Measles Guidance for the Transplant Community

This document has been developed to guide transplant providers as a collaboration between the International Society for Heart and Lung Transplantation's Infectious Disease Professional community and the Transplant Infectious Diseases Section of the Transplantation Society. Please note that measles epidemiology continues to evolve, and the recommendations contained in this document are subject to change.

Overview

There is an increase in the number of measles cases occurring worldwide, in part due to postponed or missed doses of measles-containing vaccine from 2020 through 2022 due to the COVID-19 pandemic.[1] From January 1-April 11, 2024, a total of 121 cases of measles have been reported in 18 states within the US.[2] In February 2024, 29 countries reported measles data to the European Surveillance System, with 623 cases reported by 21 countries. Additionally, the European Centre for Disease Prevention and Control has identified over 4600 new measles cases in 20 EU/EAA countries, including 13 measles-related deaths.[3] Increases in measles cases have also been seen in Asia, the Middle East, Africa, and South America.[1,4,5]

Most measles cases reported in 2024 in the US have been among children aged 12 months and older who have not received measles-mumps-rubella (MMR) vaccine. Within Europe, age-specific notification rates deceased with age, with children aged 4 years and under having been most frequently affected.[6] Many pediatric recipients of solid organ transplants or children who are severely ill in the first year of life will be unvaccinated, putting them at highest risk for measles acquisition.

Transmission

Measles is a highly contagious disease caused by a single-stranded, enveloped RNA virus. It is classified as a member of the genus Morbillivirus in the Paramyxoviridae family. Humans are the only natural hosts of measles virus. Measles is one of the most contagious of all infectious diseases. The virus is transmitted by direct contact with infectious droplets or by airborne spread when an infected person breathes, coughs, or sneezes. Measles virus can remain infectious in the air for up to two hours after an infected person leaves an area.

Clinical Findings

The incubation period (time from exposure to prodrome) is approximately 11-12 days, and the time from exposure to onset of rash averages 14 days (range 7-21 days). The measles prodrome generally lasts 2-4 days (range of 1-7 days) and is characterized by fever, malaise, anorexia, coryza, cough, and development of Koplik spots, or small bluish-white spots on the buccal mucosa. A maculopapular rash then appears and lasts approximately 5-6 days; this rash typically begins at the hairline and involves the face and upper neck and then proceeds

downward and outward to the hands and feet. The lesions initially blanch and may then begin to peel after approximately 3-4 days.[7]

Notably, however, the measles rash may be absent in transplant recipients, and viral shedding may be prolonged in immunocompromised hosts.[8]
Complications of measles can include blindness, encephalitis, subacute sclerosing panencephalitis, myocarditis severe diarrhea, otitis media, and pneumonia. Complications are most common in children under 5 years and adults over age 30 and are more likely in patients who are malnourished, or those with immunocompromise due to transplant, HIV, or other diseases.[8,9]

Diagnosis
Healthcare providers should consider measles in patients presenting with a fever, rash, coryza, conjunctivitis, and other compatible symptoms, especially if they do not have a history of measles vaccination or recovery from natural disease. Additional considerations for measles are exposure to an individual with a fever and rash, and/or living in or travelling to a community with a measles outbreak. Patients with suspected or confirmed measles should be placed in airborne precautions. Cases should be reported to the appropriate health department in keeping with local public health guidance.

Detection of measles-specific IgM antibody in serum and measles RNA by real-time polymerase chain reaction (RT-PCR) in a respiratory specimen are the most common methods for confirming measles infection. A serum sample and a throat swab (or nasopharyngeal swab) for RT-PCR should be collected from patients suspected to have measles. Urine samples may also contain virus; thus collecting both respiratory and urine samples can increase the likelihood of detecting measles virus.[10] It should be noted that measles-specific IgM antibody may be negative in the first few days of illness,[11] and the performance characteristics of measles-specific IgM among transplant recipients with acute illness is unknown.

Treatment
There is no specific antiviral therapy for measles. Medical care is largely supportive, aiming to relieve symptoms and address complications. Administration of vitamin A is recommended in all children with acute measles in order to reduce the risk of complications; dosing of vitamin A is age-specific (infants <6 months of age: 50,000 IU daily x 2 days; infants between 6-12 months of age: 1000,000 IU daily x 2 days; children ≥12 months of age: 20,000 IU daily x 2 days).[10]
Reduction of immune suppression should be considered provided that this does not compromise allograft function.

Given the risk of measles-associated mortality in immunocompromised individuals, some experts favor the use of ribavirin for treatment of disease in this population. Data regarding the clinical use of ribavirin are limited.[12,13] Some experts recommend ribavirin dosing of 15 to 20 mg/kg per day by mouth in two divided doses, but the optimal dose and duration of therapy remains undefined. Those treated with ribavirin should be monitored for hemolytic anemia, and this agent must be dosed in accordance with renal function. Its use is not recommended in patients with a history of significant or unstable cardiac disease, nor in pregnant individuals.

Investigational treatments for measles include isoprinosine and interferon, which have been used in the treatment of subacute sclerosing panencephalitis.[14,15] However, interferon is generally not recommended in solid organ transplant recipients due to the potential risk of

rejection. There are limited data on the use of intravenous immunoglobulin for the treatment of measles in solid organ transplant recipients.

Prevention

Vaccination is the best way to prevent getting measles or spreading it to other people. Measles vaccine (MMR or MMRV) is a live-attenuated vaccine and should be avoided after transplant in adults and most children due to limited safety data. However, evolving data suggest that the MMR vaccine may be safe and efficacious in pediatric liver and kidney transplant recipients who are >1 year post-transplant, on low-level immunosuppression, >2 months post-rejection, and have an age-appropriate lymphocyte count.[16,17]

At least one of the following is considered evidence of measles immunity

- Birth before 1957
- Documented administration of two doses of live measles virus vaccine (MMR, MMRV, or other measles-containing vaccine)
- Laboratory (serologic) proof of immunity or laboratory confirmation of disease

For transplant candidates, measles IgG can be obtained to help determine immunity. Seronegative transplant candidates who are not on immunosuppression can be vaccinated, but transplantation should be deferred for 4 weeks following vaccination. Notably, >30% of pre-transplant patients may not seroconvert after a single dose of MMR vaccine.[18]

Serologic status can be evaluated in patients who have undergone transplant, as it may be helpful to determine potential risk due to community exposure, travel, or occupation.

Non-immune household members including siblings of non-vaccinated pediatric transplant recipients should be vaccinated to help prevent disease transmission in the home. Separation of a transplant recipient from a household member recently vaccinated with MMR or MMRV is not required.

Post-Exposure Prophylaxis

Solid organ transplant recipients who are seronegative for measles can be administered measles immunoglobulin (IG) or intravenous immunoglobulin within six days of exposure.[10] Recipients who are seropositive do not require IG after exposure.
Non-immune household members 6 months of age and older should be vaccinated within 72 hours of exposure to help prevent disease transmission in the home.

Infection Control

Transplant recipients with suspected measles require appropriate isolation. Airborne precautions should be followed in healthcare settings and healthcare staff entering the room should use respiratory protection consistent with airborne infection control precautions (use of an N95 respirator or a respirator with similar effectiveness in preventing airborne transmission). In keeping with public health guidance, infected immunocompromised patients should remain in airborne precautions for the duration of symptoms due to prolonged viral shedding.[19]

Donors with Suspected or Documented Measles

To date, there have not been any proven cases of measles transmission from organ donors to recipients; however, donor-derived measles could lead to severe illness for transplant recipients for which there is no measles-specific antiviral therapy. Therefore, organs from donors with suspected or confirmed measles should not be utilized for transplant. Given the incubation period for measles ranges from 7-21 days from exposure to rash onset,[7] organ donors with a potential exposure to measles should be deferred for 21 days after exposure.

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