Tuberculosis – Infection Prevention and Control

Site Applicability: All PHC Sites

STANDARD:

RELATED STANDARDS: Airborne Precautions

In addition to Standard Infection Control Precautions, Airborne Precautions will be initiated on all patients/residents with suspected or confirmed active pulmonary/laryngeal tuberculosis.

The patient/resident will be placed into a private room with negative pressure as soon as possible. If the patient/resident with suspected or confirmed active pulmonary/laryngeal tuberculosis is in a facility without a private negative pressure room, then the patient/resident will be transferred to a facility with the appropriate accommodation.

Notify Infection Prevention and Control of patients who are admitted with suspected or confirmed TB.

Consultation with Infection Prevention and Control and the patient's admitting physician is strongly recommended **prior to discontinuing Airborne Precautions**. Occasionally, patients can be co-infected with other organisms and this may complicate the diagnosis of pulmonary tuberculosis. A physician's order is required. Please notify Infection Prevention and Control when discontinuing Airborne Precautions.

Need to Know:

Tuberculosis (TB) is an infection caused by *Mycobacterium tuberculosis*, a slow-growing bacillus which prefers body sites with a good oxygen supply. Pulmonary TB infection begins when the bacillus is inhaled into the lung. The most common site for TB infection is the upper region of the lungs. However, it may also spread to other sites. This is referred to as extrapulmonary TB and may involve the lymph nodes, pleura, pericardium, kidney, bone or other tissue.

Signs and Symptoms of Active Tuberculosis:

- Loss of appetite, unexplained weight loss, fatigue, hoarseness, fever or night sweats.
- Symptoms of pulmonary TB include: chest pain, shortness of breath, or a cough greater than 3 weeks (with or without hemoptysis).
- Chest X-Ray suggestive of active pulmonary TB (e.g. upper lobe infiltrates in the apical posterior segments, infiltrates in the superior segments of the lower lobs, volume loss, cavitation, miliary pattern, etc.). Atypical features may be seen in patients with immunocompromising conditions.
- If TB affects other parts of the body, the symptoms will vary according to the affected site.

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Patients/Residents at a Highest Risk for Infection with *M. tuberculosis*:

- Foreign born from high prevalence countries, e.g. Asia, Africa, Eastern Europe, Central and South America
- Aboriginal individuals
- Residents and employees of settings that are high risk (correctional facilities and long-term care facilities)
- Those living in the same household as one of the above groups
- Low income and homeless individuals (CDC pg 4-5) (PHAC pg 65, 322, 392)

Patients/residents at highest risk of progression from latent infection to active TB disease:

- Persons with HIV/AIDS
- Persons with the following clinical or immunocompromising conditions:
  - Transplant recipients (related to immunosuppressant therapy)
  - Silicosis
  - Chronic kidney disease
  - Carcinoma of the head and neck
  - Persons with untreated or inadequately treated TB disease (CDC pg 4-5) (PHAC pg 65, 392)
- Persons infected with *M. tuberculosis* in previous 2 years

Period of Communicability:

- TB is infectious for as long as there are viable tubercle bacilli being expelled from sputum or other respiratory secretions (as confirmed by culture of the bacteria).

- TB of other sites is not considered infectious by the respiratory route; however, aerosolization of body fluids should be avoided. If aerosolization is anticipated, then the same precautions for pulmonary/laryngeal TB should be followed (e.g., irrigation of a wound, surgical intervention, etc.)

Route of Transmission:

- TB is transmitted by the airborne route when a person with pulmonary/laryngeal TB coughs, sneezes, talks or sings, **or** during certain medical procedures such as bronchoscopy, autopsy or endotracheal intubation (aerosol generating procedures).

- TB of other sites is not considered infectious by the respiratory route; however, aerosolization of body fluids should be avoided. If aerosolization is anticipated, then the same precautions

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for pulmonary/laryngeal TB should be followed (e.g., irrigation of a wound, surgical intervention, etc.).

Assessment:

Assess all patients/residents on admission for signs and symptoms of TB. Determine if patient/resident is at a high risk for TB disease.

An alert in Cerner will show in the blue banner bar for all patients with active or previously known TB. All patients with a TB alert in Cerner should be assessed on admission for respiratory TB. If there is no evidence of respiratory disease, the patient does not require airborne precautions.

For patients seen as an outpatient (i.e. Pacific Lung Health Centre/ Cystic Fibrosis Program), contact the consulting physician or Infection Prevention and Control for assessment of risk. Some patients who are followed by the clinic are known to have Mycobacterium other than tuberculosis (MOTT), which is non-infectious and therefore does not require airborne Precautions.

Notify Infection Prevention and Control of patients who are admitted with suspected or confirmed TB.

Interventions

1. Initiate Airborne Precautions:

- On all patients diagnosed or suspected of having pulmonary TB. (CDC pg 323, PHAC Chapter 15)
- On all HIV positive patients with active, undiagnosed lung disease compatible with pulmonary TB.
- As soon as pulmonary/laryngeal TB is suspected (i.e., before diagnostic tests results are back). A physician's order is not required to initiate Airborne Precautions.

Note:

- In cases where the physician orders sputum for AFB even though there is a low likelihood of TB (routine respiratory workup), there should be a discussion between medical and nursing staff regarding risks and ability to place the patient in an appropriate bed.
- Patients admitted with extra-pulmonary TB may require assessment by a Specialist (i.e. Infectious Disease physician) for pulmonary/laryngeal TB. (CDC pg 18)

2. Implement Airborne Precautions:

- Post sign on the door indicating "Airborne Precautions".
- Place patient/resident in a private room, with negative air pressure, and dedicated toilet, hand washing facilities.

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- If negative air pressure is not available, then place patient/resident in a private room. Keep the door closed. Move to negative pressure room as soon as possible (within 24 hours). If the facility does not have an appropriate room, the physician will arrange for the patient to be transferred to a facility with the appropriate accommodation.
- The most responsible nurse will:
  a. Ensure that the room is set to negative pressure by:
     - Setting the dial, key or monitor that activates the pressure of the resident/patient's room to "negative" In the SPH tower, the dial to activate the pressure is inside the patient room, and pressure monitor is outside the room. In other areas, the dial, key or monitor is outside the room.

  b. Ensure the room is reaching negative pressure:
     - If there is an automatic pressure monitor, nurse to check daily that the monitor indicates it is operating in negative pressure (i.e. reading is negative and monitor is not alarming). (PHAC Chapter 15).

  c. Document that negative pressure is operational
- A particulate filter respirator mask (N95) will be worn by all staff and visitors prior to entering the patient's room. Remove mask (Doff) outside the room after the door is closed. Discard mask and perform hand hygiene. N95 masks are single use.**
- Gloves and gowns are not required unless indicated as outlined in Standard Precautions (contact with body secretions or excretions).

3. Obtain sputum specimens for *Mycobacterium tuberculosis*:

- As soon as possible.
- Three sputum specimens must be obtained at least 8 hours apart (one of which should be an early morning specimen).
- If a bronchoscopy is performed, because it is a cough-inducing procedure, additional sputum samples for AFB should be collected after the procedure to increase diagnostic yield. (CDC pg 53).

4. Patient Transport

- If the patient/resident must leave the room, the patient/resident should wear a surgical (barrier) type mask if possible (surgical masks are effective in decreasing aerosolization of exhaled infectious particles). Instruct patient on respiratory etiquette (cover mouth and nose when coughing); provide tissues and a small bag for disposal if patient is coughing. An N95 mask can be used if tolerated by the patient, however there is no evidence for efficacy when used on patients (CDC pg 16 & 121, PHAC Chapter 15).
- Healthcare personnel transporting patients who are on Airborne Precautions do not need to wear a mask or respirator during transport if the patient is wearing a mask. (PHAC 2013, Chapter 15)

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5. Patients who require mechanical ventilation

- Patients with active TB and who require mechanical ventilation should have a bacterial filter on the endotracheal tube or at the expiratory side of the breathing circuit (filter 0.3 µm (micrometer), 95% efficiency).(CDC pg 21).

6. Surgical Procedures

- Non-urgent surgical procedures on patients with active pulmonary TB should be postponed until the patient has been determined to be non-infectious. (CDC pg 21).
- Urgent procedures on patients with active pulmonary TB should be scheduled when a minimum number of other patients are present and at the end of the day in an OR suite with negative pressure. At MSJ use Day Surgery; at SPH, use OR5. Post-operative recovery should also occur in OR5 as there are currently no negative pressure recovery rooms. (CDC pg 21).

7. Bronchoscopy suite

- Schedule a patient with confirmed or suspected TB at the end of the day, and keep patient in the room until coughing subsides. Consider having patient wear a surgical mask before and after the procedure to reduce bacilli in the air. (CDC pg 123), (PHAC pg 334).
- Health Care Workers (HCW's) must wear an N95 mask during the bronchoscopy procedure for patients with confirmed or suspected TB.
- Risk classification: Bronchoscopy is a high risk activity and since SPH and MSJ are higher risk facilities (greater than 6 TB cases annually), it is recommended that an N95 mask be used during all bronchoscopies to prevent transmission from patients with unsuspected TB. (PHAC Chapter 15).

8. Induced sputum

- Schedule a patient with confirmed or suspected TB at the end of the day and keep patient in the room until coughing subsides
- Wear an N95 mask throughout procedure
- Patient to wear a surgical mask to and from the procedure room

9. Transfer/Discharge Planning

- Avoid transfer within and between institutions if possible.
- Notify the receiving department (e.g., Radiology) or facility (hospital or community agency) of the patient's status and recommended precautions prior to transport.
- Inform Home Care Liaison Nurse as appropriate.

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** During periods when N95 masks are in limited supply, IPAC will provide more detailed information on the possible re-use of N95 masks. (CDC pg 79).

Note:

A minimum of one hour is required to remove TB bacilli from the air in standard patient care rooms depending on the number of air exchanges, therefore an N95 mask will be worn when entering the room vacated by a patient/resident with active pulmonary TB until one hour has elapsed. Rooms with 12 or more air exchanges per hour require approximately 30 minutes (e.g., SPH Operating Room 5, ED negative pressure rooms, Bronchoscopy rooms,).(PHAC, pg 335), (CDC pg 20), (AIA pg 130) (FGI pg 84-85).

Table 1*: Time in Minutes needed (by number of air exchanges per hour) to Reduce Airborne Contaminants by 99% or 99.9%.

Air exchanges per hour	**99%**	**99.9%**
2	138	207
4	69	104
6	46	69
12	23	35
15	18	28
20	14	21

In general 99% removal is considered adequate for a procedure room prior to allowing another patient to enter or staff to enter without an N95 respirator.
**This table was adapted from CDC recommendations*

10. Discontinuing Precautions for confirmed cases of TB**:**

Consultation with Infection Prevention and Control and the patient's admitting physician is **strongly recommended** prior to discontinuing Airborne Precautions. **A physician's order is required.** Please notify Infection Prevention and Control when discontinuing Airborne Precautions.

Specific criteria must be followed to protect the safety of staff and patients. In general, Infection Prevention and Control will consider the following when discontinuing precautions:

For confirmed cases of TB:

- Patient/resident with confirmed active pulmonary TB has been on appropriate treatment (i.e. correct dose and choice of drugs; adequate absorption) for 2 weeks, has three negative smears for AFB, shows clinical improvement and is no longer coughing. For suspected cases of TB:

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Patient/resident with suspected pulmonary TB has three negative smears for AFB **and** an alternate clinical diagnosis has been established and there are signs of clinical improvement.

- When in doubt, it is always better to maintain Airborne Precautions until certain of diagnosis.

11. Identification and Management of Contacts:

- Infection Prevention and Control will notify Occupational Health and Safety of all patients with new diagnosis of TB. Occupational Health and Safety will notify staff of a possible exposure for assessment and follow-up.
- The need to screen patient contacts will be identified by VGH Communicable Diseases or BCCDC-TB control division in liaison with the Infection Prevention and Control Team.
- Family, visitors and other community contacts will be followed by BCCDC-TB Control Division.

12. Testing for Latent TB

Tuberculin Skin Test

(TST) (e.g. Mantoux), when ordered, will be administered by a registered nurse or physician familiar with this procedure according to the guidelines on the PHC Tuberculosis Skin Testing Record (form PHC-NF007).

Interferon Gama Release Assay

On a limited basis, interferon gamma release assay (IGRA), is available through BCCDC for selected patients who have had exposure to an individual with active pulmonary TB:

-TST- negative, immunocompromised persons

-BCG - positive patients who are TST- positive

-TST- positive Aboriginal and foreign born persons

Chronic Kidney Disease Program

All new hemodialysis patients and pre-renal transplant patients at PHC are screened for latent tuberculosis.

13. Visitors

Inform the patient and visitors of the necessary precautions (N95 mask) and the importance of compliance with Airborne Precautions to reduce the risk of transmission to visitors. Visitors do not require fit testing, however a fit check is recommended each time they don a mask.

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Visitors should be kept to a minimum, allowing only those visitors who are absolutely necessary for patient wellbeing. Visitors under the age of 12 should avoid visiting until the patient has been on at least two weeks of antibiotic treatment.

Persons infected with HIV or who have other immunocompromising conditions should especially avoid exposure to persons with TB disease (CDC pg 121).

Instruct visitors to wear a N95 mask even though they may have had contact with the patient/resident prior to the hospitalization. The risk of transmission may increase as the patient becomes more symptomatic. (CDC pg 39, 121)

Patient and Family Education

Educational Fact Sheets are available on the Internet and through Infection Prevention and Control

"Tuberculosis (TB) Disease - what is it?" from the BCCDC web site

Documentation

- Enter date and time in health record when "Airborne Precautions" were started and discontinued.
- Document sputum samples obtained: date, time, and test.
- Document other interventions as appropriate.
- Document daily that the monitor is checked for negative pressure by CNL or designate.

* If the pressure monitor alarms, ensure the door is closed. If it continues to alarm, notify Plant Operations.

Plant Operations will check all negative pressure rooms at least three times per year. Plant Operations will check patient rooms using the smoke test or other visual measurement. Rooms with digital readings should display a negative value of at least -2.5 Pascals (Pa) A copy of the testing will be sent to Infection Prevention and Control, including remedial action required. (PHAC pg 333-334)

References

1. CDC. Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings. 2005. https://www.cdc.gov/mmwr/pdf/rr/rr5417.pdf
2. PHAC. Canadian Tuberculosis Standards. 6th Edition. 2007
3. Epstein et al. The significance of Mycobacterium avium complex cultivation in the sputum of patients with pulmonary tuberculosis. CHEST 1997;111:142-147.
4. AIA. Guideline for Design and Construction of Health Care Facilities. 2006. pg. 130
5. FGI. Guidelines for Design and Construction of Health Care Facilites 2010. pg 84-85.
6. CDC. Guideline for Isolaton Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. 2007.
7. CSA. Canadian health care facilities. Z8000-11. 2011

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Revised By

PHC Infection Prevention and Control (2013)

PHC Infection Prevention and Control (2020)

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Appendix A: PHC Negative Pressure Rooms and Alarms

Site	Unit/rooms	Negative Pressure Mechanics	Anteroom	Alarm	Instructions for Use
SPH	ICU 3301,3306,3307 Maternity 3612 5A 5001-5005 5B 5014-5018 6B 6014-6018 7A 7001-7005 7B 7014-7018 7C 7033-7037 7D 7045-7049 8A 8001-8005 8C 8033* 8D 8044 9C/D 9043-4045	"Negative/ Positive" dial. Negative pressure through closing damper for in-coming air. "Positive" indicates the normal operating air function. Vented to outside. *8C room 8033 has no dial and is preset to negative pressure.	No	Rooms have a "PresSure" monitor with visual alarm set for negative pressure.*	1. Set dial inside patient room to "Negative" (patient on Airborne Precautions). 2. Close door. 3. Alarm light should be green. 4. If light continues to be red, call Plant Operations. *8C room 8033 has no dial and is preset to negative pressure.
	Emergency Department Room 3 (anteroom) Rooms 4, 5, 6	PresSure monitor outside the room activates positive or negative pressure. Vented to outside.	Room 3 Yes (In & Out anterooms) Rooms 4, 5, 6 No	PresSure monitor with visual alarm set for negative and positive pressure.**	1. Leave monitor on Neg Pressure Alarm at all times (so is ready when needed). 2. Close door. 3. Alarm light should be green. 4. If light continues to be red, call Plant Operations.

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Site	Unit/rooms	Negative Pressure Mechanics	Anteroom	Alarm	Instructions for Use
	CSICU Room 9	"On/off" Switch on wall outside the room activates the fan. Set to "On" for Negative pressure. No positive pressure capability. Vented to outside.	No	Room has a "PresSure" monitor with visual alarm set for negative pressure.	1. Set switch outside the patient room to "ON" (patient on Airborne Precautions). 2. Close door. 3. Alarm light should be green. 4. If light continues to be red, call Plant Operations.
	8D Bronchoscopy Room 8045, 8045A	Automatically on negative pressure from 0600 to 2200 Monday to Friday. Vented to outside. Switch (ON/OFF) at Nurses station for negative pressure after hours.	No	Switch at Nurses Station No monitor, no local alarm. Green light on when fans operating. Room has a "PresSure" monitor with visual alarm.	1. Room is automatically on negative pressure from 0600 to 2200 Monday to Friday. 2. After hours, if required, set to "ON" to activate the fans. 3. Leave on for one hour after procedure. 4. Plant Operations Department is electronically notified whenever switch is activated after hours.
	8D 8046, 8047	"Negative/ Positive" dial. Negative pressure through closing damper for in-coming air. "Positive" indicates the normal operating air function. Vented to outside.	No	None	Pulmonary exam rooms.

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Site	Unit/rooms	Negative Pressure Mechanics	Anteroom	Alarm	Instructions for Use
	OR Room 5	Triatek Mechanism activates Negative pressure function as well as the Alarm and pressure monitor. Note: All OR rooms are normally on positive pressure. Vented to outside.	No	Triatek 1630L Isolation Room Monitor Audio and visual alarm. Negative pressure selection activates the dampers. Key is at the nursing desk.	1. Turn the key switch to “UNLOCK” or red tab position. (on left side of monitor). 2. Push “ROOM SELECT”. 3. Push “Negative isolation”. 4. Verify the Isolation Mode shown on LCD display with asterisk (*) beside it. 5. Turn side key to “Lock”. 6. If alarm sounds, close door. 7. If continues, call Plant Operations . NOTE: Pressing the “ALARM SILENCE” (red) touchpad will silence the local buzzer but not the alarm to Plant Operations. “Positive” selection has no effect on the operating of the OR air system.
MSJ	Day Surgery Endoscopy Room	Phoenix (ON/OFF) key activates the negative pressure and the monitor/alarm. No positive pressure capability. Vented to outside.	No	Phoenix Active Pressure Monitor with local Visual Alarm And Audible Alarm The Charge Nurse has the key.	1. Turn key on the front of the negative pressure control to “ON”. 2. Keep door closed. 3. Notify Plant Operations if the alarm continues.

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Site	Unit/rooms	Negative Pressure Mechanics	Anteroom	Alarm	Instructions for Use
	3 B/C (East) 373 377	Phoenix (POS/OFF/NEG) activates negative, neutral or positive pressure. Dial activates pressure and monitor/alarm. Vented to outside.	Yes	Phoenix Active Pressure Monitor with local Visual Alarm Audible Alarm. The "NEG" key activates the monitor/alarm. The Charge Nurse has the key. Plant Operations alarm on computer screen and flashing light.	1. Turn key on the front of the negative pressure control "NEG". 2. Keep door closed. 3. Notify Plant Operations if alarm continues.
	4 East 446, 448 (FOR INFORMATION ONLY: not to be used as negative pressure room unless no other room available).	Negative pressure is created when fan is activated by vent dial. Vented to outside.	Yes	Vent Dial activates fan with LOW to HIGH. No monitoring, no alarm. Fan will provide negative pressure.	1. Turn Vent dial to "HIGH" to achieve negative pressure.

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Site	Unit/rooms	Negative Pressure Mechanics	Anteroom	Alarm	Instructions for Use
	4 West 418, 420	Fan always running, creating negative pressure. Vented to outside.	No	Triatek Pressure monitor. Visual Alarm Audible Alarm locally. Key in the Walleroo. Negative pressure fan on at all times. No positive pressure capability.	1. Turn the key switch to "UNLOCK" or red tab position. (on left side of monitor). 2. Push "ROOM SELECT". 3. Push "Negative isolation". 4. Verify the Isolation Mode shown on LCD display with asterisk(*) beside it. 5. Turn side key to "Lock". 6. If alarm sounds, close door. 7. If alarm continues, call Plant Operations.
	3rd Floor, ICU Rooms 3, 4	Phoenix (NEG/OFF/POS) key activates negative, neutral or positive pressure Two fans, (one back-up). Vented to outside.	Yes (In and Out anterooms)	Phoenix Active Pressure Monitor with local Visual Alarm and Audible Alarm. No alarm to Plant Operations	1. Turn key on the pressure control panel to "NEG". 2. Keep door to the room and the anterooms closed. 3. Lock the sliding door with the wall switch outside or inside the room (optional). 4. Notify Plant Operations if alarm continues.

*SPH Tower: PresSure monitor are set by Plant Operations for Negative pressure reading only. Red light will indicate inadequate Negative pressure.

** SPH ED:

Leave monitor on Negative Pressure Alarm at all times (so is ready when needed for a patient requiring Airborne Precautions).

For information only:

1. Changing the Room Mode.

2. Press "menu" then press down arrow twice.

3. Press "select" when the configurations shows.

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4. Press “select” when “room mode” shows.
5. Press up or down arrow to select desired mode.
6. Press “select” to accept mode change.
7. Press “menu” twice to back out.

Note: Negative pressure is indicated for patients on Airborne Precautions (i.e., Pulmonary *Mycobacterium tuberculosis*, Varicella/chickenpox)

At Providence Health Care, there is no indication for having positive pressure rooms. Please contact Infection Prevention and Control if there are concerns regarding this revision.1

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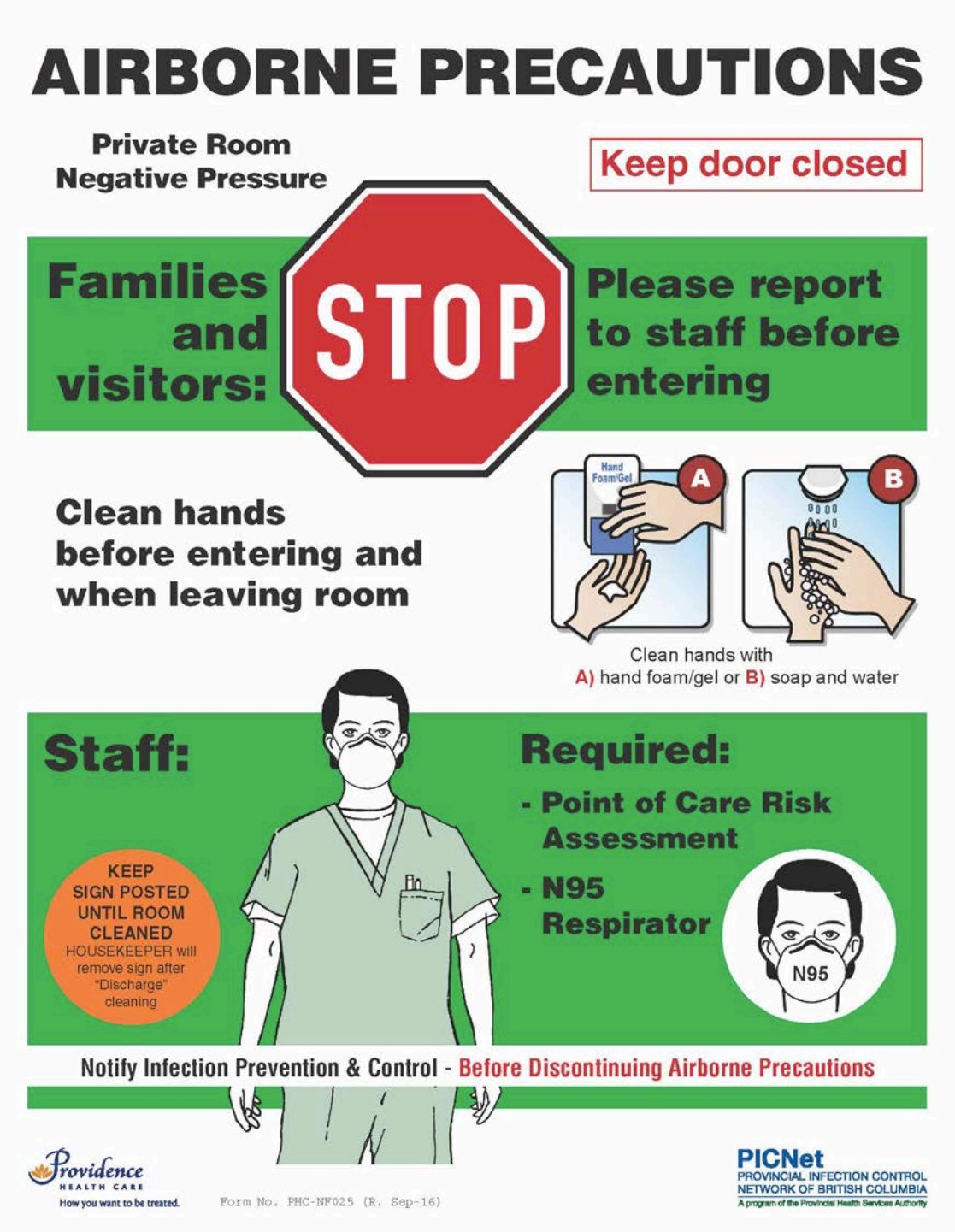
Appendix B: Airborne Precaution Sign



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