



# Interim Infection Prevention and Control Recommendations for Measles in Healthcare Settings

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## Table of Contents

Fundamental Elements to Prevent Measles Transmission.....	2
Recommendations.....	3
1. Ensure that all HCP have presumptive evidence of immunity to measles .....	3
2. Minimize potential measles exposures.....	3
A. Before arrival to a healthcare setting.....	3
B. Upon arrival to a healthcare setting.....	4
3. Adhere to standard and airborne precautions .....	4
A. Patient placement .....	4
B. Healthcare personnel .....	5
C. Transporting patients with known or suspected measles within and between healthcare facilities.....	6
D. Duration of airborne precautions.....	6
E. Manage visitor access and movement within the facility .....	6
F. Implement environmental infection control.....	7
4. Manage measles exposures.....	7
A. Management of exposed healthcare personnel .....	7
B. Management of healthcare personnel infected with measles .....	8
C. Management of patients exposed to measles who do not have presumptive evidence of measles immunity .....	8
5. Considerations for a measles outbreak .....	8
6. Train and educate healthcare personnel.....	9
7. Establish reporting within hospitals and to public health authorities.....	9
Appendix A: Considerations when Evaluating a Person for Exposure to Measles in a Healthcare Setting.....	10
Appendix B: Additional Information about Respirators .....	12

## Fundamental Elements to Prevent Measles Transmission

Measles is most commonly acquired from persons in the household or community, but spread of measles can also occur in healthcare settings.<sup>1</sup> While the most important measure to prevent measles transmission in all settings is ensuring community immunization, core measles prevention in healthcare settings requires a multi-faceted approach including:

- Ensuring HCP have presumptive evidence of immunity to measles (see Recommendations, section 1 below)
- Rapidly identifying and isolating patients with known or suspected measles
- Adhering to Standard and Airborne Precautions for patients with known or suspected measles
- Routinely promoting and facilitating respiratory hygiene and cough etiquette
- Appropriately managing exposed and ill HCP

This interim guidance should be implemented in the context of a comprehensive infection prevention program to prevent transmission of all infectious agents among patients, HCP, and visitors.

**Definition of healthcare personnel (HCP):** “HCP” includes all paid and unpaid persons working in healthcare settings who have the potential for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. HCP include but are not limited to, emergency medical service personnel, nurses, nursing assistants, physicians, technicians, therapists, phlebotomists, pharmacists, students and trainees, contractual staff not employed by the healthcare facility, and persons not directly involved in patient care, but who could be exposed to infectious agents that can be transmitted in the healthcare setting (e.g., clerical, dietary, environmental services, laundry, security, engineering and facilities management, administrative, billing, and volunteer personnel).

**Definition of healthcare settings:** “Healthcare settings” refers to places where healthcare is delivered and includes, but is not limited to, acute care facilities, long-term acute care facilities, inpatient rehabilitation facilities, nursing homes and assisted living facilities, home healthcare, vehicles where healthcare is delivered (e.g., mobile clinics), and outpatient facilities, such as dialysis centers, physician offices, and others.

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<sup>1</sup> During 2001-2014, 6% of non-imported measles cases in the United States resulted from transmission in healthcare facilities. Fiebelkorn AP, Redd SB, Kuhar DT. Measles in Healthcare Facilities in the United States During the Postelimination Era, 2001-2014. *Clin Infect Dis*. 2015 Aug 15;61(4):615-8.

**Definition of exposure to measles for HCP in healthcare settings:** HCP exposures to measles in a healthcare setting include spending any time while unprotected (i.e., not wearing recommended respiratory protection):

- In a shared air space with an infectious measles patient at the same time, or
- In a shared air space vacated by an infectious measles patient within the prior 2 hours\* See Appendix A.

\* Measles has been reported to survive in air for up to 2 hours. For spaces with a defined rate of air changes per hour (ACH), see the following for additional considerations about estimating the time for 99.9% removal efficiency of airborne contaminants: [Table B1 “Air changes/hour \(ACH\) and time required for airborne-contaminant removal by efficiency” from the 2003 Guidelines for Environmental Infection Control in Health-Care Facilities](https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#tableb1) (<https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#tableb1>).

## Recommendations

### 1. Ensure that all HCP have presumptive evidence of immunity to measles

- Presumptive evidence of immunity to measles for HCP includes:
  - Written documentation of vaccination with 2 doses of measles virus-containing vaccine (the first dose administered at age  $\geq 12$  months; the second dose no earlier than 28 days after the first dose); OR
  - Laboratory evidence of immunity (measles immunoglobulin G [IgG] in serum; equivocal results are considered negative); OR
  - Laboratory confirmation of disease; OR
  - Birth before 1957.
- Consider vaccinating HCP born before 1957 who do not have other evidence of immunity to measles.
- During a measles outbreak, 2 doses of measles virus-containing vaccine are recommended for all HCP, regardless of year of birth.
- [Recommendations on immunization of HCP for measles are maintained by CDC and ACIP](https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm) (<https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm>).

### 2. Minimize potential measles exposures

#### A. Before arrival to a healthcare setting

- When scheduling appointments by phone:

- For persons with signs or symptoms of measles, provide instructions for arrival, including which entrance to use and the precautions to take (e.g., how to notify hospital staff, don a facemask upon entry, follow triage procedures).

Instruct Emergency Services to notify the receiving facility/accepting physician in advance when transporting a patient with known or suspected measles

### **B. Upon arrival to a healthcare setting**

- Utilize existing triage stations for rapid identification and isolation of patients with measles.
  - Persons with signs or symptoms of measles should be identified, provided a facemask<sup>2</sup> to wear, and separated from other patients *prior to or as soon as possible after entry into a facility*.
- Facilitate adherence to respiratory hygiene, cough etiquette, hand hygiene, and triage procedures.
  - Post visual alerts (e.g., signs, posters) in appropriate languages about respiratory hygiene, cough etiquette, and hand hygiene at the facility entrance and in common areas (e.g., waiting areas, elevators, cafeterias).
  - Provide persons with signs or symptoms of measles with instructions on all relevant infection control expectations.
  - Make supplies to perform hand hygiene available to all persons in the facility.
  - Provide supplies (e.g., facemasks) near the visual alerts if possible.

### **3. Adhere to standard and airborne precautions**

- Adhere to Standard Precautions, which are the foundation for preventing transmission of infectious agents in all healthcare settings.
- Adhere to Airborne Precautions when caring for patients with known or suspected measles.

For information on Standard and Airborne precautions, refer to the *Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings* (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>).

#### **A. Patient placement**

- Immediately place patients with known or suspected measles in an airborne infection isolation room (AIIR).
  - The patient's facemask could be removed as long as they remain in the AIIR.

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<sup>2</sup> A facemask is a term that applies collectively to items used to cover the nose and mouth and includes both procedure masks and surgical masks.

## Interim Infection Prevention and Control Recommendations for Measles in Healthcare Settings

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- If an AIIR is not available, transfer the patient as soon as possible to a facility where an AIIR is available.
  - Pending transfer, place the masked patient in a private room with the door closed. If feasible, the patient should continue to wear the mask for the duration of time spent in the non-AIIR room.
    - Preferably, the patient should be placed in a room where the exhaust is recirculated with high-efficiency particulate air (HEPA) filtration.
    - After the patient leaves the room, it should remain vacant for the appropriate time (up to 2 hours) to allow for 99.9% of airborne-contaminant removal. (See Appendix B, [Table B1.: Air changes/hour and time required for airborne-contaminant removal by efficiency](https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#table1) [<https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#table1>]).
- An AIIR should meet current standards, including:
  - Providing at least six (existing facility) or 12 (new construction/renovation) air changes per hour.
  - Directing exhaust of air to the outside.
  - If an AIIR does not directly exhaust to the outside, the air may be returned to the air-handling system or adjacent spaces if all air is directed through HEPA filters.
- When an AIIR is in use for a patient on Airborne Precautions, monitor air pressure daily with visual indicators (e.g., smoke tubes, flutter strips), regardless of the presence of differential pressure sensing devices (e.g., manometers).
- Keep the AIIR door closed when not required for entry and exit.

For information on AIIR requirements, refer to the 2007 [Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings - Glossary](https://www.cdc.gov/infectioncontrol/guidelines/isolation/glossary.html#A) (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/glossary.html#A>).

### ***B. Healthcare personnel***

- HCP without acceptable presumptive evidence of measles immunity should not enter a known or suspected measles patient's room if HCP with presumptive evidence of immunity are available.
- Respiratory Protection:
  - HCP should use respiratory protection (i.e., a respirator) that is at least as protective as a fit-tested, NIOSH-certified disposable N95 filtering facepiece respirator, regardless of presumptive evidence of immunity, upon entry to the room or care area of a patient with known or suspected measles.
  - Respirator use must be in the context of a complete respiratory protection program in accordance with Occupational Safety and Health Administration (OSHA) [Respiratory](#)

[Protection Standard 29 CFR 1910.134](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134) (<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134>).

- HCP should be medically cleared and fit-tested if using respirators with tight-fitting facepieces (e.g., a NIOSH-certified disposable N95) and trained in the proper use of respirators, safe removal and disposal, and medical contraindications to respirator use.

**C. *Transporting patients with known or suspected measles within and between healthcare facilities***

- Limit transport of patients with known or suspected measles to essential purposes, such as diagnostic and therapeutic procedures that cannot be performed in the patient's room or in the facility.
- When transport within the facility is necessary,
  - The patient should wear a facemask if tolerated.
  - Use a transportation route and process that includes minimal contact with persons not essential for the patient's care.
- Notify HCP in the receiving area of the impending arrival of the patient and of the precautions necessary to prevent transmission. When transport outside the facility is necessary, inform the receiving facility and the transport vehicle HCP in advance about airborne precautions being used. Consider using an interfacility infection control transfer form (example available here: [Interfacility Infection Control Transfer Form \[PDF - 3 Pages\]](https://www.cdc.gov/hai/pdfs/toolkits/Interfacility-IC-Transfer-Form-508.pdf) [<https://www.cdc.gov/hai/pdfs/toolkits/Interfacility-IC-Transfer-Form-508.pdf>])

**D. *Duration of airborne precautions***

- Patients with measles should remain in Airborne Precautions for 4 days after the onset of rash (with onset of rash considered to be Day 0).
- Immunocompromised patients with measles should remain in Airborne Precautions for the duration of illness due to prolonged virus shedding in these individuals.<sup>3</sup>

**E. *Manage visitor access and movement within the facility***

- If there are persons with measles in your community, consider screening visitors for signs and

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<sup>3</sup> Severely immunocompromised patients include, but are not limited to, patients with severe primary immunodeficiency; patients who have received a bone marrow transplant until at least 12 months after finishing all immunosuppressive treatment, or longer in patients who have developed graft-versus-host disease; patients on treatment for acute lymphocytic leukemia within and until at least 6 months after completion of immunosuppressive chemotherapy; and patients with a diagnosis of AIDS or HIV-infected persons with severe immunosuppression defined as CD4 percent <15% (all ages) or CD4 count <200 lymphocytes/mm<sup>3</sup> (aged >5 years) and those who have not received MMR vaccine since receiving effective ART. Some experts include HIV-infected persons who lack recent confirmation of immunologic status or measles immunity. The treating physician for the exposed individual should be consulted to determine if the patient is immunocompromised.

symptoms of measles before entering the facility.

- Visitors without acceptable presumptive evidence of immunity should not enter the room of a patient with known or suspected measles.
- Limit visitors to patients with known or suspected measles to those who are necessary for the patient's well-being and care.

### ***F. Implement environmental infection control***

- Standard cleaning and disinfection procedures (e.g., using cleaners and water to pre-clean surfaces prior to applying disinfectants to frequently touched surfaces or objects for indicated contact times) are adequate for measles virus environmental control in all healthcare settings.
- Use an EPA-registered disinfectant for healthcare settings, per manufacturer's instructions.
- Manage used, disposable PPE and other patient care items for measles patients as regulated medical waste according to federal and local regulations.

Detailed information on environmental cleaning in healthcare settings can be found in CDC's [Guidelines for Environmental Infection Control in Healthcare Facilities](https://www.cdc.gov/infectioncontrol/guidelines/environmental/index.html) (<https://www.cdc.gov/infectioncontrol/guidelines/environmental/index.html>) and [Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings](https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html) (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>).

## **4. Manage measles exposures**

- Evaluate exposed HCP, patients, and visitors for presumptive evidence of measles immunity. (For contact investigations, see Appendix A: Considerations when Evaluating a Person for Exposure to Measles in a Healthcare Setting.

### ***A. Management of exposed healthcare personnel***

- For HCP *with* presumptive evidence of immunity to measles who have had an exposure to measles:
  - Postexposure prophylaxis is not necessary.
  - Work restrictions are not necessary.
  - Implement daily monitoring for signs and symptoms of measles infection for 21 days after the last exposure; have awareness that previously vaccinated individuals may have a modified disease presentation.
- For HCP *without* presumptive evidence of immunity to measles who have had an exposure to measles:

- Administer [postexposure prophylaxis in accordance with CDC and ACIP recommendations](https://www.cdc.gov/measles/hcp/index.html#prophylaxis) (<https://www.cdc.gov/measles/hcp/index.html#prophylaxis>).
- Exclude from work from the 5<sup>th</sup> day after the first exposure until the 21<sup>st</sup> day after the last exposure, regardless of receipt of postexposure prophylaxis.
- HCP who received the first dose of MMR vaccine prior to exposure may remain at work and should receive the second dose of MMR vaccine, at least 28 days after the first dose.
  - Implement daily monitoring for signs and symptoms of measles infection for 21 days after the last exposure.
- During a measles outbreak, administer measles vaccine to healthcare personnel in accordance with [CDC and ACIP immunization recommendations](https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm) (<https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm>).

### ***B. Management of healthcare personnel infected with measles***

- For HCP with known or suspected measles, exclude from work for 4 days after the rash appears (with rash onset considered as Day 0).
- For immunosuppressed HCP who acquire measles, exclude from work for the duration of illness.

### ***C. Management of patients exposed to measles who do not have presumptive evidence of measles immunity***

- Place the exposed patient without presumptive evidence of measles immunity on Airborne Precautions for 21 days after the last exposure, or until discharge, if earlier.
- Administer postexposure prophylaxis in accordance with CDC and ACIP recommendations.
- Notify public health authorities about measles-exposed patients who are being, or may have been, discharged so that appropriate follow-up can occur.

## **5. Considerations for a measles outbreak**

In the event of an outbreak or exposure involving large numbers of patients who require Airborne Precautions:

- Consult infection control professionals before patient placement to determine the safety of alternative rooms that do not meet engineering requirements for an AIIR.
- Place together (cohort) patients who have confirmed measles in areas of the facility that are separated from the rest of the patient population which is important for protecting patients who are at increased risk for infection (e.g., immunocompromised patients).
- Use temporary portable solutions (e.g., exhaust fans) to create a negative pressure environment in the converted area of the facility to create [expedient patient isolation rooms](#):



(<https://www.cdc.gov/niosh/topics/hcwcontrols/engcontrolsolutions/expedient-patient-isolation.html>)

- Discharge air directly to the outside, away from people and air intakes, OR
- Direct all air through HEPA filters before it is introduced to other air spaces.

## **6. Train and educate healthcare personnel**

- Provide all HCP with job- or task-specific education and training, including refresher training, on preventing transmission of measles.
- Train, medically clear, and fit-test HCP for respiratory protection device use (e.g., N95 filtering facepiece respirators).
  - Alternatively, train and medically clear HCP in the use of an alternative respiratory protection device (e.g., Powered Air-Purifying Respirator (PAPR)) whenever respirators are required.
  - [OSHA Respiratory Training Videos](https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html) ([https://www.osha.gov/SLTC/respiratoryprotection/training\\_videos.html](https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html)).
- Ensure that HCP are educated, trained, and can demonstrate competency in the use of appropriate PPE prior to caring for patients with known or suspected measles.

## **7. Establish reporting within hospitals and to public health authorities**

- Implement mechanisms and policies that promptly alert key facility staff, including hospital leadership, infection control, healthcare epidemiology, occupational health, clinical laboratory, and frontline staff, about patients with suspected or known measles.
- Communicate and collaborate with public health authorities:
  - Promptly notify public health authorities of patients with known or suspected measles.
  - Designate specific persons within the facility who are responsible for:
    - Communication with public health officials, and
    - Dissemination of information to HCP.

## Appendix A: Considerations when Evaluating a Person for Exposure to Measles in a Healthcare Setting

In healthcare settings, persons potentially exposed to measles include patients, visitors, and HCP who are not wearing recommended respiratory protection (regardless of presumptive evidence of measles immunity status) who are:

- In a shared air space with an infectious measles patient at the same time, or
- In a shared air space vacated by an infectious measles patient within the prior 2 hours

Based on frequently asked questions to CDC and State and local health departments, the following additional considerations are provided for determining follow-up needs for measles exposures in healthcare settings:

- Effectiveness of source control measures for measles have not been formally studied in healthcare settings. However, known measles transmission has not been reported in scenarios in which exposure risk could be considered low, but is technically not zero, such as in a triage area and transport route within a facility when a suspect measles patient is appropriately identified at entry, masked, and quickly transported to an AIIR.
- Examples of higher risk exposures to measles include, but are not limited to:
  - Susceptible HCP who are unprotected (i.e., not wearing recommended respiratory protection) and are providing face-to-face care to an unmasked patient
  - Persons in the waiting room with an unmasked measles patient for an extended period of time
- While masking patients does not eliminate the possibility of exposing others, it reduces respiratory aerosol generation.<sup>4,5,6</sup>
- Defining what constitutes a shared air space:
  - Smaller spaces, such as the patient compartment of an ambulance, a single patient room, or a clinic waiting area, are shared air spaces
  - Different areas in a larger space or rooms that share a common air handling system, such as a large emergency department with patient waiting, triage, HCP work areas, or multiple individual patient rooms that share a common unfiltered air source, are also shared airspaces.
- Other factors in the shared air space also likely have an impact on the efficiency of measles transmission, including humidity and air flow dynamics between rooms.

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<sup>4</sup> John DF, Druce JD, Birch C, Grayson ML. A quantitative assessment of the efficacy of surgical and N95 masks to filter influenza virus in patients with acute influenza infection. *Clin Infect Dis*. 2009 Jul 15;49(2):275-7.

<sup>5</sup> Milton DK, Fabian MP, Cowling BJ, Grantham ML, McDevitt JJ. Influenza virus aerosols in human exhaled breath: particle size, culturability, and effect of surgical masks. *PLoS Pathog*. 2013 Mar;9(3):e1003205.

<sup>6</sup> Diaz KT, Smaldone GC. Quantifying exposure risk: Surgical masks and respirators. *Am J Infect Control*. 2010;38:501-8.

## Interim Infection Prevention and Control Recommendations for Measles in Healthcare Settings

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- However, distances farther from the source patient may pose decreased risk of transmission to others. HCP responsible for maintaining the building's air handling system(s) should be consulted when assessing exposure risk between different rooms or areas of a facility, e.g., to identify where ventilation return air is recirculated (without passing through HEPA filtration).
- Persons who are considered to be in a high-risk group for severe illness and complications from measles include severely immunocompromised persons, infants too young to be vaccinated, and pregnant women who do not have presumptive evidence of measles immunity. See [Measles \(Rubeola\) For Healthcare Professionals](https://www.cdc.gov/measles/hcp/index.html). (<https://www.cdc.gov/measles/hcp/index.html>).
- To better inform future guidance, health departments and facilities are encouraged to record and report details about the circumstances associated with healthcare-associated cases of measles, including adherence to recommended precautions and facility location(s) of index and secondary cases.

## Appendix B: Additional Information about Respirators

- A respirator is a personal protective device that is worn on the face, covers at least the nose and mouth, and is used to reduce the wearer’s risk of inhaling hazardous airborne particles (including dust particles and infectious agents), gases, or vapors.
- A commonly used respirator is a filtering facepiece respirator (commonly referred to as an N95).
  - Respirators are certified by NIOSH, CDC.
  - N95 respirators may also be cleared by FDA as medical devices, depending on the intended use.
- To work properly, respirators must be specially fitted for each person who wears one.
  - This is called “fit-testing” and is usually done in a workplace where respirators are used.
- Respirator use must be in the context of a complete respiratory protection program in accordance with [OSHA Respiratory Protection Standard 29 CFR 1910.134](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134) (<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134>).
- HCP should be medically cleared and fit-tested if using respirators with tight-fitting facepieces (e.g., a NIOSH-certified disposable N95) and trained in proper respirator use, safe removal and disposal, and medical contraindications to use.
- Additional resources:
  - US Food & Drug Administration (FDA), “[Masks and N95 Respirators:](https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/masks-and-n95-respirators)” (<https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/masks-and-n95-respirators>)
  - [NIOSH information about respirators](https://www.cdc.gov/niosh/topics/respirators/) (<https://www.cdc.gov/niosh/topics/respirators/>)
  - [OSHA Respiratory Protection eTool](https://www.osha.gov/SLTC/etools/respiratory/index.html) (<https://www.osha.gov/SLTC/etools/respiratory/index.html>)