PICNet PROVINCIAL INFECTION CONTROL NETWORK OF BRITISH COLUMBIA

Management of Health Care Providers Pre and Post Exposure to Measles, Mumps or Rubella

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Vaccine Preventable Disease Expert Working Group

Table of Contents

Introduction

Recent outbreaks of measles (2010) and mumps (2008) in British Columbia (BC) highlighted variations in the approach taken by Health Authorities to assess and provide pre and post exposure protection to Health Care Providers (HCPs). Documentation of individual's immune status is lacking in many cases as well. This makes decisions regarding the need to furlough exposed staff members very challenging. Since the only vaccine available in BC that provides immunity to measles, mumps and rubella is a combined vaccine, the Vaccine Preventable Disease Expert Working Group felt it sensible to include all three of these diseases in one document. The purpose of this document is to provide recommendations for adequate protection and management of HCPs who may be exposed to measles, mumps or rubella while providing care.

Immunity to measles, mumps and rubella is particularly important for adults at high risk for exposure, including HCPs. Vaccine for measles, mumps and rubella is only available in Canada as measles, mumps and rubella (MMR) vaccine, thus HCPs who have been assessed as immune to one virus contained in the vaccine may need additional doses of MMR to ensure immunity to the other viruses. Immunity to one virus contained in the vaccine is not a contraindication to receiving additional doses of MMR vaccine, as there is no increased risk of side effects with additional doses. Serologic testing pre or post immunization is neither necessary nor recommended. HCPs with a medical contraindication to receipt of MMR vaccine should consult with their local Occupational Health provider or Medical Health Officer.

Background

Measles

In 2010, an outbreak of measles occurred in BC. The virus was likely brought to BC by travelers visiting the province during late February or early March; two different genotypes have been identified in samples collected during the outbreak. Cases were initially diagnosed in the Lower Mainland, among individuals who were unimmunized or had received only one dose of measles containing vaccine. The outbreak spread to all five geographic Health Authorities and as of June 20, 2010 there were 80 confirmed cases. Fifty one (60%) cases presented to an Emergency Department and 17 (20%) were admitted to hospital. One case required admission to an Intensive Care Unit (ICU). The protection and management of HCPs who were exposed or who may have been exposed to cases became a significant issue.

Mumps

In 2008, an outbreak of mumps occurred in BC. Cases were initially noted in members of a faith-based community, living in the Fraser Health region, who have traditionally refused immunization for vaccine preventable diseases. As cases occurred in the community, and were admitted to healthcare facilities, issues arose regarding the protection and management of those HCPs who had experienced or who were at risk of experiencing close, unprotected exposure to cases. When HCPs in the affected region were surveyed, documentation of their mumps immunization status was lacking in the majority of cases.

Rubella

Most cases of rubella in BC are not acquired locally but are related to overseas travel to countries where rubella is still endemic due to limited or lack of access to rubella containing vaccine. As well, rubella infections may be underreported, as their rarity has reduced familiarity with the clinical presentation, and the illness may be subclinical or with manifestations resembling other viral exanthems.

Rubella and congenital rubella syndrome are now rare in BC. In the past decade, two cases of congenital rubella syndrome were reported in infants born to mothers with undiagnosed illness: in 2002 and 2004. Between 1998 and 2005, only 15 cases of rubella were reported in BC; in 2006 and 2007, no cases were reported, and in 2008 and 2009, a single case was reported each year. In 2010, a cluster of 7 cases was reported; associated with transmission from an index case in a workplace. The mean age of cases in this outbreak was 49 years and most were foreign-born with no prior history of rubella vaccination. There were no cases of congenital rubella syndrome associated with this cluster.

General Disease Information

Measles

Measles is an acute illness classically characterized by fever, cough, coryza, conjunctivitis and an erythematous maculopapular rash which begins on the head and spreads to the rest of the body. Koplik spots are pathognomonic but are not always seen. Approximately one out of every 1000 cases results in encephalitis, which may lead to permanent brain damage. The case fatality rate is approximately one per 3000 cases. Measles is extremely contagious; it is generally transmitted by the airborne route but can also be transmitted by direct contact with respiratory droplets. The average incubation period is eight to 12 days from exposure to onset of prodromal symptoms but ranges from seven to 18 days. Cases are contagious from one to two days before onset of symptoms (two to four days before onset of rash) to four days after appearance of rash. Immunocompromised individuals may have prolonged excretion of the virus in their respiratory secretions and therefore may remain contagious for the duration of the illness.

Mumps

Mumps is an acute viral infection classically characterized by fever, swelling and tenderness of one or more of the salivary glands (usually the parotid glands), headache and myalgia.

One-third of post-pubertal males that develop parotitis may also experience orchitis. Other presentations are common and some cases are asymptomatic. The incubation period ranges from 12 to 25 days and is usually between 16 and 18 days. Virus has been isolated from saliva from seven days before to nine days after onset of parotitis. Maximum infectiousness occurs between approximately two days prior to the onset of symptoms to four days after. Asymptomatic infections can be communicable. The virus is spread through droplets expelled from the respiratory tract during activities such as coughing, singing, talking or laughing. It should be noted that neither wild type infection nor vaccination provides a lifelong guarantee of immunity.

Rubella

Rubella is an acute viral illness that is usually mild, or even asymptomatic (25-50% of cases). It is characterized by fever, lymphadenopathy and an erythematous maculopapular rash that starts on the face, becomes generalized in 24 hours and lasts on average three days. Rare complications include thrombocytopenia and encephalitis. Maternal rubella during pregnancy can result in miscarriage, fetal death or a constellation of anomalies, referred to as congenital rubella syndrome Congenital defects occur in up to 85% of fetuses if maternal infection associated with rash occurs during the first 12 weeks of gestation.

Rubella is transmitted primarily through direct or droplet contact with nasopharyngeal secretions. The incubation period ranges from 14 to 21 days, most commonly 14 to 17 days. Cases are contagious from seven days before to seven days or more after onset of rash. Immunity from either wild type or vaccine virus is usually prolonged although reinfection has been reported on rare occasions.

Baseline Assessment of Employee Immunity and Vaccination Status

The most opportune time for assessment of immunization status is at the time of employment. Acceptable documentation includes a written record that includes the day, month and year of vaccine receipt.

The Working Group recommends that the following age-based criteria for vaccination, outlined in Table 1, be used when assessing employees.

Table 1. Number of doses of MMR vaccine recommended by year of birth for BC HCPs

Date of Birth	Measles	Mumps	Rubella
Prior to 1957	0 doses	0 doses	1 dose
1957 to 1969	2 doses	1 dose	1 dose
1970+	2 doses	2 doses	1 dose

Measles

Live measles vaccine was licensed in Canada in 1963. In 1969 BC recommended that all infants (at 12 months of age or older), preschoolers and susceptible school children receive a dose of live measles (rubeola) vaccine. Prior to that time, measles outbreaks were common and almost all children were infected. The combined MMR vaccine was introduced into BC's publicly-funded immunization program in 1981 and a single dose was recommended for measles protection. In 1996, in the face of ongoing measles outbreaks, BC conducted a measles-rubella vaccine campaign for children from 19 months of age through to grade 12. Starting in 1998, a second dose of measles vaccine (given as MMR) was recommended for those aged 18 months through 18 years, for adequate measles protection. Beginning in 2005, a second dose of measles vaccine (given as MMR) was recommended for all health care providers born after 1956. The efficacy of a single dose of live measles vaccine given at 12 or 15 months of age is estimated to be 90% to 95%. With a second dose, almost 100% of those vaccinated are considered immune. People who were born before 1957 are generally considered immune to measles through infection with wild virus. The 1957 cut-off is different than the National Advisory Committee on Immunization (NACI) recommended cut-off year of 1970. BC pre-natal blood specimens tested in 1999 showed a difference of 5% in the measles IgG seroprevalence between those born prior to 1957 vs. those born 1957 to 69, and a 2% difference between those born 1957 to 1969 and those born from 1970 to 1980. Individuals born in 1957 or later should receive two doses of live measles-containing vaccine for adequate measles protection, generally given as MMR. Please note that the 1957 cut-off date is currently under review in BC and may change. This recommendation will then be updated.

HCPs are considered immune to measles if they fulfill <u>one</u> of the following criteria:

- They were born prior to 1957
- They can produce documentation of receipt of two doses of live measles-containing vaccine (generally given as MMR)
- They have a letter from their physician confirming a clinical illness compatible with measles in the past and documented appropriate laboratory confirmation (presence of measles-specific IgM, rise in convalescent measles-specific IgG, virus detection by PT-PCR testing or isolation on cell culture)
- They have documented serological proof of immunity (a measles-specific IgG reactive result of at least 200mIU/ml, or "positive" results using a test that is equivalent to a value of at least 200 mIU/ml). A study is underway to compare results from the assay previously used in BC to measure measles IgG to results from an assay that measures IgG in mIU/ml. This will allow interpretation of earlier results with respect to the international standard.

Mumps

As mumps vaccine was licensed in Canada in 1969, people born prior to 1970 were previously considered immune through exposure to wild virus. However, for those born after 1956 and before 1970, a single dose of mumps-containing vaccine (generally given as MMR) is now recommended, as experience has shown that a significant number of people in this group may not be immune. It should be noted that this recommendation exceeds that of

the National Advisory Committee on Immunization which is not prescriptive. Persons born after 1969 should receive two doses of mumps-containing vaccine, generally given as MMR. Cases of mumps have occurred in persons born after 1969 who only ever received one dose of mumps-containing vaccine and protection is improved with the second dose.

HCP are considered immune for mumps if they fulfill <u>one</u> of the following criteria:

- They have a letter from their physician confirming clinical diagnosis of acute mumps and documented laboratory confirmation of same
- They were born before 1957
- They were born between 1957 through 1969 and documented evidence of one dose of mumps-containing vaccine
- They were born 1970 or later and documented evidence of two doses of mumps-containing vaccine.

Rubella

In 1969, the first live attenuated rubella vaccine was authorized in Canada. Shortly thereafter the National Advisory Committee on Immunization (NACI) recommended two rubella immunization strategy options for provinces and territories: routine immunization of infants and selective immunization of young girls. In BC, routine infant immunization as well as a catch-up program for children to age 11 years was conducted in 1970; in 1974 rubella vaccine began to be offered to young women and a program for girls in grade 5 was started and continued until 1986. In 1981, MMR vaccine was incorporated into routine infant immunization at 1 year of age. In 1986, BC conducted a catch-up program of measles, mumps and rubella for children in Kindergarten through grade 12. In 1996, a two-dose program of MMR was introduced into routine immunization programs in all provinces and territories, and in BC a 'catch-up' program for measles elimination was conducted for preschool and school age children using a combined measles-rubella (MR) vaccine. In BC, the second dose of MMR is given at 18 months of age. Additional doses of rubella vaccine are not deemed to be required; however, it is a component of MMR in which the other two components require two doses to result in the highest levels of immunity.

HCPs are considered immune to rubella if they fulfill <u>one</u> of the following criteria:

- They can produce documentation of receipt of one dose of live rubella virus vaccine (generally given as MMR)
- They have a letter from their physician confirming a clinical illness compatible with rubella in the past and documented appropriate laboratory confirmation (presence of rubella-specific IgM, rise in convalescent rubella-specific IgG, virus detection by RT-PCR testing or isolation on cell culture)
- They have documented serological proof of immunity (a rubella-specific IgG reactive result of at least 10mIU/ml).

Note that unlike measles and mumps, there is no "threshold" year of birth, prior to which immunity is assumed due to exposure to wild virus.

While the published literature supports a protective level of rubella-specific IgG being at least 10 mIU/ml, serologic testing of HCP in the pre-exposure context is not recommended for establishment of rubella immunity and HCP should be discouraged from seeking testing. This is because HCP must demonstrate evidence of immunity against a variety of vaccine-preventable diseases, including mumps, against which protection through vaccination is available only with administration of combined MMR vaccine, and for which there is no known serological correlate of protection.

Management of Health Care Provider Cases

Mumps

Health care providers who are diagnosed with mumps should generally be excluded from work until at least until five days after the onset of classical clinical symptoms (e.g. parotitis, sialadenitis, pancreatitis, and orchitis). This exclusion may be extended up to nine days if the HCP remains symptomatic. HCPs working with immuno-compromised or other vulnerable patients should be excluded for nine days after the onset of classical clinical symptoms, or reassigned to another area after day five, at the discretion of Occupational Health.
The diagnosis of mumps depends on the correlation of both clinical and laboratory findings as each alone may not be sufficiently sensitive.

For *surveillance* purposes, an individual is considered to have mumps if he/she has <u>one</u> of the following:

- Unilateral parotitis and an epidemiological link to a laboratory-confirmed case
- Bilateral parotitis
- Laboratory confirmation of mumps by RT-PCR
- Positive serologic test for mumps IgM antibody and a clinical picture compatible with acute mumps.

Return to Work for Symptomatic HCPs

1. If the HCP has classical symptoms (e.g. parotitis, sialadenitis, pancreatitis, orchitis) he/she may consider return to work after five days of isolation following symptom onset, provided that he/she is clinically well.

2. If the HCP continues to be unwell with symptomatic disease after 5 days, extend their time off work until he/she is well. HCPs working with immuno-compromised or other vulnerable patients should be excluded for nine days after the onset of classical clinical symptoms, or reassigned to another area after day five, at the discretion of Occupational Health.

3. In both instances these assessments are independent of any laboratory results.

Measles

Health care providers who are diagnosed with measles should be excluded from work until at least five days after the onset of rash, provided they are clinically well. Prior to return to work the HCP should contact their local Occupational Health provider with information from a health care provider concerning:

- Clinical presentation
- Date of rash onset
- Date of resolution of acute symptoms
- Laboratory confirmation of measles illness.

Exclusion may be extended if the HCP remains symptomatic. HCPs working with immunocompromised patients may be excluded beyond day five, at the discretion of the local Occupational Health provider and/or the Medical Health Officer.

Rubella

Health care providers who are diagnosed with rubella should be excluded from work until at least seven days after the onset of rash, provided they are clinically well. Prior to return to work the HCP should contact their local Occupational Health provider with information from a health care provider concerning:

- Clinical presentation
- Date of rash onset
- Date of resolution of acute symptoms
- Laboratory confirmation of rubella illness.

Exclusion may be extended if the HCP remains symptomatic. HCP working with immunocompromised or other vulnerable patients may be excluded beyond day seven, at the discretion of the local Occupational Health provider and/or the Medical Health Officer.

Management of Health Care Providers who are Contacts of a Case

Measles

A contact of a case of measles is defined as an unprotected individual who has spent any length of time in a room or enclosed space while the measles case was present or for up to two hours after the case has left the room/space. Personal protective equipment (PPE) should be worn in accordance with the Public Health Agency of Canada's recommendations and/or best practice guidelines.

Available data suggest that live measles virus vaccine, if given within 72 hours of measles exposure, will prevent or modify disease, although not in all circumstances. The vaccine will also induce protection against subsequent measles infection. Therefore, vaccine is the intervention of choice for exposed HCPs without evidence of immunity, unless contraindicated.

If the HCP was born on or after January 1, 1957 and has documented evidence of receiving one dose of live measles-containing vaccine:

- Draw a blood specimen for measles IgG and give a dose of MMR vaccine immediately thereafter (ideally within three days of exposure, with day of exposure counted as day zero). If MMR vaccine is contraindicated for medical reasons (e.g. immunocompromised or pregnant), immune globulin (IG) should be offered within six days of exposure to prevent or modify measles disease.
- When serostatus is unknown or pending or if the HCP is found to be IgG seronegative, he/she must remain off work between day five (post first exposure) and day 21 (post last exposure), inclusive, regardless of receipt of MMR vaccine or IG post-exposure.
- If the HCP is found to have protective levels of IgG he/she may return to work.

If the HCP was born on or after January 1, 1957 and has no documented evidence of receiving any live measles-containing vaccine:

- Draw a blood specimen for measles IgG and give a dose of MMR vaccine immediately thereafter (ideally within three days of exposure with day of exposure counted as day zero). If MMR vaccine is contraindicated for medical reasons (e.g. immunocompromised or pregnant), immune globulin should be offered within six days of exposure to prevent or modify measles disease.
- When serostatus is unknown or pending or if the HCP is found to be IgG seronegative, he/she must remain off work between day five (post first exposure) and day 21 (post last exposure), inclusive, regardless of receipt of MMR vaccine or IG post-exposure.
- If the HCP is found to have protective levels of IgG he/she may return to work.
- Give a second does of MMR vaccine at least 28 days after the first.

Regardless of measles IgG status, HCPs also need to be assessed for immunity to mumps and rubella.

Mumps

A close contact is defined as an individual with direct unprotected contact with the oral secretions of a case or close contact (within two metres) with a case. PPE should be worn in accordance with the Public Health Agency of Canada's recommendations and/or best practice guidelines.

HCPs who are close contacts of a case of mumps in the community should report to Occupational Health and/or Infection Prevention and Control immediately. HCPs who are close contacts of a case of mumps within the facility should report to Occupational Health and/or Infection Prevention and Control if not already identified by those programs during the course of an investigation.

If a HCP was born prior to 1957:

- No doses of vaccine are required as natural immunity is assumed.
- The HCP can continue to work.

If the HCP was born 1957 through 1969 and has documented evidence of having received <u>one</u> dose of mumps-containing vaccine:

- No further doses of vaccine are required.
- The HCP can continue to work.

If the HCP was born after 1969 and has documented evidence of having received <u>two</u> doses of mumps-containing vaccine:

- No further doses of vaccine are required.
- The HCP can continue to work.

If the HCP was born after 1969 and has documented evidence of having received <u>one</u> dose of mumps-containing vaccine:

- He/she should receive one additional dose of MMR.
- The HCP can continue to work.
- If the HCP refuses the dose of MMR that person should be furloughed beginning on day 10 after the first exposure to the case through day 26 after the last contact with the case (where the day of exposure is day one).

If the HCP was born after 1956 and does not have documented evidence of having received any previous doses of mumps-containing vaccine:

- Serology of the exposed HCP drawn before the exposure is acceptable and once immunized with the appropriate number of doses of MMR vaccine based on year of birth; these HCPs can continue to remain at work as long as they remain asymptomatic.
- He/she should immediately receive one dose of MMR after serology is taken.
    - If the HCP refuses the dose of MMR that person should be furloughed beginning on day 10 after the first exposure to the case through day 26 after the last contact with the case (where the day of exposure is day one).
- While awaiting the results of mumps serology, the HCP should be off work if the period of communicability has begun (beginning on day 10 after the first exposure to the case where the day of exposure is day one).
    - If the mumps IgG is positive, and he/she has received one dose of MMR, the HCP can then return to work. Those HCP born after 1969 should receive a second dose of MMR 28 days later to ensure the individual is protected against measles and rubella.
    - If the mumps IgG is negative, the HCP should receive a second dose of MMR 28 days after the first. That person should be furloughed beginning on day 10 after the first exposure to the case through day 26 after the last contact with the case (where the day of exposure is day one).

It should be noted that a reactive serology for mumps IgG cannot be used for establishing immunity to mumps as no international standard has been set for serum levels of IgG that are considered protective. A positive serology should only be used for the practical purposes of deciding if an exposed individual needs to be furloughed. A reactive serology does provide evidence that the individual has had either prior exposure to natural disease or immunization. A dose of MMR is given to these individuals post exposure as a booster in order to stimulate an anamnestic response. This recommendation is based on the expert opinion of the working group members and experience from the 2007 mumps outbreak that occurred in Nova Scotia. All exposed HCP should be provided with education on signs and symptoms of mumps and only work if they remain asymptomatic.

Management of Casual Contacts of a Case of Mumps

A casual contact is defined as an individual with unprotected contact greater than two metres from a case.

Casual contacts of a case should be educated about the signs and symptoms of mumps and their mumps vaccination history should be reviewed. They do not need to be excluded from work. If they develop symptoms of mumps, they should not come to work, should seek medical care and should notify Occupational Health and/or Infection Control.

Tracing Contacts of Cases of Mumps

Given the relatively low risk for transmission of mumps to a susceptible contact, it is reasonable to use two days before and five days after onset of classical signs and symptoms of mumps when tracing contacts exposed to a case, as this covers the time period when the index case is likely to be most infectious.

Furloughing Asymptomatic HCPs

Asymptomatic HCPs should be furloughed from day 10 after the first contact through day 26 after the last contact with a case of mumps if:

The HCP was born after 1956, has no documentation of immunity and

- On serological testing is IgG negative or
- IgG is present on serologic testing but the sample was taken on or after day seven after the first exposure to the case. By this time it is no longer possible to distinguish pre-existing antibody from a new response to acute infection and the result cannot be interpreted.

Regardless of Mumps status, HCP also need to be assessed for immunity to measles and Rubella.

Laboratory Diagnosis of Mumps in Vaccinated versus Unvaccinated People

For mumps, unlike rubella and hepatitis B virus, no International Standard IgG concentration has been correlated with clinical immunity.

For individuals born prior to 1957, most are assumed to have been exposed to circulating wild mumps virus during their childhood and they are thought to be immune for life. Evidence of immunity to mumps has been typically based on detection of anti-mumps IgG.

The value of mumps serology is greatest in people with no known history of mumps vaccination and who are young enough not to have been exposed to wild type virus. In these individuals a negative anti-mumps IgG confirms the lack of immunity and acute mumps in an unvaccinated person will typically manifest both a reactive anti-mumps IgG and IgM on clinical presentation.

Recent outbreaks in previously mumps immunized populations confirm that while natural infection typically is associated with long term immunity and a detectable anti-mumps IgG, post vaccination immunity is not lifelong and the detection of anti-mumps IgG does not correlate completely with protection against mumps. Furthermore, outbreaks in individuals vaccinated against mumps confirm that individuals with detectable anti-mumps IgG can become infected with mumps and that they may or may not manifest anti-mumps IgM at the time of clinical presentation. As a result, serology and even convalescent serologic testing is typically not helpful in guiding management. In addition, recent literature suggests that individuals with partial immunity (a vaccination history and reactive anti-mumps IgG) shed mumps virus for a shorter period of time of approximately six days and therefore nucleic acid based detection (e.g., PCR) of parotid secretions may be negative despite clinical manifestations unless a sample is obtained early during the course of the clinical illness.

Management of Health Care Provider Contacts of a Case of Rubella

A contact of a case of rubella is defined as an individual with direct unprotected contact with the nasopharyngeal secretions of a case or close contact (within two meters) with a case. The HCP contact's vaccination status should be assessed. Actions taken are based on this assessment.

HCP Who Are Considered Immune to Rubella

If the HCP has documented evidence of one dose of live rubella virus vaccine, or a documented history of laboratory-confirmed rubella infection:

- No further vaccine required
- The HCP may continue to work

HCP Who Are Considered Susceptible to Rubella

If the HCP has no documented evidence of receiving any live rubella virus vaccine:

- Draw a blood specimen for rubella IgG and give a dose of MMR vaccine immediately thereafter.
- When serostatus is unknown or pending or if the HCP is found to be rubella IgG seronegative, they must remain off work between day seven (post first exposure) and day 21 (post last exposure), inclusive, with day of exposure counted as day zero, regardless of receipt of MMR vaccine post-exposure.
- Post-exposure vaccination is not proven to prevent rubella infection and does not allow for return to work prior to the maximum incubation period being expired. Vaccination will protect against rubella infection in future exposures.

- If the HCP is found to have protective levels of rubella IgG he/she may return to work.
- HCPs should be counselled to avoid pregnancy for one month following immunization. Breast-feeding is not a contraindication to immunization with MMR.

HCPs who develop a rubella-like illness following exposure should be tested (including by culture/RT-PCR) to confirm the diagnosis, and not return to work until seven days after onset of rash.

Regardless of rubella IgG status, HCPs also need to be assessed for immunity to measles and mumps.

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