Airborne precautions

Revised: June 14, 2019

Introduction

Airborne precautions, used in addition to standard precautions, prevent the spread of infectious droplet nuclei, which are small particles (less than 5 micrometers) suspended in the air and dispersed over long distances by air currents. Susceptible individuals can inhale these suspended particles even without having face-to-face contact with the source of the particles (for example, the infected individual).[1] (See *Conditions requiring airborne precautions*.)

◆ ***Clinical alert:*** For information on Coronavirus disease (COVID-19), please refer to the latest recommendations from the CDC, located at https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%253A%252F%252Fwww.cdc.gov%252Fcoronavirus%252F2019-ncov%252Fhcp%252Finfection-control.html, when caring for a patient with known or suspected Coronavirus disease.◆

◆ ***Clinical alert:*** Please refer to the latest recommendations from the Centers for Disease Control and Prevention (CDC), located at https://www.cdc.gov/vhf/ebola/hcp/index.html, when caring for a patient with known or suspected Ebola virus infection.◆

CONDITIONS REQUIRING AIRBORNE PRECAUTIONS

If a patient is known to have a condition that requires airborne precautions, the facility should follow the Centers for Disease Control and Prevention's isolation precautions *to prevent the spread of the organism by the airborne route.*[2] This table outlines some common conditions that require airborne precautions, including the required duration and special considerations.[1]

Condition	Precautionary period	Special considerations (as applicable)
Avian influenza	• For 14 days after onset of symptoms or until an alternative diagnosis is confirmed	N/A
Chickenpox (varicella)	• Until lesions are crusted and no new lesions appear	• Susceptible health care workers shouldn't enter the room if immune health care workers are available. • Contact precautions should be instituted.
Herpes zoster (disseminated disease [rash affects three or more dermatomes][3] in *any* patient or localized disease in an *immunocompromised* patient until disseminated disease is ruled out)	• Duration of illness	• Susceptible health care workers shouldn't enter the room if immune health care workers are available. • Contact precautions should be instituted.
Measles (rubeola)	• For 4 days after onset of rash • For duration of illness in immunocompromised patients	• Susceptible health care workers shouldn't

		enter the room if immune health care workers are available.
Monkeypox	• Until the disease is confirmed and smallpox is excluded	• Contact precautions should be instituted until lesions have crusted.
Severe acute respiratory syndrome	• Duration of illness plus 10 days after resolution of fever	• Eye protection (goggles or face shield) should be worn. • Contact precautions should be instituted. • Vigilant environmental disinfection should be performed.
Smallpox	• Duration of illness until all scabs have crusted and separated (typically 3 to 4 weeks)	• Contact precautions should be instituted. • Unvaccinated health care workers shouldn't provide care if immune health care workers are available.
Tuberculosis, extrapulmonary, draining lesion	• Until the patient improves clinically and drainage has ceased or until three consecutive negative cultures of continued drainage are obtained[1]	• Contact precautions should be instituted.
Tuberculosis, pulmonary or laryngeal disease, confirmed	• Until the patient improves clinically while on effective therapy (such as a decreased cough and fever or improved chest X-ray results) and has three consecutive sputum smears negative for acid-fast bacillus, collected on separate days[1]	N/A
Tuberculosis (TB), pulmonary or laryngeal disease, suspected	• Until active TB is deemed highly unlikely and either another diagnosis explains the clinical findings or the results of three consecutive sputum smears for acid-fast bacillus, collected 8 to 24 hours apart are negative[1] [4]	• At least one of the three sputum specimens should be collected in the morning.[1]

Effective airborne precautions require an airborne infection isolation room—a single-patient room that's equipped with monitored negative pressure (in relation to the surrounding area). An airborne infection isolation room should have 12 air exchanges/hour if the room has been newly constructed or renovated or 6 air exchanges/hour if it's an existing room. The air is either vented directly to the outside of the building or filtered through high-efficiency particulate air (HEPA) filtration before recirculation.[1][5] According to the CDC, air pressure should be monitored daily, using visual indicators, while the room is in use.[5] The door to the room should be kept closed to maintain the proper air pressure balance between the isolation room and the adjoining hallway or corridor. An anteroom is preferable.

All people who enter an airborne infection isolation room must wear respiratory protection, which is provided by a disposable respirator (such as an N95 respirator or a HEPA respirator) or a reusable respirator (such as a HEPA respirator or a powered air-purifying respirator [PAPR]) when infectious pulmonary or laryngeal tuberculosis or smallpox is suspected or confirmed and during procedures that cause aerosolization of viable organisms in patients with suspected or confirmed infectious tuberculosis skin lesions.[1][5] Regardless of the type or respiratory protection worn, they should ensure proper a fit to the face each time they wear a respirator by performing a user seal check.[1][5] When using a PAPR, they must ensure proper functioning of the unit. The CDC has no recommendation for the type of personal protective equipment (for example, surgical mask or respiratory protection with an N95 or higher respirator) to be worn by susceptible healthcare personnel or those with presumed immunity who must have contact with patients with known or suspected measles, chickenpox, or disseminated herpes zoster.[1]

♦ ***Clinical alert:*** When a patient comes to your facility complaining of respiratory symptoms and an airborne infection is suspected, put a surgical mask on the patient's face (if tolerated) and immediately place the patient in a private room with the door closed until an airborne infection isolation room is available. If the patient can't tolerate a mask, place the patient in a private room with the door closed and wear a respirator when entering the room and caring for the patient.♦

Equipment

- Isolation sign
- Tissues
- No-touch receptacle
- Optional: respirators (either disposable N95 or HEPA respirators or reusable HEPA respiratory or PAPRs), surgical masks

Preparation of Equipment

Inspect all equipment and supplies. If a product is expired, is defective, or has compromised integrity, remove it from patient use, label it as expired or defective, and report the expiration or defect as directed by your facility. Keep all airborne precaution supplies outside of the patient's room in a wall- or door-mounted cabinet, a cart, or an anteroom.

Implementation

- Review the patient's medical record and verify the need for airborne precautions.
- Gather and prepare the necessary equipment and supplies.
- Perform hand hygiene.[6][7][8][9][10][11]
- Confirm the patient's identity using at least two patient identifiers.[12]
- Situate the patient in a single-patient airborne infection isolation room with the door closed *to maintain negative pressure.*[1][13] If possible, the room should have an anteroom. Ensure that a private bathroom, if available, is also under negative air pressure. Monitor negative pressure per regulations.
- Explain isolation precautions to the patient and family (if appropriate) according to their individual communication and learning needs *to increase their understanding, allay their fears, and enhance cooperation.*[14]
- Keep the patient's door (and the anteroom door) closed at all times *to maintain negative pressure and to contain the airborne pathogens.*[1] Put an AIRBORNE PRECAUTIONS sign on the door *to notify anyone entering the room of the situation.*
- Before entering the room, if needed, put on a respirator according to the manufacturer's instructions.[1] Adjust the straps for a firm but comfortable fit. Check the seal. (See *Respirator seal check*.)

EQUIPMENT

RESPIRATOR SEAL CHECK

After you put on your respirator, perform a seal check by placing your hands over the facepiece, as shown below, and then exhaling gently. The seal is considered satisfactory if a slight positive pressure builds up inside the facepiece without

air leaking from the seal.[15] Air leakage is evidenced by the fogging of your glasses, a feeling of air trickling down your uncovered face, or a lack of pressure buildup under the facepiece.

If the respirator has an exhalation valve, cover the filter surface with your hands as much as possible and then inhale. The seal is considered satisfactorily if the facepiece collapses on your face and you don't feel air passing between your face and the facepiece.

- If you're using a PAPR, check for proper function, battery life, and air flow.
- Perform hand hygiene.[6] [7] [8] [9] [10] [11]
- Enter the patient's room and remove the patient's mask if the patient is wearing one.
- Provide the patient with tissues, and instruct the patient to cover the nose and mouth with a tissue when coughing or sneezing. Place a sign in the patient's room as a reminder.[1]
- Provide the patient with a no-touch receptacle for used-tissue disposal. Instruct the patient to dispose of tissues in the receptacle after use and to perform hand hygiene after contact with respiratory secretions and contaminated objects.[16]
- Perform hand hygiene.[6] [7] [8] [9] [10] [11]
- If worn, remove your respirator after leaving the patient's room and closing the door. To remove your respirator, grasp the bottom and then the top elastic. *Avoid touching the front of the respirator because the front is considered contaminated.*[15]
- As appropriate, discard the respirator in an appropriate receptacle, or store it for reuse. You may reuse an N95 respirator according to the manufacturer's recommendations if it isn't damaged or soiled. [17]
- Perform hand hygiene.[6] [7] [8] [9] [10] [11]
- Document the procedure.[18] [19] [20] [21]

Special Considerations

- Fit testing is performed to confirm that the respirator fits the user adequately. It's performed initially and then periodically at a frequency determined by federal, state, and local regulations.[5] [22] Fit testing also should be performed with changes in physical features that could affect the respirator fit (such as scarring, weight loss or gain, or dental changes).[22]

- Teach visitors the proper way to wear respiratory protection, and make sure that they wear it while they're in the patient's room.[5]
- Limit the patient's movement from the airborne infection isolation room. If the patient must leave for essential procedures, ensure the patient wears a surgical mask that covers the nose and mouth.[1][5][13] Notify the receiving staff of the patient's isolation precautions *so that the precautions will be maintained and the patient will be returned to the airborne infection isolation room promptly.* If the patient has skin lesions from varicella, smallpox or *M. tuberculosis*, the lesions should be covered *to decrease the risk of aerosolization during transport.*[1]
- Depending on the type of respirator and recommendations from the manufacturer, discard your respirator or store it until the next use.[1] A reusable respirator should be stored by hanging it in a designated storage area or by placing it in a clean, breathable container such as a paper bag. Store respirators so they don't touch each other and make sure that the person using the respirator is identified clearly *to minimize potential cross-contamination*.[17]
- If a patient on airborne precautions requires surgery, schedule the procedure when a minimal number of health care workers and other patients are present. If possible, schedule it as the last case of the day so that more time is available to clean and disinfect the operating room. Use an operating room with an anteroom, if possible. Ensure that all health care workers involved in the surgery wear respiratory protection.[5][13]
- After a patient with suspected or confirmed *M. tuberculosis* leaves an airborne infection isolation room, allow adequate time to elapse before allowing entry of another patient *to ensure removal of contaminated air from the room.* Consult with an infection preventionist about the appropriate length of time. The CDC recommends that a room with six air exchanges/hour be left empty for 69 minutes to effectively remove 99.9% of airborne contaminants.[5]

Complications

Social isolation is a complication of airborne precautions.

Documentation

Record the need for airborne precautions on the nursing care plan and as otherwise determined by your facility. Document initiation and maintenance of the precautions, and the patient's tolerance of the procedure. Document teaching provided to the patient and family (if applicable), their understanding of that teaching, and any need for follow-up teaching. Also document the date at which airborne precautions were discontinued.

This procedure has been reviewed by the Academy of Medical-Surgical Nurses.

AMSN
ACADEMY OF MEDICAL-SURGICAL NURSES

Related Lexicomp and UpToDate Patient Teaching Handouts

- Isolation Precautions

References

(Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions)

1. Siegel, J. D., et al. (2007, revised 2018). "2007 guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings" [Online]. Accessed April 2019 via the Web at https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf (Level II)
2. The Joint Commission. (2019). Standard IC.01.05.01. *Comprehensive accreditation manual for hospitals.* Oakbrook Terrace, IL: The Joint Commission. (Level VII)
3. Centers for Disease Control and Prevention. (2018). "Shingles (Herpes Zoster): Clinical overview" [Online]. Accessed April 2019 via the Web at https://www.cdc.gov/shingles/hcp/clinical-overview.html
4. Centers for Disease Control and Prevention. (2016). "Tuberculosis (TB) fact sheet: Infection control in heath-care settings" [Online]. Accessed April 2019 via the Web at https://www.cdc.gov/tb/publications/factsheets/prevention/ichcs.htm
5. Centers for Disease Control and Prevention. (2005). Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR Recommendations and Reports, 54*(RR-17), 1–141. Accessed April 2019 via the Web at http://www.cdc.gov/mmwr/PDF/rr/rr5417.pdf (Level I)
6. Centers for Disease Control and Prevention. (2002). Guideline for hand hygiene in health-care settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *MMWR Recommendations and Reports, 51*(RR-16), 1–45. Accessed April 2019 via the Web at https://www.cdc.gov/mmwr/pdf/rr/rr5116.pdf (Level II)

7. The Joint Commission. (2019). Standard NPSG.07.01.01. *Comprehensive accreditation manual for hospitals.* Oakbrook Terrace, IL: The Joint Commission. (Level VII)
8. World Health Organization. (2009). "WHO guidelines on hand hygiene in health care: First global patient safety challenge, clean care is safer care" [Online]. Accessed April 2019 via the Web at http://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1 (Level IV)
9. Centers for Medicare and Medicaid Services, Department of Health and Human Services. (2018). Condition of participation: Infection control. 42 C.F.R. § 482.42.
10. Accreditation Association for Hospitals and Health Systems. (2018). Standard 07.01.21. *Healthcare Facilities Accreditation Program: Accreditation requirements for acute care hospitals.* Chicago, IL: Accreditation Association for Hospitals and Health Systems. (Level VII)
11. DNV GL-Healthcare USA, Inc. (2019). IC.1.SR.1. *NIAHO® accreditation requirements, interpretive guidelines and surveyor guidance – revision 18.2.* Milford, OH: DNV GL-Healthcare USA, Inc. (Level VII)
12. The Joint Commission. (2019). Standard NPSG.01.01.01. *Comprehensive accreditation manual for hospitals.* Oakbrook Terrace, IL: The Joint Commission. (Level VII)
13. Accreditation Association for Hospitals and Health Systems. (2018). Standard 07.01.10. *Healthcare Facilities Accreditation Program: Accreditation requirements for acute care hospitals.* Chicago, IL: Accreditation Association for Hospitals and Health Systems. (Level VII)
14. The Joint Commission. (2019). Standard PC.02.01.21. *Comprehensive accreditation manual for hospitals.* Oakbrook Terrace, IL: The Joint Commission. (Level VII)
15. Centers for Disease Control and Prevention. (n.d.). "How to properly put on and take off a disposable respirator" [Online]. Accessed April 2019 via the Web at https://www.cdc.gov/niosh/docs/2010-133/pdfs/2010-133.pdf
16. Centers for Disease Control and Prevention. (2012). "Respiratory hygiene/cough etiquette in healthcare settings" [Online]. Accessed April 2019 via the Web at https://www.cdc.gov/flu/professionals/infectioncontrol/resphygiene.htm
17. Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH). (2014, reviewed 2018). "Pandemic planning: Recommended guidance for extended use and limited reuse of N95 filtered facepiece respirators in healthcare settings" [Online]. Accessed April 2019 via the Web at https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html (Level VII)
18. The Joint Commission. (2019). Standard RC.01.03.01. *Comprehensive accreditation manual for hospitals.* Oakbrook Terrace, IL: The Joint Commission. (Level VII)
19. Centers for Medicare and Medicaid Services, Department of Health and Human Services. (2018). Condition of participation: Medical record services. 42 C.F.R. § 482.24.
20. Accreditation Association for Hospitals and Health Systems. (2018). Standard 10.00.03. *Healthcare Facilities Accreditation Program: Accreditation requirements for acute care hospitals.* Chicago, IL: Accreditation Association for Hospitals and Health Systems. (Level VII)
21. DNV GL-Healthcare USA, Inc. (2019). MR.2.SR.1. *NIAHO® accreditation requirements, interpretive guidelines and surveyor guidance – revision 18.2.* Milford, OH: DNV GL-Healthcare USA, Inc. (Level VII)
22. Occupational Safety and Health Administration. (2011). "Respiratory protection, standard number 1910.134" [Online]. Accessed April 2019 via the Web at https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134 (Level VII)

Additional References

- Cheng, V. C., et al. (2015). Infection control preparedness for human infection with influenza A H7N9 in Hong Kong. *Infection Control and Hospital Epidemiology, 36,* 87–92. (Level VI)

Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions

The following leveling system is from *Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice* (2nd ed.) by Bernadette Mazurek Melnyk and Ellen Fineout-Overholt.

Level I:	Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)
Level II:	Evidence obtained from well-designed RCTs
Level III:	Evidence obtained from well-designed controlled trials without randomization
Level IV:	Evidence from well-designed case-control and cohort studies
Level V:	Evidence from systematic reviews of descriptive and qualitative studies
Level VI:	Evidence from single descriptive or qualitative studies
Level VII:	Evidence from the opinion of authorities and/or reports of expert committees

Modified from Guyatt, G. & Rennie, D. (2002). Users' Guides to the Medical Literature. Chicago, IL: American Medical Association; Harris, R.P., Hefland, M., Woolf, S.H., Lohr, K.N., Mulrow, C.D., Teutsch, S.M., et al. (2001). Current Methods of the U.S. Preventive Services Task Force: A Review of the Process. American Journal of Preventive Medicine, 20, 21-35.