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CONTAGIOUS COMMENTS
Department of Epidemiology

Fever and Rash: Evaluation of Patients with Possible Measles

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MEASLES

Measles is considered among the most contagious viruses in the world. About 90% of people who have never been immunized against measles become ill after exposure. The incubation period for measles is 7-21 days after exposure (most commonly 8-12 days). Complications of measles include otitis media, pneumonia, encephalitis, and even death. Infants, young children, pregnant women, and immunocompromised hosts are at highest risk for severe disease. Patients infected with measles are contagious 4 days before the onset of the rash through 4 days after the appearance of the rash. Vaccination is highly effective against measles. Two doses of the MMR vaccines is 97% effective at preventing measles infection.

On December 18, 2023, an international traveler was evaluated and diagnosed with measles at Children's Hospital Colorado. Children's Hospital has been working closely with CDPHE and local health departments in response to this case. All patients who were potentially exposed at CHCO have been notified and offered post exposure prophylaxis if indicated.

Key Points

- Consider measles in a patient with fever and rash who was at the following sites within Colorado:
    - Denver International Airport on December 13 from 4:30 – 8:00 pm. Possible exposures to people who were moving through Concourse A, bridge security, baggage claim, and passenger pick up area.
    - Children's Hospital Colorado Emergency Department on December 18 from 8:30 – 11:00 am.
- Consider measles in patients who have a fever AND a rash, regardless of their travel history. Suspicion should be high if the patient is un/underimmunized for measles and/or has traveled within the past 4 weeks either internationally or to areas of the US with measles outbreaks (for current information, visit https://www.cdc.gov/measles/cases-outbreaks.html)
- **Airborne isolation** precautions should be used for patients with illness compatible with measles, where there is no other explanation. This includes:
    - Immediately place a medical mask on the patient and place them and anyone accompanying them into negative pressure room.
    - If a negative pressure room is not available, procedure masks should be worn by the patient and anyone with them and placed into a regular room. The door to the room should remain closed.
    - When inside the room, providers should wear gowns, gloves, and use a properly fitted N95 mask or PAPR (if the provider has not been fitted for an N95 mask, has facial hair, or is pregnant)
- Patients with measles may have complications including otitis media, pneumonia, croup, diarrhea, or encephalitis. These presentations should not skew providers from making a diagnosis of measles or from properly isolating to prevent transmission to others.

If sending a patient to another facility for measles testing, it is imperative to:

- Contact the facility in advance to ensure that they have the capability of placing the patient on airborne isolation (usually an ED or Urgent Care will be the best facilities to do this – outpatient labs are NOT recommended due to difficulties with patient isolation). Provide a patient ETA if possible.

- Ask which entrance the patient should use, as well as a phone number the family can call when they arrive and before they enter the facility. Provide this information to the family so that they do not wait in the waiting room.
- Give procedure masks to the patient and any accompanying individuals. Instruct them that they should put the masks on before entering the facility.

History and Assessment of Fever and Rash with Measles

Characteristics *more consistent* with measles:

- Patient has had at least 1-2 of the "3 Cs": cough, coryza, conjunctivitis (bilateral)
- Must have some fever (may be subjective)
- Rash started on forehead and/or behind the ears, then spread down the body to the extremities. Macules eventually become confluent, particularly on the face.
    - Immunized patients who have measles may present with less intense rash that may not spread as extensively.
    - Immunocompromised patients may not have rash
    - Usually spares the palms and soles
- Rash resolves in the order in which it appeared (head, then body)
- Patient has had ≤ 1 measles vaccine

Characteristics *less consistent* with measles:

- Fever disappears before rash appears
- No fever present during the illness
- No cough or conjunctivitis
- Rash is petechial, vesicular, on palms/soles, and/or hive-like.

The differential diagnosis of fever and rash is broad. Please see attached table.

Laboratory Testing and Specimen Collection for Suspected Measles

The provider initially evaluating the patient should call the Colorado Department of Health and Environment (CDPHE) at 303-692-2700 (business hours) or 303-370-9395 (after hours) as soon as possible to report suspected or confirmed measles cases and to determine recommended testing. For detailed instructions, please see the CDPHE laboratory testing guidelines: Specimens for Measles Virus Isolation or RT_PCR_with BRAND.pdf - Google Drive or https://cdphe.colorado.gov/diseases-a-to-z/measles

For patients presenting < 7 days of rash onset:

- After consultation with CDPHE, obtain a NP swab, throat swab, or buccal swab for PCR testing. Samples should be sent to CDPHE. CDPHE will also accept urine for PCR testing.
- Early in the course of infection PCR is the most sensitive and most important sample to collect.
- Additionally, can collect 1-2mL blood in a red top or serum separator tube. If possible, spin down serum. Send for measles IgM test. Measles IgM testing is currently not available at CDPHE but they can send to CDC if there is high suspicion for measles and approved by CDPHE. Alternatively, serum can be sent for IgM testing to a commercial laboratory, such as Mayo Laboratories.

If a patient presents >7 days of rash onset:

- Collect 1-2mL blood in a red top or serum separator tube. If possible, spin down serum. Send for measles IgM testing (see above).

What if the patient tests positive for measles?

Should the patient seen in your clinic, Urgent Care, or ED test positive for measles, the CDPHE and your local public health department will work with you and your staff to identify potential exposures and provide guidance on appropriate notification and follow-up.

For more information

Anyone requesting additional information about measles can call the free help line CO-HELP at 303-389-1687 (toll free: 1-877-462-2911)

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Please return your e-mail address to: Maggie Bay, Children's Hospital Colorado, Epidemiology – Box B276, 13123 E. 16th Avenue, Aurora, CO 80045 or e-mail address: **Maggie.Bay@childrenscolorado.org**.

Thank you for your interest in our publication.

Differential Diagnosis for Fever and Rash				
	Diagnosis	**Fever**	**Rash**	**Other signs/ symptoms**
Infectious	Varicella (chicken pox)	Yes	• Vesicular lesions on erythematous base	
	Enteroviruses (Hand-foot-mouth)	Yes	• Diffuse, pink, macular • Can become vesicular or maculopapular • May be present on palms/soles	Sore throat, oral ulcers, malaise, diarrhea
	Mononucleosis syndrome (EBV, CMV)	Yes	• Macular rash on trunk and extremities; may be on palms/soles • More often if amoxicillin/ampicillin given	Sore throat, exudative tonsillitis, adenopathy (may be diffuse), splenomegaly, atypical lymphocytosis
	Mpox	May be present	• Solitary, small, firm, rubbery lesions usually in same stage • Intraoral, facial, rectal, genital lesions; disseminated rash can be on palms/soles • Progression through stages: enanthem → macule → papule → vesicle → pustule (+/- central umbilication) → scab → healing	Prodrome 1-3 days can include fever, headache, myalgias, and lymphadenopathy May have history of close contact with patient with suspected/known mpox, high-risk activities, or travel to endemic area
	Acute retroviral syndrome (HIV)	Yes	• Possible (similar to EBV)	Many manifestations; consider in adolescents with exudative pharyngitis or diffuse adenopathy
	Adenovirus	Yes	• Maculopapular rash; may start on face and spread to trunk/extremities	Sore throat, exudative or non-exudative conjunctivitis
	Parvovirus B19 (5th disease)	Low-grade if present	• "Slapped cheeks" with maculopapular rash on body that becomes "lacy" • May be present on palms/soles	
	Rubella (German measles)	Low-grade	• Maculopapular; progresses down from face	History of international travel, unimmunized patient, mild illness, tender posterior cervical and suboccipital adenopathy
	Roseola (HHV-6)	High	• Erythematous macular rash; rare on face • Infrequently purpura on hands/feet "stocking-glove"	Children usually ≤2 years, fever recedes as rash begins, irritable
	Scarlet fever (Group A β-hemolytic Strep)	Typically high	• Erythematous, "sandpapery" • ± Pastia lines (increased rash intensity in skin folds)	Sore throat; circumoral pallor; strawberry tongue; + strep test
	Meningococcemia (*Neisseria meningitidis*)	May be present	• Skin begins pallid or mottled → petechial → hemorrhagic/ purpuric rash	Abrupt onset of illness, myalgias; severe headache and mental status change if meningitis present
	Rickettsial infection	Yes	• Variety of rashes	History of tick bite or travel to appropriate geographic area; tick may be present on exam
	Zoonotic infection	Yes	• Variety of rashes	History of unusual animal exposures (farms, petting zoos, exotic pets, rats)
Non-infectious	Hives or atopic dermatitis	No		Coincidental febrile illness
	Drug reaction/ Stevens Johnson	Possible	• May be present on palms/soles • SJS with sloughing inside mouth, macules on skin	History of current or recent medication, especially an antibiotic SJS with bilateral conjunctivitis
	Kawasaki disease	Typically high	• Multiple forms; typically diffuse, maculopapular – may look like measles • Present on palms/soles • Finger/toe peeling occurs ~2 weeks after acute illness begins	Children <6 years Combination of: cracked lips, strawberry tongue, non-exudative pharyngitis, non-exudative bilateral conjunctivitis, erythema and edema of hands and feet, adenopathy