



Recognizing and Diagnosing Measles in the Clinic

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Measles is the most highly infectious febrile rash illness, infecting a majority (up to 90%) of vulnerable close contacts¹. It is spread through direct contact with infectious droplets and by airborne transmission. It is at least five times more infectious than influenza. It can result in serious complications, such as pneumonia, encephalitis, and death².

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who cannot be vaccinated like infants and immune-compromised individuals. Currently in Iowa, only 84% of 2 year olds and 89% of kindergartners are up to date on measles vaccination, making our state vulnerable to measles outbreaks⁴.

Clinical presentation

Healthcare providers need to be prepared to identify and diagnose measles infection. The clinical presentation is highly characteristic in individuals without immunity, with an incubation, prodrome, and exanthem phase. After an incubation period of typically 11 to 12 days⁵ (range of

eight to 12 days)⁶, children have a prodrome period that lasts two to four days. Initially the prodrome can look like a common upper respiratory infection (URI). Prodrome symptoms include:

- 1) cough, which is brassy and frequently severe,
- 2) conjunctivitis, which is non-purulent and can be severe and painful with tearing and photophobia, and
- 3) coryza (rhinorrhea, sneezing, and congestion).

Children feel and look increasingly ill over the prodrome phase. Koplik spots on the buccal mucosa occur during the prodrome phase in 60% to 70% of patients and are pathognomonic. They look like a “grain of salt on a red background.” The exanthem or rash period starts at about 14 days (range of seven to 21 days) after initial exposure and typically lasts five to seven days. The classic rash is “morbilliform,” a macular rash with overlying small papules and progresses in a characteristic fashion, starting at the hairline and behind the ears and moving down the body to the feet over several days. It can begin as discrete lesions and then coalesce. The rash is initially erythematous and blanching, progresses to a copper color, then to brown and non-blanching. The rash clears in the same centrifugal pattern from head to toe.

As a result of the highly effective, two-dose measles, mumps, and rubella (MMR) vaccine, measles was officially eliminated in the U.S. in 2000. Many pediatric providers have never seen a case of measles infection. Unfortunately, the U.S. is currently experiencing an alarming resurgence of measles infections due to decreased vaccination rates. As of June 12, 2025, a total of 1,197 lab-confirmed measles cases have been reported in 32 states in the U.S. This is in comparison to 59 in 2023 and 285 in 2024³. It is imperative that healthcare providers are prepared to diagnose and contain measles outbreaks and to advocate for prevention through vaccination.

The outbreak began in January 2025 in close-knit communities with low vaccination rates in west Texas. There have been three confirmed deaths in the U.S. due to measles infection in 2025, two in Texas in unvaccinated, previously healthy school-age children and one in New Mexico in an unvaccinated adult. Among all U.S. measles cases this year, 95% occurred in unvaccinated individuals³. The actual number of measles cases is at least three times as many as reported since many cases never present for medical care.

The first confirmed measles case in Iowa since 2019 was reported on May 23, 2025, in an unvaccinated adult in central Iowa. More than 95% of a community needs to be fully vaccinated to achieve measles “herd immunity.” Herd immunity prevents outbreaks and protects those

Consider measles as a diagnosis in anyone with fever ($\geq 101^{\circ}\text{F}$ or 38.3°C) and a generalized maculopapular rash with cough, coryza, or conjunctivitis who has recently traveled internationally or domestically to a region with a **known measles outbreak** or has other known or suspected exposure to measles¹¹.

Fever usually peaks after two to three days during the rash phase, sometimes reaching 105°F , and then resolves in uncomplicated measles. Persistence of fever raises concern for bacterial superinfection. Pharyngitis, cervical lymphadenopathy, vomiting, and diarrhea are other common symptoms. The differential diagnosis for measles includes Kawasaki disease and other viral infections. Vaccination status is extremely helpful in distinguishing the diagnosis⁶.

Complications of measles can be devastating. Over half of children with measles develop lower respiratory tract infection by the virus itself or secondary bacterial pneumonia. Otitis media is a common complication. Less common complications are pericarditis, appendicitis, blindness, and thrombocytopenic purpura. Measles encephalitis occurs in 1 in 1,000 measles cases and has about 20% mortality.

Subacute sclerosing panencephalitis (SSPE) is a much later and almost universally fatal neurologic complication. It occurs in 1 in 100,000 people with measles⁶. The incidence is higher in children infected

before 12 months of age. SSPE typically presents seven to 10 years after initial infection. Initially, patients develop mood disturbance, personality changes, and worsening academic performance. Symptoms progress to motor disturbance, seizures, declining cortical activity, and coma. Diagnosis is made with clinical picture, classic EEG findings, and elevated measles antibodies in cerebrospinal fluid. SSPE is thought to be caused by persistent measles infection and an ineffective immune response.

Healthcare providers should suspect measles in patients presenting with a febrile rash illness, especially if they have recently traveled to an international or domestic area with active outbreaks or if they have had contact with a person with a febrile rash illness. Measles polymerase chain reaction (PCR) is recommended as soon as measles is suspected. The CDC recommends collecting either a nasopharyngeal (NP) swab or throat (OP) swab for reverse transcription polymerase chain reaction (RT-PCR) testing along with a blood specimen for serology testing from all suspected cases of measles¹¹. Nasopharyngeal or throat swabs are preferred. Testing is most accurate within three days of the onset of the rash. Serologies may be used to aid in the diagnosis, but measles IgM can be falsely negative early in the exanthem period¹.

Each suspected measles case should be reported to Iowa Health and Human Services (IHHS). Providers must be ready to diagnose measles based on the clinical presentation and epidemiology before lab results are available to ensure appropriate control measures are implemented to mitigate spread⁷.





Treatment

Treatment of measles is mainly supportive. Oral vitamin A has been shown to reduce mortality in children less than 2 years of age in developing countries⁶. Vitamin A has no role in measles prevention. The World Health Organization and the American Academy of Pediatrics recommends all children with measles, regardless of nutritional status, receive vitamin A supplementation. The dose is based on age: 50,000 IU in children <6 months old, 100,000 IU in children 6 to 11 months old, and 200,000 IU in children >12 months old. Two doses are given; one at the time of diagnosis and the second the following day.

Infection control

Patients with measles are contagious four days prior to and four days after the onset of rash. Patients should remain isolated during this period to prevent transmission. Airborne transmission precautions are recommended for hospitalized patients and home quarantine for patients who do not require hospitalization. Patients with known or suspected measles should be provided with a face mask (2 years of age and older) and placed in an airborne infection isolation room (AIIR). If this is not available, the patient should be in a private room with a mask on and the door shut. The room should not be used for two hours after the patient leaves. Healthcare providers should wear an N95 mask regardless of their immune status.

Why get vaccinated?

Two doses of measles vaccine is safe and highly effective. A single dose of measles vaccine provides 93% immunity, while two doses provide immunity in 97% of vaccinated individuals. Measles vaccination is routinely given at 12 to 15 months of age. One dose of MMR vaccine is recommended for children 6 to 11 months old when their risk of infection is high, such as during an outbreak or if they are traveling to an endemic area in the U.S. or abroad.

Providers and families should understand that early vaccination before 12 months of age does not count in the recommended two-dose series, since maternal antibodies may decrease an infant's response to the vaccine. Many studies have shown that MMR vaccine does not cause autism⁸.

Post-exposure prophylaxis (PEP): Measles vaccination within 72 hours of initial exposure may provide some protection against measles infection and may prevent progression to severe illness. Immunoglobulin administration within six days of exposure is an option that can be considered^{6,9}.

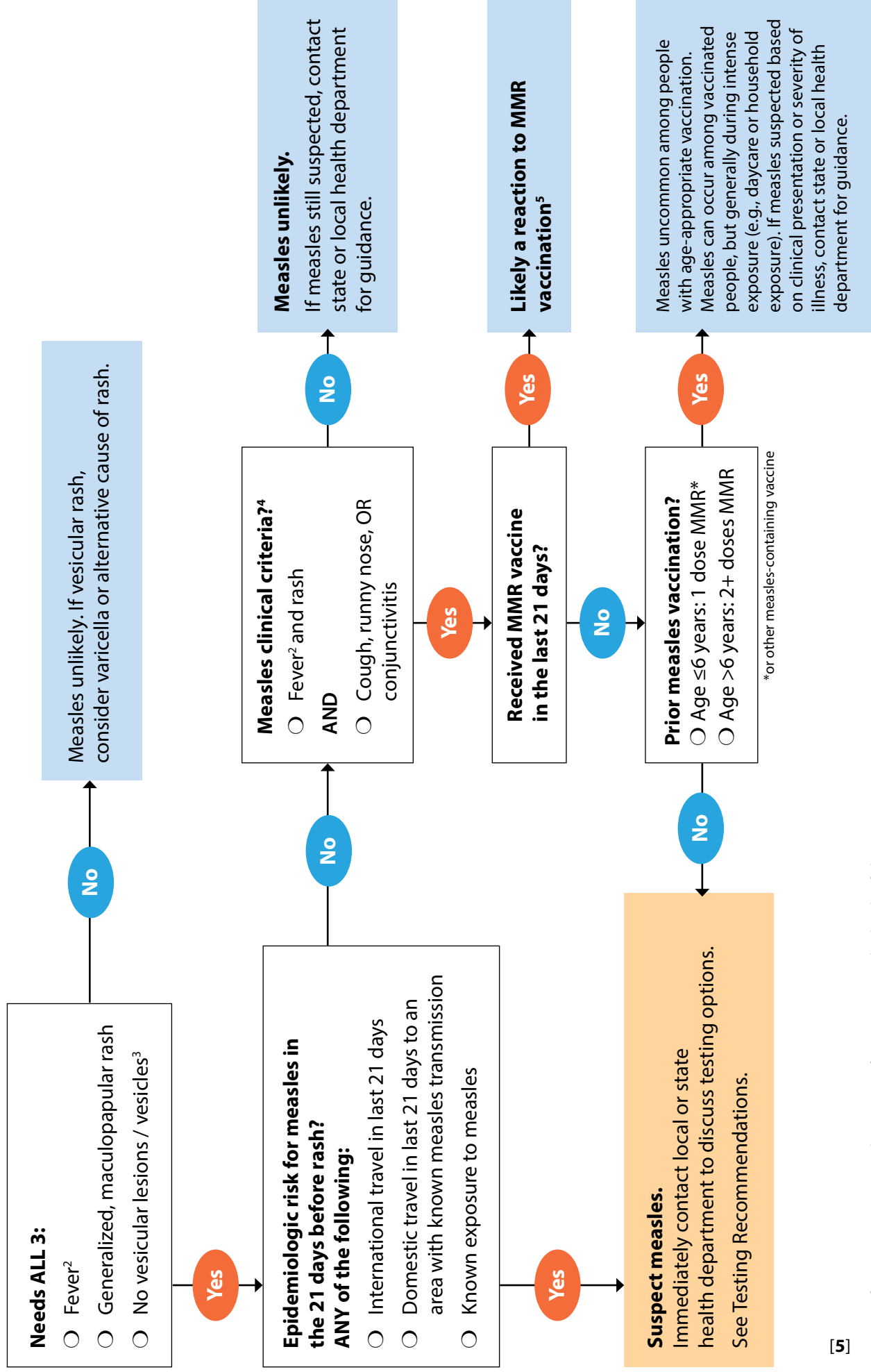
Pediatricians can help counter misinformation about vaccination by providing evidence-based information to families regarding the safety of vaccines¹⁰.

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Evaluating a patient presenting with rash when there is no local measles transmission¹

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Notes

1. This testing algorithm is intended to be used by bedside providers in settings where there is not local measles transmission. This assumes that the pre-test probability for most people without known epidemiologic risk for measles and who do not meet case criteria will be low. In settings with active measles transmission, the threshold at which to pursue testing may be lower, and a more permissive algorithm could be considered.
2. Either a measured or patient-/family-reported fever is adequate; fever may not be measured at the time of healthcare evaluation due to normal fluctuation or to use of antipyretics (e.g., ibuprofen).
3. A vesicular rash is not consistent with measles and should prompt consideration for other causes of rash (e.g., varicella/chickenpox).
4. Measles clinical criteria (CSTE* case definition) include ALL of the following:
 - Generalized maculopapular rash.
 - Fever.
 - Cough, coryza (runny nose), or conjunctivitis (also known as the “3 C’s”).
5. Up to 5% of MMR recipients will get a short-lived, mild febrile rash. This is more common with the first dose of MMR. People who experience this vaccine reaction are not contagious to others around them. If a person has received MMR within 21 days before rash onset, but also has epidemiologic risk for measles, then specialized testing may be required and should be discussed with local or state public health authorities.

*CSTE: Council of State and Territorial Epidemiologists: <https://ndc.services.cdc.gov/case-definitions/measles-2013/>.

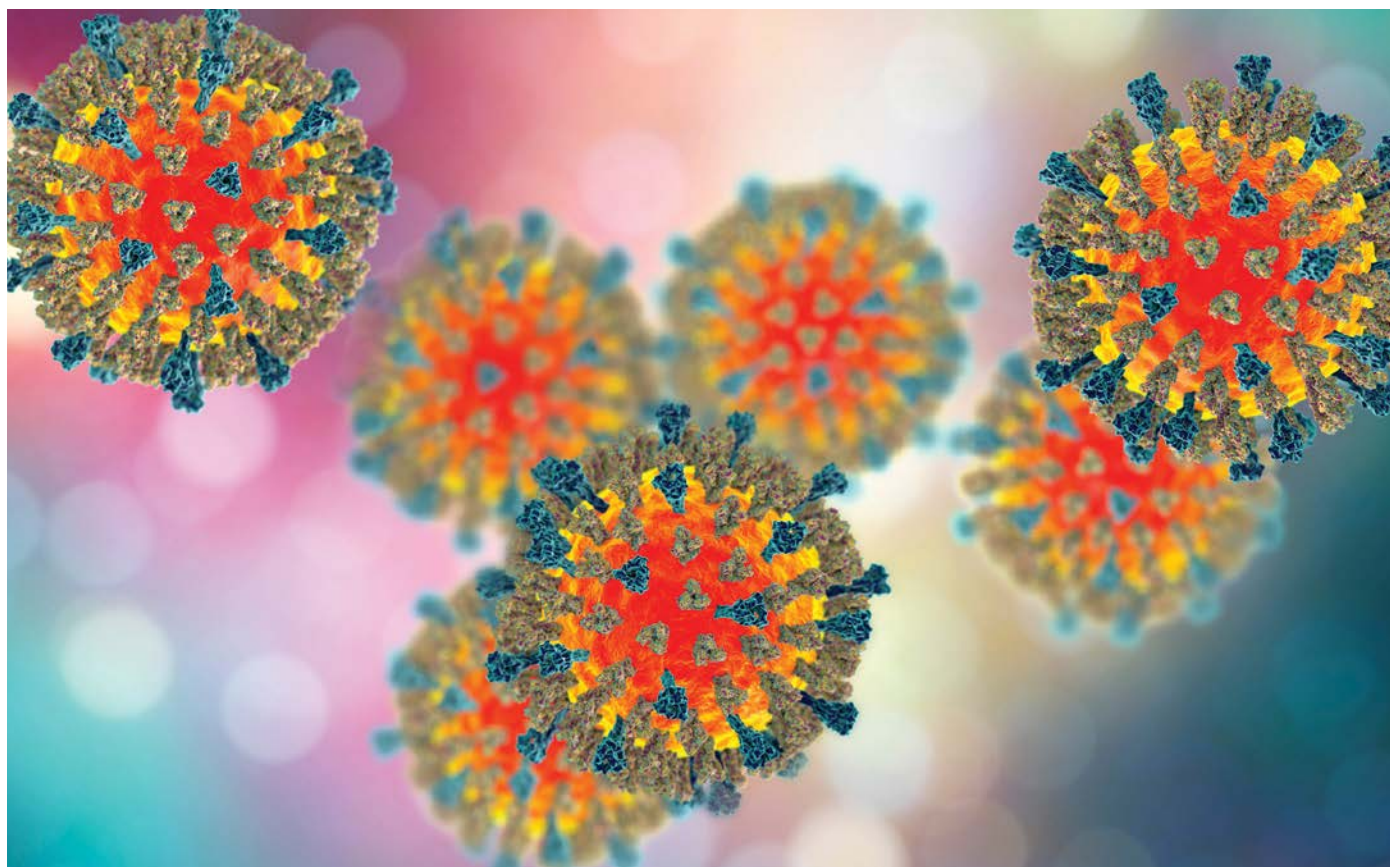
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Example of chickenpox rash.



Example of measles rash.



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The *EPSDT Care for Kids Newsletter* is published three times a year, in print and online, as a joint effort of the Iowa Department of Health and Human Services and the Center for Disabilities and Development, which is nationally designated as Iowa's University Center for Excellence in Developmental Disabilities. The goal of this newsletter is to inform Iowa health care professionals about the EPSDT Care for Kids program, to encourage them to make use of this important resource, and to provide them with information about a wide range of developments in the field of health care.

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