Alert

Patients in airborne isolation need to be placed in a negative-pressure airborne infection isolation room (AIIR).

The door to the isolation room and the anteroom should never be open at the same time.

Airborne precautions are the highest level of isolation. Until an airborne-transmitted illness is diagnosed, airborne precautions represent the safest precautions.

Wash hands or use an alcohol-based hand sanitizer immediately after removing all personal protective equipment (PPE).

Overview

Infection prevention and control measures help to ensure the protection of individuals, in a range of settings, who may be vulnerable to acquiring an infection both in the general community and when receiving care because of health problems.

Infection-control practices that reduce and eliminate sources of infection transmission help to protect patients and health care personnel from disease. The nurse is responsible for educating a patient about infection control. Knowledge of the infectious process, disease transmission, and critical thinking skills associated with use of aseptic techniques and barrier protection is essential for both health care personnel and patients.

One of the most common airborne pathogens is TB. Current guidelines for preventing and controlling tuberculosis (TB) focus on detecting the infection early, preventing close contact with a patient who has active TB, and applying effective infection-control measures in the health care setting. Other airborne pathogens include chicken pox and Rubeola (i.e., measles). Shingles, also a varicella infection, does not require airborne isolation precautions.

TB should be suspected in any patient who has a persistent cough lasting longer than 3 weeks, accompanied by chest pain, bloody sputum, unexplained weight loss or loss of appetite, fever, chills, night sweats, malaise, or fatigue. Isolation for a patient with suspected or confirmed TB includes placing the patient on airborne precautions in a negative-pressure AIIR with special air handling and ventilation capacity.

The advantages of the QuantiFERON® TB Gold blood test (QFT-G) in place of the traditional TB skin test (TST) are that it does not boost responses measured by subsequent tests, and the results are not subject to reader bias. QFT-G can be used in place of, but not in addition to, the TST. A patient who has a positive QFT-G result, regardless of signs or symptoms, should be evaluated for TB disease before latent TB infection is diagnosed. At minimum, a chest radiograph should be examined for abnormalities consistent with TB.

Health care personnel who care for patients with suspected or confirmed infectious illness transmitted via airborne route should wear nonpowered air-purifying respirators (i.e., N95). These respirators are high-efficiency particulate masks that have the ability to filter particles at a 95% or better efficiency. Health care
personnel who use these respirators must be fit-tested in a reliable way to determine which size mask is appropriate and to ensure that the wearer knows when a good seal is achieved. Fit testing must be performed before personnel are required to wear the respirator in the workplace and must be repeated at least annually. Fit testing must also be conducted whenever respirator design or facial changes occur that could affect the respirator’s proper fit. A respirator that has not been fitted properly may leave unprotected gaps between the respirator and the face, impairing the respirator’s effectiveness.

If facial hair or unusual facial features make it difficult to fit a mask-type respirator properly, a powered air-purifying respirator (PAPR) may be used. A PAPR has the same filtering properties as the mask-type respirator and is approved by national-organization guidelines. This type of respirator covers the head and uses a blower to move air through the filter and into the face piece, helmet, or hood. A PAPR does not require fit testing before use.

Respirators are disposable, but the same individual may use them more than once. They should be stored between uses in a clean, breathable container (e.g. paper bag) paper bag, in a dry place, and out of direct sunlight. The respirator should be discarded if it becomes wet or damaged.

Using a respirator does not, on its own, fully protect health care personnel from acquiring an infection. Other infection-control practices, such as performing hand hygiene, isolating an infected patient, and using appropriate coughing etiquette are also important to minimize the risk of infection.

EDUCATION
- Provide developmentally and culturally appropriate education based on the desire for knowledge, readiness to learn, and overall neurologic and psychosocial state.
- Explain the purpose of the isolation to the patient and family and any precautions that the family should take when entering into an isolation room.
- Provide the patient and family information on the signs and symptoms of infections.
- Educate the patient and family about modes of infection transmission.
- Explain to the patient and family the methods of infection prevention.
- Demonstrate to the family how to put on and take off the PPE.
- Educate the patient and family about the exposure of individuals contacted by the patient before the diagnosis.
- Encourage questions and answer them as they arise.

ASSESSMENT AND PREPARATION
Assessment
1. Perform hand hygiene.
2. Verify the correct patient using two identifiers.
3. Assess the patient’s potential for infectious pulmonary or laryngeal TB.
   a. Positive QFT-G test
   b. Positive acid-fast bacilli (AFB) smear or culture
   c. Signs or symptoms of TB
   d. Cavitation on chest x-ray study
   e. History of recent exposure
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4. Assess for signs or symptoms of other airborne infections (e.g., Rubeola, chicken pox).

Preparation
1. Label the door of the room.
2. Limit trips in and out of the room; gather all needed equipment and supplies before entering the room.
3. Provide dedicated medical equipment (e.g., stethoscope, blood pressure cuff, thermometer) to patient.†
4. Ensure that the patient and family can identify the methods of airborne transmission.

PROCEDURE
PAPR Option
Donning PPE
1. Perform hand hygiene.
2. Obtain PPE appropriate for the recommendations and type of isolation used for a patient who has or is suspected of having an airborne-transmitted infectious illness, per the organization’s practice.
3. Inspect PPE before donning. Ensure that the PPE is intact, that all required PPE and supplies are available, and that the correct size has been selected.
4. Enter the anteroom if present.

To maintain the necessary negative pressure within the isolation room, the door to the anteroom and the door to the isolation room should never be open at the same time.

If there is no anteroom, place the respirator mask or PAPR just outside the patient’s room.

5. Perform hand hygiene.
6. If a PAPR with a self-contained filter and blower unit integrated inside the helmet will be used, put on the belt and battery before donning the impermeable gown so that the belt and battery unit are under the gown.
7. Don a fluid-resistant or impermeable gown if the patient is also in contact isolation.
8. If a PAPR with an external belt-mounted blower will be used, attach the tubing and don a belted blower unit. Ensure that the blower and tubing are outside the gown to ensure proper airflow.
9. Don gloves, pulling the cuffs over the sleeves of the gown.
10. Don a PAPR with a full-face shield, helmet, or headpiece.

a. For a PAPR with a self-contained filter and blower unit inside the helmet, use a single-use (disposable) hood that extends to the shoulders and fully covers the neck. Ensure that the hood covers all of the hair and the ears and that it extends past the neck to the shoulders.†

b. For a PAPR with an external belt-mounted blower unit and attached reusable headpiece, use a single-use (disposable) hood that extends to the shoulders and fully
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covers the neck. Ensure that the hood covers all of the hair and the ears and that it extends past the neck to the shoulders.

11. Verify the integrity of the PAPR. Extend the arms, bend at the waist, and go through a range of motion that is sufficient for delivering patient care.
12. Perform hand hygiene and don gloves. Don a gown if the patient is also in contact isolation. Don both a gown and eye protection if there is a risk of being splashed by blood, body fluids, secretions, or excretions.
13. Enter the patient’s isolation room, close the door, and arrange the supplies and equipment.

   **Rationale:** An AIIR is engineered to direct the flow of air from the hallway through the room and vent to the outside without mixing with the air flowing into other rooms. Once the air is vented to the outside, infectious agents are rendered noninfectious by dilution.¹

15. Verify the correct patient using two identifiers.
16. Explain the procedure to the patient and ensure that he or she agrees to treatment.
17. Provide designated care to the patient while maintaining precautions.

   a. Keep hands away from own face.
   b. Limit touching surfaces in the room.
   c. Remove gloves when torn or heavily contaminated, perform hand hygiene, and don clean gloves.

18. Collect any ordered specimens.

   a. In the presence of the patient, label the specimen per the organization’s practice.⁵
   b. Place the labeled specimen in a biohazard bag.

19. After providing patient care, leave the isolation room, close the door, and enter the anteroom.

**Doffing PPE**

1. Inspect PPE for visible contamination, cuts, or tears before starting the doffing process.

   a. If PPE is potentially contaminated, disinfect it using an Environmental Protection Agency (EPA)-registered disinfectant wipe and allow it to dry.
   b. If the organization’s conditions permit and appropriate regulations are followed, use an EPA-registered disinfectant spray, particularly on contaminated areas. Allow it to dry.

   **Rationale:** Potentially contaminated PPE is disinfected before doffing to minimize the risk of contamination.

2. Remove and discard gloves, taking care not to contaminate bare hands during the removal process.
3. Remove and discard the gown.
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a. Depending on the gown design and the location of the fasteners, untie or gently break them.
b. Avoid contact of the scrubs or disposable garments with the outer surface of the gown during removal.
c. Pull the gown away from body, rolling it inside-out and touching only the inside of the gown.

4. Remove the PAPR with an external belt-mounted blower.

a. Remove the headpiece while still connected to the belt-mounted blower and filter unit.

   If a PAPR with a self-contained filter and blower unit inside the helmet is used, remove the hood and wait until later in the procedure to remove the integrated components.

b. Remove the belt-mounted blower unit and place all reusable PAPR components in an area or container designated for the collection of PAPR components for disinfection.

5. Perform a final inspection for any indication of contamination, and immediately change into clean surgical scrubs or disposable garments if contamination is identified.

   Rationale: The final inspection is a key step to ensuring health care team members’ safety.

6. Transport the specimen to the laboratory per the organization’s practice.
7. Perform hand hygiene.

N95 Respirator Option

Donning PPE

1. Perform hand hygiene.
2. Choose PPE appropriate for the recommendations and type of isolation used for a patient who has or is suspected of having airborne-transmitted infectious illness, per the organization’s practice.
3. Inspect PPE before donning. Ensure that the PPE is intact, that all required PPE and supplies are available, and that the correct size has been selected.
4. Enter the anteroom if present.

   To maintain the necessary negative pressure within the isolation room, the door to the anteroom and the door to the isolation room should never be open at the same time.

   If there is no anteroom, place the respirator mask or PAPR just outside the patient’s room.

5. Perform hand hygiene.
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6. Don a fluid-resistant or impermeable gown if the patient is also in contact isolation. Don both a gown and eye protection if there is a risk of being splashed by blood, bodily fluids, secretions, or excretions.

7. Don the N95 respirator and complete a user seal check.
   
   a. Check the respirator before donning it to ensure that there is no damage or tears and that the straps are in good condition.
   b. Place the mask over the nose, mouth, and chin. Ensure that the bottom flap is pulled out completely, if applicable.
   c. Secure the lower elastic strap at the top of the neck and the upper elastic strap above the ears at the back or top of the head.
   d. Adjust the mask for a comfortable fit.
   e. Place the fingertips on each side of the metal nosepiece. Beginning at the bridge of the nose, move down the cheeks and mold the flexible nosepiece to create a snug fit.

   **Avoid pinching the nosepiece, which may result in an improper fit.**

   f. Perform a fit-check.
      
      i. Inhale rapidly and ensure that the mask collapses slightly.
      ii. Exhale and use the hands to check for leaks around the face.

   A. Adjust the nosepiece if there are air leaks around the nose.
   B. Adjust the straps along the sides of the head if there are air leaks at the mask edges.

   g. Repeat the fit-check.

8. Don gloves, pulling the cuffs over the sleeves of the gown.
9. Verify the integrity of the PPE. Extend the arms, bend at the waist, and go through a range of motion that is sufficient for delivering patient care.
10. Enter the patient’s isolation room, close the door, and arrange the supplies and equipment.

   **Rationale:** An AIIR is engineered to direct the flow of air from the hallway through the room and vent to the outside without mixing with the air flowing into other rooms. Once the air is vented to the outside, infectious agents are rendered noninfectious by dilution.¹

11. Introduce yourself to the patient.
12. Verify the correct patient using two identifiers.
13. Explain the procedure to the patient and ensure that he or she agrees to treatment.
14. Ensure that the patient understands the teaching. Answer questions as they arise and reinforce information as needed.
15. Provide designated care to the patient while maintaining precautions.
   
   a. Keep hands away from own face.
   b. Limit touching surfaces in the room.

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**Doffing PPE**

1. Inspect the PPE for visible contamination, cuts, or tears before starting the doffing process.
   a. If PPE is potentially contaminated, disinfect it using an EPA-registered disinfectant wipe and allow it to dry.
   b. If the organization’s conditions permit and appropriate regulations are followed, use an EPA-registered disinfectant spray, particularly on contaminated areas. Allow it to dry.

   **Rationale:** Potentially contaminated PPE is disinfected before doffing to minimize the risk of contamination.

2. Remove and discard gloves, taking care not to contaminate the bare hands during the removal process.
3. Remove and discard the gown.
   a. Depending on the gown design and the location of the fasteners, untie or gently break them.
   b. Avoid contact of the scrubs or disposable garments with the outer surface of the gown during removal.
   c. Pull the gown away from body, rolling it inside-out and touching only the inside of the gown.

4. Don clean gloves.
5. Remove the N95 respirator.
   a. Tilt the head slightly forward.

   **Rationale:** Tilting the head forward aids the doffing process and minimizes the risk of contamination.

   b. Grasp the bottom elastic strap first and then the top elastic strap.
   c. Remove them without touching the front of the N95 respirator.

   **Rationale:** Avoiding touching the front of the N95 respirator aids the doffing process and minimizes the risk of contamination.

   d. If not reusing the respirator, discard the N95 respirator.
   e. If reusing the respirator, place the reusable respirator mask in a labeled, clean, breathable container (e.g. paper bag) for reuse by the same person. N95 respirators
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can be reused when supplies are limited (e.g., influenza pandemics or widespread outbreaks of other respiratory illnesses).\footnote{2}

Rationale: Reusable storage bags keep equipment contaminant free and should be labeled to prevent more than one person from wearing the mask. A damaged or crushed mask may not seal properly.

**Use caution not to crush the mask.**

**Do not leave the mask hanging around the neck. Humidity, dirt, and crushing reduce the efficiency of the mask.**

6. Remove and discard gloves, taking care not to contaminate the bare hands during the removal process.
7. Perform a final inspection for any indication of contamination, and immediately change into a clean pair of surgical scrubs or disposable garments if contamination is identified.

Rationale: The final inspection is a key step to ensuring health care team members’ safety.

8. Transport the specimen to the laboratory per the organization’s practice.

**Moving the Patient in Airborne Isolation within the Facility**
1. Perform hand hygiene and don gloves and the recommended respirator.
2. Verify the correct patient using two identifiers.
3. Take steps to reduce the risk of airborne transmission when the patient is out of the room, per the organization’s practice.

Rationale: The organization’s practice for wearing PPE should be followed when moving the patient within the facility. A respirator is not needed if the patient is wearing a surgical mask during the move.

a. Call the receiving unit and inform them of the patient’s isolation status if the patient must be moved within the facility.
b. For patients needing off-unit testing, schedule as the last case of the day, at times when the procedure or test can be performed rapidly, or when waiting areas are less crowded.

Rationale: These precautions reduce the number of people who are potentially exposed. The last case of the day may prevent delays needed to sanitize the room.

4. Provide the patient with a surgical mask and instruct him or her to wear it over the mouth and nose.

a. Ensure an adequate supply of surgical masks is available.
b. Replace the surgical mask if it becomes wet or torn.
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5. Remain with the patient while he or she is out of the isolation room to ensure that he or she does not remove the surgical mask.

6. Place a portable high-efficiency particulate air (HEPA) filter in the room, if available, before a new patient’s arrival. Ensure that the HEPA filter runs for at least 1 hour before another patient is brought into the room. Ensure that any individual entering the room during this interim period is wearing an N95 particulate respirator.

7. Discard supplies, remove PPE, and perform hand hygiene.


MONITORING AND CARE

1. Assess the patient’s laboratory test results for repeated AFB smears that may be negative.

   a. Collect three consecutive AFB sputum smears 8 to 24 hours apart, making sure at least one is an early morning specimen.²
   b. Discontinue precautions only when the likelihood of infectious disease is deemed negligible and either there is another diagnosis that explains the clinical picture or the results of three consecutive AFB sputum smears are negative. Each of the specimens should be collected 8 to 24 hours apart,² and at least one should be an early morning specimen.
   c. Discontinue isolation precautions per the organization’s practice.

      i. When the TB diagnosis is ruled out (i.e., three consecutive negative sputum smears)²
      ii. When the patient is noninfectious
      iii. When another diagnosis explains the clinical picture

2. Remind the patient to cover his or her mouth with a tissue when coughing and to wear a surgical mask when leaving the room.

3. Ensure that the patient has had sufficient opportunity to discuss health problems, course of treatment, or other topics important to him or her while in the isolation room.

4. Continually monitor the patient’s and family’s understandings of ongoing isolation. Offer opportunities for them to ask questions.

5. Monitor the patient for loneliness or boredom and for signs and symptoms of depression (e.g., lack of appetite, difficulty sleeping).

   Rationale: Monitoring for loneliness, boredom, and depression allows for complications from isolation to be identified and for intervention.

6. Discard linen, trash, and disposable items.

   a. Use single bags that are sturdy and impervious to moisture to contain soiled articles. Double-bag heavily soiled linen or heavy, wet trash if necessary.
   b. Tie the bags securely at the top with a knot.

7. Ensure that equipment is disinfected when it is removed from the room, before use on another patient.

8. Resupply the room as needed. Have another person on the health care team hand in new supplies, if needed.
Rationale: Limiting trips in and out of the room reduces the exposure of the health care team to airborne pathogens.

EXPECTED OUTCOMES
- Respirator mask fits properly.
- Health care team members are free from airborne-transmitted infectious illness.
- Patient spontaneously engages in discussions with the health care personnel and family.
- Patient asks for information about disease transmission.
- Patient explains purpose of isolation and cooperates with precautions.

UNEXPECTED OUTCOMES
- Respiratory mask is not donned properly.
- Health care team members contract an airborne-transmitted infectious illness.
- Patient does not cooperate with precautions.

DOCUMENTATION
- Education
- Procedures performed
- Patient’s response to social isolation
- Evidence or suspected breach of isolation precautions
- Unexpected outcomes and related nursing interventions

PEDIATRIC CONSIDERATIONS
- Isolation creates a sense of separation from family and the loss of control. A strange environment may add to any confusion the child feels during isolation. A preschool-age child is unable to understand the cause-and-effect relationship for isolation. Older children may be able to understand cause, but they still may be frightened.
- A child requires simple explanations; for example, “This is a special room that will help you get better.” All barrier precautions should be shown to the child. The family should be actively involved in any explanations.
- For preschool-age and school-age children, making a game out of wearing the mask (e.g., superheroes) can lessen the child’s anxiety regarding PPE.

OLDER ADULT CONSIDERATIONS
- Isolation can be a particular concern for older adults, especially those who have signs and symptoms of confusion or depression. Many older adults become confused when they are confronted with a health care team member using barrier precautions or when left in a room with the door closed. The need for closing the door (negative-pressure AIIR), along with the patient’s safety and additional safety measures, should be assessed.
- Older adults should be assessed for signs of depression, such as loss of appetite or a decrease in verbal communication. If necessary, the health care team should be consulted for appropriate interventions.
REFERENCES


*In these skills, a “classic” reference is a widely cited, standard work of established excellence that significantly affects current practice and may also represent the foundational research for practice.

Elsevier Skills Levels of Evidence
- Level I - Systematic review of all relevant randomized controlled trials
- Level II - At least one well-designed randomized controlled trial
- Level III - Well-designed controlled trials without randomization
- Level IV - Well-designed case-controlled or cohort studies
- Level V - Descriptive or qualitative studies
- Level VI - Single descriptive or qualitative study
- Level VII - Authority opinion or expert committee reports

Supplies
- Basic care items
  - Hygiene items
  - Medication equipment
- Nonpowered air-purifying respirator mask (i.e., N95 or PAPR)
- PPE (gloves, gown, and eye protection [based on patient’s clinical condition])
- Negative-pressure AIIR

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