

Preventing Measles in Healthcare Settings During an Outbreak

Between 2001 and 2014, 6% (N=1,318) of non-imported United States measles cases were transmitted in healthcare settings. There is currently a lack of data to clearly define measles exposure and it is sometimes difficult to determine shared air space. Most healthcare settings are also not engineered to handle highly contagious airborne agents such as measles. These uncertainties and barriers make responding to measles exposures challenging.

CLINICAL PRESENTATION OF MEASLES

Measles typically presents as an acute viral illness characterized by fever and generalized maculopapular rash. Signs and symptoms generally appear 7-21 days after initial exposure. The prodrome usually consists of fever and at least one of the three “Cs” - cough, coryza, and conjunctivitis. Koplik spots (punctate blue-white spots on the buccal mucosa) are occasionally seen. The rash is red, maculopapular, and usually starts on the face then proceeds down to the neck and trunk, and then out to the extremities. Rash appears discrete but may become confluent and lasts several days. Complications may include diarrhea, otitis media, pneumonia, hepatitis, encephalitis, and death. Infected individuals are contagious from four days before rash onset through the fourth day after rash appearance. Rash onset should be considered day 0 when calculating infectious period.

TRANSMISSION AND INFECTION CONTROL

Measles is one of the most contagious infectious diseases and the most contagious vaccine-preventable disease. Approximately 90% of susceptible persons in close contact with measles will develop the disease. The virus is transmitted by airborne particles, droplets, and direct contact with the respiratory secretions of an infected person and can live for up to two hours in an airspace where the infected person coughed or sneezed or on contaminated surfaces.

Patients should be screened for measles at the point of entry into a healthcare facility and should be given a mask and placed in airborne isolation immediately (i.e., placed in a negative pressure room). If a negative pressure room is not available, place the patient in an exam room with the door closed and wearing a surgical mask. Do not use that room for two hours after the patient has left. Patient should be transferred to a facility with appropriate airborne isolation room as soon as possible. Staff with documented immunity should be identified to care for the patient and any employee entering the room must wear respiratory protection (i.e., N95 respirator), regardless of immunity.

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STANDARD PRECAUTIONS & REGULATED MEDICAL WASTE

Standard cleaning and disinfection procedures are recommended. EPA-registered disinfectants should be used per manufacturer's instructions. No special management of waste is required; follow federal and local regulations for management of regulated medical waste.

AIRBORNE PRECAUTIONS

All suspected cases of measles should immediately be placed in an airborne infection isolation room (AIIR). If possible, the patient should be masked before entry to the healthcare facility and taken directly to an AIIR. Patients with suspected measles should not remain in waiting areas, even if they are wearing a mask.

If an AIIR is not available, the healthcare facility should place the masked patient in a private room with the door closed. If possible, placement should NOT be made in a room where exhaust is recirculated without high-efficiency particulate air (HEPA) filtration. The patient should be transferred as soon as possible to a facility with an AIIR.

Transportation of the infectious patient should be limited to essential purposes only. If the patient must leave the AIIR, they should wear a facemask the entire time and minimize the time outside of the AIIR. If the patient must be transferred to another healthcare facility, the receiving facility (receiving area, transport vehicle, infection control department) should be notified in advance.

AIIR should meet current standards with daily monitoring of pressure with visual indicators (e.g., smoke tubes, flutter strips) regardless of presence of differential pressure sensing devices. The AIIR should provide at least six (existing facility) or 12 (new construction/renovation) air changes per hour. Direct exhaust of air to outside or direct through high-efficiency particulate air (HEPA) filtration before returning to air handling system. More information can be found here: [cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf](https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf).

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Air Changes per Hour (ACH) and Time for Airborne Contaminant Removal

ACH	Time (mins.) required for removal 99% efficiency	Time (mins.) required for removal 99.9% efficiency
2	138	207
4	69	104
6	46	69
8	35	52
10	28	41
12	23	35
15	18	28
20	14	21
50	6	8

[cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#table1](https://www.cdc.gov/infectioncontrol/guidelines/environmental/appendix/air.html#table1)

All healthcare providers entering the AIIR should use respiratory protection at least as protective as a fit-tested, NIOSH-certified disposable N95 filtering facepiece respirator. Even healthcare providers who have presumptive evidence of immunity should use respiratory protection.

Airborne precautions should be continued for four days after the onset of rash. Rash onset should be considered day 0. For immunocompromised patients, airborne precautions should be continued for the duration of illness.

Visitors should be limited to those necessary for well-being and care and should have evidence of immunity.

HEALTHCARE EXPOSURE

For healthcare facilities, exposure is defined as any person who was in the same area of the facility (outside of an AIIR) as a measles patient for any length of time or were in these areas up to two hours after the patient left, regardless of surgical mask usage. Exposure is not defined by whether the case patient was wearing a surgical mask, but whether proper infection control measures were in place. For example, if an infectious patient enters the facility, is screened, then given a mask and taken directly to a private room, there is exposure. The infectious patient was not properly masked **before** entering the facility, resulting in exposure risk until the patient was masked and isolated. It is important to note that if the infectious patient is not immediately isolated (masked but remains in the waiting area or walked down a hallway that others used) there is risk of exposure. If a facility can confirm that an infectious patient wore a

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surgical mask prior to entering the facility and was immediately placed in airborne isolation, then there is no exposure.

Exclusion of Healthcare Personnel with Measles

Healthcare personnel (HCP) who develop measles should be relieved from all patient contact, excluded from work, and isolated for four days after they develop rash (date of rash onset should be considered day 0). For example, if a healthcare worker (HCW) develops rash on June 1, they should be isolated for June 2, 3, 4, and 5. The HCW may return to work on June 6.

Exclusion of Asymptomatic Healthcare Personnel without Evidence of Immunity

HCP without presumptive evidence of immunity who have been exposed should be offered the first dose of MMR vaccine and excluded from work from day five after the first exposure to day 21 following their last exposure, regardless of whether they received post-exposure prophylaxis (PEP).

Hospital patients who are a contact of a case, and who do not have presumptive evidence of measles immunity, should be given PEP or placed in airborne isolation until 21 days after their last exposure to the case-patient or four days after the onset of rash should they develop measles.

If immune globulin is administered to an exposed person, observations should continue for signs and symptoms of measles for 28 days after exposure since immune globulin may prolong the incubation period.

If a measles case or an outbreak occurs within a medical facility or in the areas served by a medical facility, all personnel should receive two doses of MMR vaccine, regardless of birth year, unless they have other documentation of measles immunity. **Birth year before 1957 is not acceptable presumptive evidence of immunity for HCP during an outbreak.** Healthcare facilities should provide MMR vaccine to all personnel without presumptive evidence of measles immunity. HCP who have been recently vaccinated do not require any restriction in their work activities. Those with documentation of one vaccine dose may remain at work and should receive the second dose. Because of the small possibility of measles vaccine failure, all staff entering the room of a person with suspect or confirmed measles should use respiratory protection consistent with airborne infection control precautions regardless of presumptive immunity status. **Serologic screening of HCP during an outbreak to determine measles immunity prior to vaccination is not recommended.**

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REPORTING SUSPECTED MEASLES CASES

Suspected cases of measles should be reported **immediately** to the local health department (LHD) at time of initial clinical suspicion.

Do not wait for laboratory confirmation to report. If you are considering the diagnosis of measles and are ordering diagnostic testing, the patient should be appropriately isolated and reported at that time.

The LHD can coordinate diagnostic testing, including viral PCR, and provide guidance on managing potential exposures.

ADDITIONAL TIPS FOR PREVENTING MEASLES TRANSMISSION DURING AN OUTBREAK

These suggestions can be applied to any acute care facility that has seen suspected or confirmed measles cases or is in an area experiencing active measles transmission. Facilities should evaluate their capacity to implement preventative measures **BEFORE** an outbreak occurs, ideally.

DISPLAY SIGNAGE

- Post signage outside your entrances instructing people with symptoms (e.g., rash, fever) and risk factors (e.g., international travel, exposure to a person with measles) to inform staff before entering the facility. The signs should provide clear instructions on how to alert staff and include a phone number to call if needed.
- Post similar signage in your waiting rooms, check in desks, elevators, or other high-traffic areas.
- Have stations set up with surgical masks and hand sanitizer in the waiting areas near the signs for patients to put on themselves if they have fever/upper respiratory symptoms regardless of rash status.

IMPLEMENT SCREENING

- Consider stationing a greeter at the entrances to the facility to screen all patients upon entry for fever and rash. **If patient has fever and rash, mask the patient and immediately place in airborne isolation.** Ensure that the greeter has documented immunity to measles and is able to alert staff if immediate isolation is needed.
- If a surgical mask cannot be tolerated, implement other practical means of containment (e.g., place a blanket loosely over the head of infants or young children so as not to restrict breathing) while they are escorted to an AIIR.

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- If a patient is reporting fever (without rash), they should be screened for prodromal symptoms including the three “Cs”- cough, coryza, or conjunctivitis. If the patient reports one or more of the three “Cs,” ask about risk factors to determine if measles should be considered. If patient reports any of the following risk factors, **mask the patient and immediately place in airborne isolation.**
 - Travel in the previous 21 days to a country with endemic measles virus circulation or state/community with ongoing measles transmission.
 - Any known contact with a suspect or confirmed case of measles.
- Screen those accompanying the suspected measles patient for early symptoms of illness and consider masking.
- Whenever possible, place staff conducting screening outside of entryways to identify potentially infectious patients **before** they enter the main emergency department space.
- If feasible and patient privacy can be protected, consider evaluating suspected measles patients outside, away from the entrance.
- Once a surgical mask is placed on the patient, ensure a clear path to the exam room and escort the patient into the building. The path must be cleared of patients prior to escorting the patient to the exam room and for two hours after the patient leaves.
- Provide registration desk and other staff involved in screening with an up-to-date list of affected states and countries with current measles outbreaks.
- When admitting a febrile patient with rash or upper respiratory symptoms, do a second screen for measles to determine if the patient needs to be placed in airborne isolation. Alert the inpatient team if measles is suspected and have a low threshold for placing in airborne isolation.

ADDITIONAL CONTROL MEASURES FOR OUTPATIENT FACILITIES IN AFFECTED COMMUNITIES

- Add automated messaging about measles on your main phone line that patients hear before they come in or request an appointment.
- Identify and call patients who are due/overdue for their MMR.
- Pre-screen scheduled patients for presumptive evidence of measles immunity to flag patients that should be offered MMR vaccine during their visit.
- When scheduling or calling patients to confirm appointments, screen susceptible patients (e.g., no/unknown immunity; immunocompromised; <12 months old; unvaccinated patients) for symptoms of measles including prodromal symptoms. If patients are reporting fevers, rash or any of the three “Cs,” consider the following measures to avoid exposure:

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- Schedule patients who are suspected of having measles after hours when other patients are no longer present.
- Instruct them to call upon arrival before entering the facility in order to be escorted in with a surgical mask and taken directly to a private room.
- If possible, bring suspect patients in through alternative entrances so they do not walk through the waiting room. If the clinic has separate space without other patients, that may be the best place to screen suspect measles patients.
- See patients suspected of having measles outside (i.e., examine patient in the car) if feasible.
- Conduct home visits to evaluate suspect measles patients, if feasible.

INCREASE STAFF AWARENESS

- Educate staff on what a classic measles rash looks like. Staff should also be aware that certain patients with partial immunity may have an atypical presentation (previously vaccinated adults, immunocompromised patients, infants <12 months).
 - The CDC has posted photos of measles rash at [cdc.gov/measles/aboutphotos.html](https://www.cdc.gov/measles/aboutphotos.html).
- Ensure that all emergency department staff (including interns, residents, and per diems) have been trained on your facility's measles protocol and make sure the protocols are easily accessible to staff for reference.
 - Staff should know how and who to notify when there is a suspect measles case, both internally (e.g., ED manager, infection control, infectious disease/epidemiology staff) and externally (e.g., LHD). Those contact numbers should be readily available.
- During each shift change, have a staff huddle and ensure that measles protocols are reviewed, highlighting the key messages: identify, isolate, and inform.
- Create a measles guidance page on your intranet or physical binders with needed information for providers such as epidemiology updates, infection control guidance and LHD reporting information.

IMPLEMENT SYSTEMS TO ENHANCE IDENTIFICATION OF HIGH-RISK PATIENTS

- If possible, work with your information technology department to enhance identification of at-risk patients through:
 - Adding screening questions in the electronic medical record with decision support tools on expected actions if any of the screening questions are positive.
 - Placing a flag on the charts of patients with a known measles exposure including date of last exposure and incubation period. This can make it easier to identify

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high-risk patients, especially if they are presenting with prodromal symptoms prior to rash onset.

- Identify and flag patients who have not received their MMR on time and emphasize to your providers the importance of offering the vaccine during encounters/admissions.

PATIENT MOVEMENT CONSIDERATIONS

- When transporting a patient within the facility, the patient should be wearing a surgical mask or another method of source control for patients unable to wear a mask.
- If transferring a patient or sending a patient with suspected or confirmed measles to another department or facility, ensure that the receiving department/facility/provider is informed of the diagnosis **before** the patient arrives so they can implement appropriate infection control measures.
- When discharging a patient with suspected measles, they should wear a mask and take a private vehicle if needed. Public transportation should be avoided when potentially infectious.

ENSURE EMPLOYEE HEALTH AND SAFETY

- Minimize the number of HCP interacting with suspect or confirmed measles patients. HCP with evidence of immunity should be identified to care for suspect or confirmed measles patients.
- All HCP entering the room should wear a fit-tested N95 respirator (regardless of immunity status) or a respirator with similar effectiveness in preventing airborne transmission. Staff who are not immune should not care for measles patients.
 - If N95 or other airborne respirators are unavailable, HCP should use a facemask.
- Work with employee/occupational health to ensure measles immunity of all staff, including interns, per diem staff, and contractors. Immunity must be verified by **one** of the following:
 - Written documentation of vaccination (i.e., two doses of a measles-containing vaccine or MMR vaccine administered at least 28 days apart); **or**
 - Laboratory evidence of immunity as indicated by a positive measles IgG titer; **or**
 - Laboratory confirmation of prior measles virus infection; **or**
 - Born prior to January 1, 1957. However, **during an outbreak**, it is recommended that unvaccinated HCP born before 1957 who lack laboratory evidence of measles immunity or laboratory confirmation of disease should receive two doses of MMR vaccine.

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ADDITIONAL RESOURCES

West Virginia Department of Health and Human Resources, Division of Infectious Disease Epidemiology-Measles Information: oeps.wv.gov/measles/pages/default.aspx

West Virginia Department of Health and Human Resources, Division of Infectious Disease Epidemiology-Measles Information for General Public: oeps.wv.gov/measles/documents/community/Measles_fact_sheet.pdf

CDC-Measles Information for Healthcare Professionals: cdc.gov/measles/hcp/index.html

ACIP/CDC-Prevention of Measles, Rubella, Congenital Rubella Syndrome, and Mumps, 2013: cdc.gov/mmwr/pdf/rr/rr6204.pdf

CDC-Photos of Measles: cdc.gov/measles/about/photos.html

CDC-Isolation Precautions Guidelines:

cdc.gov/infectioncontrol/guidelines/isolation/index.html

CDC-Global Measles Outbreaks Information:

cdc.gov/globalhealth/measles/globalmeaslesoutbreaks.htm

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