the effectiveness of therapy.

- A patient admitted for **active TB** determined to be **culture positive** but of confirmed **negative smear** status will remain on airborne precautions until:
  - Completion of minimum 14 days of daily anti-tuberculosis therapy by Directly Observed Treatment (DOT)
  - Three successive sputum specimens (spontaneous or induced) are negative on smear
  - There is evidence of clinical improvement