Smallpox Clinical Description & Recommendations for a Vaccination Program

Smallpox: Isolation and Quarantine

Infection control precautions are critical to control smallpox because it is a communicable disease. Smallpox may be spread person to person via droplets, aerosol, or even through hand-to-hand contact.

Viral particles are present in the lesions and scabs of infected patients and secondary transmission may occur after exposure. Housekeepers were some of the most frequent victims of secondary transmission within the hospital setting, which is believed to be due to exposure to the patients' contaminated clothing and bed linens. Smallpox scabs retain viable viral particles for decades, but it is not known how long they remain a transmissible infection threat.

Smallpox is not as infectious as other common infectious diseases, including chickenpox and measles. There is generally a 25 – 40% chance of transmission of smallpox in people who have significant contact with infected patients. Historically, transmission typically occurs in three to four secondary contacts per case, but there can be as many as twenty or more secondary cases per primary case in a non-immune population. In other words, transmission is much less likely if a case of smallpox occurs in an immunized population.

Hospitalized patients need to be isolated using airborne and contact precautions. Rapid identification of cases and immediate, effective isolation are essential to prevent nosocomial transmission.

The patient will require a negative pressure room, or, if your facility does not have enough available negative pressure rooms, the patient may be isolated using a hepa-filtered room. When using a hepa-filtered room, physical isolation should also be used. In other words, it is best to place the patient in a room that is physically isolated from other patients. Rooms or the wing of a floor in an area separated from other patients are preferable to decrease the risk of transmission.

Another isolation precaution that needs to be instituted includes the use of an N95 respiratory mask for each patient encounter by both staff and visitors; a standard surgical mask is not sufficient to prevent transmission. In addition, gowns and gloves must be worn for every patient encounter.

Patients should remain on isolation until all of their scabs have separated, a process that requires approximately three weeks.

In the past, housekeepers were susceptible to secondary transmission of smallpox, a process that was believed to be caused by the physical contact with or re-aerosolization of viral particles during the handling of linens, although the exact mechanism of transmission is uncertain. Linens should be carefully handled so as to minimize the risk of aerosolizing any potential viral particles present.

Current recommendations state that the linens of smallpox patients should be incinerated or autoclaved and then washed in hot water with bleach added. Another option is the use of disposable linens, which is more cost effective than autoclaving or incineration. These recommendations are based on previous documented cases of secondary transmission to housekeepers handling the linens of smallpox patients.

It should be noted, however, that infection control practices, especially in relation to housekeeping and the handling of other potentially infectious materials, have been significantly improved in the last thirty years since the eradication of smallpox. Some experts believe that the use of Standard Precautions, which are currently used for the handling of all hospital linens, would be sufficient to prevent the secondary spread of smallpox.

Because of the suspected low risk of secondary transmission when using standard precautions to handle laundry and the high cost associated with autoclaving or incinerating linens, recommendations for the handling of smallpox patient linens are currently under review. Preliminary discussions and documents indicate that minimizing the disruption of linens and washing in hot water with 1 cup of bleach added may be the new recommendations for linen care.

Since smallpox can be spread from the bodies of smallpox victims, cremation is recommended to prevent secondary transmission to mortuary employees.

Contacts of smallpox patients should be monitored daily for seventeen days past the date of the most recent exposure or fourteen days past vaccination for signs of illness, most notably fever, that occur in the prodrome phase of smallpox disease. Whenever possible, contacts should be monitored by a trained individual rather than self-monitored. However, due to time and staff constraints, self-monitoring is acceptable and may be preferable in large outbreak settings. Regardless of who performs the monitoring, contacts' temperatures should be taken and recorded twice a day (morning and evening).

If self-monitoring, contacts should communicate the results to the specified local health department employee or other designated investigator.

Asymptomatic contacts may continue routine daily activities until symptoms develop or for the duration of the monitoring period, which is seventeen days past the date of exposure. Monitored contacts who develop symptoms of early disease, especially fever, should be isolated immediately. Any monitored contact who develops a temperature greater than 101^0 Fahrenheit or 38.3^0 Centigrade on two successive readings obtained 12 hours apart should be immediately isolated.

A thorough epidemiological investigation and patient history will be imperative to identify contacts. As mentioned in another section of this training resource, patients are considered infectious starting the day before the first skin lesion appears. However, due to the likelihood of obtaining an inaccurate date of appearance for the first lesion, it is best to obtain a history starting with the first day of fever onset. Since fever generally occurs 1-2 days before the appearance of the first lesion, this will better enable all potential contacts to be identified.

The patient history should focus on all potential contacts starting on the first day of fever onset through the date of isolation of the index case. This will most likely be a period of 1 to 10 days.

A contact is defined as all household members and anyone who has had face-to-face contact (within 6 feet) of the patient since the onset of fever. This may include hospital employees in a variety of occupations as well as hospitalized patients and visitors.

Within the larger group of contacts, there are two distinct sub-sets: high-risk and low-risk contacts.

High-risk contacts are those that have had prolonged face-to-face contact, including household members and healthcare or hospital workers directly involved with care of the patient.

Low-risk contacts include those with indirect contact with the patient, such as hospital employees that did not work directly with the patient or they worked in the same area, but did not care for the patient. This might include healthcare workers who did not provide direct patient care to the smallpox patient but who worked on the floor that housed the patient.

The high-risk group of contacts should be vaccinated and be monitored in the manner previously described. Low-risk contacts should receive vaccination, but may not require intensive monitoring since their risk of exposure is low.

Many facilities may opt to vaccinate and monitor all potential contacts, regardless of level of risk, to reduce confusion. As this is a more conservative approach, it is acceptable and may be preferred in order to reduce the risk of secondary spread. Each facility should establish a pre-event definition for contacts, including guidelines on which groups need to receive vaccination and/or monitoring. These definitions and guidelines should be written into the facility's disaster or bioterrorism response plan.

Home isolation is an option for patients with mild disease who do not require extensive medical care and may be preferable in large outbreaks to prevent nosocomial transmission.

Another alternative to traditional hospital or home isolation is to have a designated smallpox center or hospital that would be used to house and treat victims of smallpox. A few examples of emergency smallpox centers include the following: warehouses, school gymnasiums or outside tented areas furnished with medical supplies and equipment and staffed by immunized healthcare providers. Optimally, the sites for such centers should be determined during the planning phase of bioterrorism preparedness and should be a community-wide collaborative effort.

The term quarantine means enforced isolation, including the detainment of people known or suspected of being infected and the exclusion of healthy individuals from areas that are known or suspected of being contaminated or housing infected patients. Quarantine measures are currently being discussed and evaluated for possible use following an outbreak of smallpox.

Public health officials must evaluate existing quarantine laws for their region and evaluate the need to revise or institute new policies as needed.