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Brief report

Measles investigation: A moving target

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Measles is a highly contagious respiratory infection with significant transmission risk once thought to be on the verge of elimination. Outbreaks in Europe have resulted in resurgence; however, experience with measles is limited in the United States. We describe the impact of 2 measles cases presenting to our emergency department in May 2011. Exposure criteria were defined and revised. Guidance documents were developed and distributed. Suspect cases were masked and escorted to negative pressure. Lack of prompt IgM and polymerase chain reaction testing resulted in delayed disease confirmation. Computerized flagging systems were established. Exposed individuals were screened to determine the need for prophylaxis. Investigation costs were calculated. A total of 171 patients and visitors and 94 employees met exposure criteria. Employees had proof of immunity to measles. Of these, 43 patients and visitors returned for prophylaxis. No subsequent transmission occurred. The conservative cost for these investigations was $63,176.39. Multiple challenges were identified. Inexperience with measles can result in significant outbreaks. Although transmission did occur at another facility, it was prevented at our facility because of rapid case recognition, isolation, health care worker immunity, and multidisciplinary response. Discordance between the Healthcare Infection Control Practices Advisory Committee and public health guidelines for measles control created unnecessary challenges.

We will discuss the impact of 2 cases of measles at our facility and the multiple challenges encountered, including lack of availability of timely testing, inconsistencies among the various national guidelines, unrealistic expectations for patient transport, and varying exposure definitions and prophylaxis recommendations.

DISEASE

In the United States (US), endemic measles was eliminated in 2000, but it remains a reportable disease. It is a highly contagious respiratory disease caused by the rubeola virus spread via airborne route and by direct contact with nasal or throat secretions of infected people. The virus is aerosolized and remains suspended in the air for an extended period of time.[1] The incubation period is defined as 5-18 days, but it may be as long as 21 days with fever onset 7-18 days from exposure. Individuals are considered communicable from 4 days before rash onset to 4 days after rash onset.[2] The symptoms of infection appear in 2 stages starting with runny nose, cough, fever, conjunctivitis, photophobia, and koplik spots. The second stage consists of a red, blotchy, generalized rash.[3]

The measles vaccine was first introduced in the US in 1963 as a 1-dose vaccination. Then, in 1971, a measles, mumps, rubella (MMR) combination vaccine was introduced. A 2-dose recommendation for the MMR vaccine at 12-15 months and 4-6 years of age was initiated in the US in 1989 because of an increase in measles cases.[4] One dose of the measles vaccine is believed to elicit 94%-98% immunity in healthy individuals, and 2 doses are thought to provide up to 99% immunity. Routine antibody testing is not recommended for persons with documented 2-dose vaccination or laboratory-confirmed measles disease.[5]

FACILITY

Our facility is a 651-bed academic tertiary care medical center, regional level 1 trauma center, and includes a medical college and multiple primary and specialty practice sites. The emergency department (ED) is 27,136 sq ft (2,521 sq. m.), averages 72,000 patient visits per year, with 7 negative pressure rooms and a negative

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pressure decontamination area. The triage area is a separate area with a secured entrance through which patients must be granted access.

At our facility, airborne precautions require a negative pressure room and the use of N95 respirators for all health care workers. Additionally, only immune health care workers are assigned to confirmed or suspected measles patients.

CASE REVIEW, MANAGEMENT, AND HOSPITAL COURSE

Patient 1 is a 20-year-old male college student who lives in a fraternity house and was evaluated at 2 outside health care settings for fever, respiratory symptoms, and rash. No precautions were taken at either facility because the patient was diagnosed with a viral upper respiratory infection. While in an outside ED, the patient was placed in the hall on a stretcher.

Subsequently, patient 1 presented to our ED on Friday, May 13, 2011, at 9:30 PM with a 5-day history of fever (maximum temperature of 40.4°C), headache, sore throat, congestion, productive cough, lesions on the buccal mucosa, and 3-day history of rash on his trunk, thighs, and extremities, sparing his soles and face. Patient denied any recent travel or sick contacts. The patient had not received any vaccines against measles because of a religious exemption.

Patient 1 presented to the ED triage window with fever and rash. Per our protocol, the patient was instructed to don a surgical mask and was placed in a triage room with the door closed. Droplet precautions were initiated within 1-2 minutes of arrival.

The patient was next moved to an exam room with the door closed and seen by a physician where droplet precautions were maintained. The physician was concerned about measles and contacted local and state health departments. Approval was granted for IgM measles serology at the state laboratory. Although the patient met the measles case definition, the public health official's suspicion was low because there were no other cases regionally. The specimen was tested 3 days later because of the weekend. Unfortunately, proper isolation was not discussed between the ED and public health leading to additional exposures.

The hospital epidemiology department was notified approximately 5 hours after the patient arrived. They advised that the patient be placed on airborne precautions in a negative pressure room. Then, the patient was approved for discharge by public health on home isolation at his fraternity house pending laboratory results.

A hospital serology technologist was called in to run an immediate measles IgG test on Saturday morning, which was negative. The hospital was notified of a positive IgM for measles on Monday, May 16 at 3:00 PM, confirming the diagnosis.

Patient 2 is a 2-year-old boy who also presented to 2 other outside health care facilities with fever, respiratory symptoms, and rash and was diagnosed with a viral illness.

Patient 2 presented to our ED 15 days after patient 1 on Saturday, May 28 at 10:30 AM. The patient had a history of fever for 4 days (maximum temperature of 40.0°C), cough, sore throat, photophobia, and a 48-hour history of rash. It was discovered that the patient and his mother were picking up a relative at the same time patient 1 was being evaluated at an outside ED. Patient 2 had not been immunized against measles.

Patient 2 arrived at our facility with a parent and entered the triage area unscreened when the door into triage was open to allow entry to other patients. Moments later, when the nurse realized the patient had a fever and rash, the patient was masked and placed in a private room with the door closed. The patient was moved to a negative pressure room on airborne precautions once available, approximately 30 minutes later. The patient required admission and was admitted to a pediatric floor on airborne precautions. The patient was masked and transported through the hospital with the assistance of security to clear all hallways and elevators during transportation.

A hospital serology technologist was called in to run measles IgG, which was negative. Prior to the holiday weekend, a process was set up to have weekend coverage for the state laboratory allowing for measles IgM and viral polymerase chain reaction (PCR) testing at the state laboratory on Sunday. The IgM and viral PCR were positive, confirming the second case of measles.

METHODS

Exposure definition

The exposure definition for patient 1 was initially defined by public health to include all persons (regardless of age) in the triage area at the same time and for 2 hours after the patient was there. They then expanded the definition to include any high-risk patients that were in the entire 27,136 sq ft ED. This was subsequently revised a third time to include all patients in the entire ED.

This exposure definition was changed a fourth time after patient 2 to exclude persons born prior to 1957. In response to both cases, exposure lists were developed.

Exposure notification and postexposure prophylaxis

Following patient 1, patients and visitors who were in triage were contacted by the hospital infection preventionists on the evening of May 16 and on the morning of May 17 regarding potential exposure and were recommended for postexposure prophylaxis (PEP). An additional group of patients were identified as high risk and notified on May 18. The remaining patients were notified on May 19 and 20.

Patients and visitors who were in triage at the same time or within 2 hours after patient 2 were notified on May 29 and 30 and recommended for PEP. Follow-up was limited to the triage area only for this case because it is a segregated area.

Following both cases, all staff were notified of the exposure via letter and informed that if they were immunocompromised to present to employee health services for immunoglobulin and to self-monitor for symptoms.

Infection prevention and control response to measles

A joint conference call with the state health department, Centers for Disease Control and Prevention (CDC), and our facility was held to discuss the case, prophylaxis recommendations, and future prevention measures.

The epidemiology department and ED developed a plan for patients with fever and rash to help prevent future exposures. Suspect cases would be masked and accompanied from the window of the triage area to an outside access door to the negative pressure decontamination room for evaluation.

The epidemiology department created alerts and guidance documents to aid in managing patients presenting with rash/fever or known exposure to measles. These documents included case definitions and recommendations for patient management, transportation, and testing.

Based on the recommendations made during the conference call with the CDC, a plan was developed with security to assist with patient transport of suspect measles patients by clearing hallways and elevators during transportation of the patient.

Information services created a specific code in the patient registration system to identify all exposed patients should they return. This list was shared with our ambulatory practice sites. Any exposed patient returning to the hospital was placed on airborne precautions through the incubation period (defined as 21 days after exposure unless received immunoglobulin) until a positive measles IgG titer