Section 2

Respiratory and Direct Contact

Government of Saskatchewan

Respiratory and Direct Contact

Introduction and General Considerations

This section provides a general overview of the communicable diseases transmitted through respiratory and direct contact. The information in this introduction provides both general considerations and key concepts. Specific procedures and information are included within each disease chapter.

Objectives

1. Individuals infected with organisms that are transmitted through respiratory (droplet or aerosolization) and direct contact will be identified, investigated and managed in a timely manner.
2. The complications secondary to infection will be minimized in individuals through the timely identification, investigation and implementation of control measures.
3. Outbreaks will be contained through the timely identification of the source and contacts and through the implementation of prevention and control measures.
4. Health authorities will work to deliver immunization programs according to the provincially funded recommended immunization schedule. Immunization coverage rates are a useful indicator to evaluate programs and plan service delivery to provide the best protection to the population.
5. Information will be managed in a confidential manner and will be shared in accordance with Appendix B - Interjurisdictional Communication, *The Public Health Act, 1994* and *The Health Information Protection Act* and their respective regulations.
6. Information that is required for notification purposes will be extracted from the electronic case management system.

Background

As a group, acute respiratory diseases are one of the leading causes of death from any infectious disease (Heymann, 2008). It has been demonstrated that Canada's ability to fight an outbreak, such as Severe Acute Respiratory Syndrome (SARS), is more closely tied to specific strengths of the public health system than to the health system that provides individual health services. Key aspects of the public health system include the capacity to detect, prevent, understand, and manage outbreaks of significant infectious diseases.

An effective response to an outbreak of severe respiratory illness requires cooperation and collaboration among all jurisdictions – regional, First Nations, provincial, national, and international partners to ensure the timely mitigation of risk and prevention of further illness.

Reporting Requirements

See Reporting Requirements in General Information - Section 1 of the manual for guidelines. Refer to Appendix A – Reporting and Follow-up Timelines.

Methods of Control

Primary Prevention

Many of the organisms that cause respiratory diseases are spread via respiratory droplets generated by coughing and sneezing. These organisms are also spread from person to person when they are in close contact with one another or through touching something with organisms on it and then touching their mouth or nose. "In shelters and other homeless service programs large numbers of people may live together and regularly move in and out. People often share sleeping and bathroom facilities. This means people may have contact with others who have an infection" (Toronto Public Health, 2006).

Coughing and sneezing can also generate small airborne particles that can be inhaled causing infection in the recipient. In general, the following measures are the best way to avoid contact with respiratory droplets or secretions.

Hand Hygiene

"Proper handwashing with soap and water is an important barrier to many infectious diseases and promotes better health and well-being" and "handwashing is one of the most practical and effective ways of preventing the spread of disease" (World Health Organization as quoted by College of Registered Nurses of Manitoba, 2010).

This is especially important after touching surfaces or objects that might be contaminated with respiratory droplets, or after touching persons who are ill with respiratory symptoms. Alcohol hand gels are an adequate substitute when soap and clean water are not readily available and your hands are not visibly soiled. Alcohol gels are not effective if hands are soiled with protein material. Refer to Attachment – Handwashing.

Personal Protective Measures

Avoiding crowds and practicing respiratory hygiene and cough etiquette can help reduce the spread of respiratory illnesses:

- cover the nose and mouth when coughing or sneezing;
- tissues should be used to contain secretions and should be properly disposed of at the earliest opportunity;
- practice hand hygiene after handling items that may be contaminated with respiratory secretions.

Avoiding sharing of personal items (eating/drinking utensils, towels, toothbrushes, etc.) may reduce the risk of transmission of bacteria and viruses. Bacteria and viruses that cause respiratory illness may survive on hard non-porous surfaces and be transmitted to others, via hand contamination and self-inoculation. These surfaces should be cleaned and sanitized on a regular basis, especially when people are sick.

Immunization

A number of communicable diseases transmitted by respiratory contact and direct contact are preventable through vaccination. "Vaccination programs are considered to be the most cost-beneficial health intervention and one of the few that systematically demonstrate far more benefits than costs" (Health Canada, 2002, p. 2). Immunization history should be obtained from and reviewed with clients. Every effort should be made to update a client's immunizations as per the recommendations in the Saskatchewan Immunization Manual.[1]

[1] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Secondary Prevention
Asymptomatic carriage can serve as a source of infection to others. When a case occurs in a setting with susceptible individuals (i.e., long term care facilities), active screening of individuals may be an appropriate action so prevention and control measures can be implemented to interrupt the chain of infection.

The specific level of intervention and contact tracing varies according to the disease and should be individualized based on the guidelines in the specific agent.

General Guidelines for Investigation of Diseases Transmitted through Respiratory and Direct Contact

These guidelines aim to assist in the collection of information and define control measures for organisms that are transmitted through respiratory and direct contact. Refer to the General Information - Roles of Stakeholders section of the manual. Appendix C - Major Legislation identifies the significant Acts and Regulations that are applicable to Communicable Disease Control in Saskatchewan. The following questions/guidelines[2] can assist you to determine the approach you will need to follow to prevent and control the disease.

1. What is the source of the disease? Can it be identified? Communication with the case is important to determine the **risk factors**, **exposures** and **potential exposures of others** to the disease.
2. Who else may have been exposed to the disease? When determining the possible source and possible contacts exposed, the **incubation period, mode of transmission** and **period of communicability** are important considerations. Key considerations include:
    - Recent exposure to someone else who is sick with similar symptoms.
    - Travel history.
    - Attendance in childcare, school, daycare, healthcare settings.
3. Is an outbreak present?

[2] These questions were adapted from
http://www.health.gov.nl.ca/health/publications/diseasecontrol/dcresp.pdf

4. What is the potential impact of the disease for the individual? Their household/family? Their community?
5. Are there people who are more likely to develop symptoms or serious manifestations of the infection?
6. Is there a population who are more likely to be susceptible to the infection?
7. What interventions are available to prevent the transmission of the infection? Refer to disease specific measures and implement necessary activities.
8. Is there a high risk for transmission to others (e.g., highly communicable agent, common vehicle for transmission such as food or water, etc.)? Determine if this individual is in a situation where there is a high risk of transmission of the organism (childcare, health care worker, environmental conditions conducive to transmission, etc.). Who else may have been exposed to the disease? Conduct contact tracing to:
    - Determine if the contact is in a high-risk group.
    - Inform contacts of any prophylaxis and/or exclusion measures:
        - information that should be gathered from the contacts relates to their **level of risk**, **the need for testing**, the potential **benefit of prophylaxis** (as detailed in the disease sections specifically) and **immunization history**.
        - interventions such as **exclusion/isolation/quarantine** may be appropriate depending on the nature of the disease and the status of the contacts that have been identified.
9. Educate case and contacts regarding:
    - The nature of the disease including the incubation period, period of communicability, mode of transmission, etc.
    - Self-care measures.
    - Personal protective measures, which should always include hand washing, not sharing personal items (eating and drinking implements, towels, lip balms, etc.).
    - Disease control measures they must follow (treatment, exclusion, etc.).
    - Publicly funded treatment and chemoprophylaxis is indicated for certain diseases such as meningococcal disease, tuberculosis and *Haemophilus influenzae* type b invasive disease. Publicly funded control measures may be used in long-term care facilities in the event of an influenza outbreak.

10. Obtain an immunization history from case and appropriate contacts.
    - Immunizations should be offered to cases and contacts that are not up-to-date or who are eligible for vaccines as per the Saskatchewan Immunization Manual[3] – Chapter 5: Immunization Schedules and Chapter 7: Immunization of Special Populations.
    - Depending on the organism and other circumstances, it may be prudent to offer immunization for the disease for both the case and the contact(s). Refer to disease section for details.
11. Document case management and follow-up information on the electronic case management and surveillance system.
12. Communication with other stakeholders (physicians, acute and long term care, schools, daycares, etc.) is vital for a coordinated and efficient response to a single case or an outbreak of communicable disease. Maintaining **confidentiality** according to the corresponding legislation is important.

Special Considerations

Certain individuals and certain environments may be considered higher-risk. The following sections outline some circumstances that may need to be considered when doing your investigation.

Immunocompromised/Immunosuppression

The status of an individual's immune system may have an impact on the individual's response to the disease. When there are circumstances that have an impact on an individual's immune system, additional interventions may be required.

Elderly and Infants

Elderly people and infants may be more susceptible to some communicable diseases. Some organisms are also more virulent in these individuals.

[3] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Immigrants/Refugees

Depending on the diseases required to be screened for under immigration regulations and adherence with treatment regimes prior to emigrating, the immigrant or refugee may carry with them diseases specific to their country of origin. Additionally, these individuals may be more susceptible to certain diseases as immunization programs in their country of origin may be different from Saskatchewan or Canadian standards.

Individuals with Suboptimal Personal Hygiene Practices

Individuals with poor practices of personal hygiene (i.e., mentally or physically handicapped) may serve as a vehicle of transmission due to the lack of self-care measures that are useful in interrupting the chain of infection.

Child Care Centres

Young children have limited ability to implement the individual measures to reduce the risk of spread of diseases. This provides an increased opportunity for transmission. This also necessitates early identification and diligent infection control practices. Refer to the Saskatchewan Ministry of Health Infection Control Manual for Child Care Facilities.[4] This serves as an excellent resource for daycare settings to assist in minimizing the risk and spread of communicable diseases.

Health Care Facilities and Institutional Settings

Health care facilities present as a high-risk environment for two reasons:

1. Typically, the clients/patients within the facility are there because either they have a medical condition that puts them at greater risk for contracting an infection or they are already infected and experiencing complications of a communicable disease.
2. Health Care Workers serve as a vehicle for transmission of a communicable disease to a high-risk individual.

To avoid this, familiarity with and adherence to Infection Control Guidelines and Practices is of paramount importance.

Travel

[4] http://www.saskatchewan.ca/live/births-deaths-marriages-and-divorces/starting-a-family/early-learning-and-child-care/child-care .

Travel to destinations where one can be exposed to communicable diseases that are not common or endemic in Saskatchewan or Canada.

Environments Where Individuals are in Close Proximity to Others

This may be related to crowded living conditions such as multi-family homes and homeless shelters. It may also be related to environments where people are in close proximity to groups of people such as in schools, airport/bus terminals, public transportation vehicles, etc.

Public Health Agency of Canada (2007) states "Statistics Canada uses the measure of persons per room (PPR) to assess crowding in houses. PPR is calculated by dividing the number of persons living in a dwelling by the number of rooms." Rooms refers to all rooms within a dwelling excluding bathrooms, halls, vestibules and rooms used solely for business purposes. This statistic is not sensitive to the size of the house or the rooms, or to the composition of the household (age of occupants, etc.). For diseases transmitted through the respiratory route it is found that the higher the number of persons per room, the greater the risk for transmission within the household. Greater than one person per room puts the occupants at greater risk for these illnesses.

References

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

British Columbia Centre for Disease Control. (2007). *BCCDC Communicable disease control manual.* Retrieved August, 2010 from http://www.bccdc.ca/dis-cond/comm-manual/default.htm.

College of Registered Nurses of Manitoba (2010). *Hand washing resource page*. Retrieved August, 2010 from http://www.crnm.mb.ca/news-publicawareness-handwashing.php.

Government of Newfoundland and Labrador. (2010). *Disease control manual: Diseases transmitted by respiratory routes.* Retrieved August, 2010 from http://www.health.gov.nl.ca/health/publications/diseasecontrol/dcresp.pdf.

Government of Saskatchewan. (2007). *The Public Health Act, 1994*. Regina, SK: Queens Printer Saskatchewan.

Government of Saskatchewan. (2008). *The Health Information Protection Act*. Regina, SK: Queens Printer Saskatchewan.

Health Canada. (2002). *Canadian immunization guide* (6th ed.). Ottawa, Canada: Canadian Medical Association.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Mandell, G. L., Bennett, J. E., Dolin, R. (2000). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (5th ed.). Philadelphia, PA: Churchill Livingstone.

Public Health Agency of Canada. (2003). *Health Canada's preparedness for and response to respiratory infections season and the possible re-emergence of SARS.* Retrieved August, 2010 http://www.phac-aspc.gc.ca/sars-sras/ris-sir/index-eng.php.

Public Health Agency of Canada. (2007). Housing conditions that serve as risk factors for tuberculosis infection and disease. *Canada Communicable Disease Report (CCDR), Vol. 33*, October 1 2007. Retrieved August, 2010 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/07vol33/acs-09/index-eng.php.

Toronto Public Health. (2006). *Breaking the chain – Infection control manual: Infection prevention and control for homeless and housing service providers.* Retrieved August, 2010 from www.toronto.ca/health/cdc/pdf/infectioncontrolmanual.pdf.

Respiratory and Direct Contact

Diphtheria

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.
From Public Health to Ministry of Health: Immediate.

Public Health Follow-up Timeline: Initiate within 24-48 hrs.

Information

Case Definition (Public Health Agency of Canada, 2008)

Confirmed Case	Clinical illness* or systemic manifestations compatible with diphtheria in a person with an upper respiratory tract infection or infection at another site (e.g., wound, cutaneous) PLUS at least one of the following: • Laboratory confirmation of infection: ▪ isolation of *Corynebacterium diphtheriae* with confirmation of toxin from an appropriate clinical specimen,[1] including the exudative membrane **OR** ▪ isolation of other toxigenic Corynebacterium species (*C. ulcerans* or *C. pseudotuberculosis*) from an appropriate clinical specimen, including the exudative membrane **OR** ▪ histopathologic diagnosis of diphtheria. **OR** • Epidemiologic link (contact within two weeks prior to onset of symptoms) to a laboratory-confirmed case.
Probable Case	Clinical illness* in the absence of laboratory confirmation or epidemiologic link to a laboratory-confirmed case.
Suspected Case	Upper respiratory tract infection (nasopharyngitis, laryngitis or tonsillitis) with or without a nasal, tonsillar, pharyngeal and/or laryngeal membrane.
*Clinical illness is characterized as an upper respiratory tract infection (nasopharyngitis, laryngitis or tonsillitis) with or without an adherent nasal, tonsillar, pharyngeal and/or laryngeal membrane, plus at least one of the following: • gradually increasing stridor; • cardiac (myocarditis) and/or neurologic involvement (motor and/or sensory palsies) one to six weeks after onset; • death, with no known cause.	

[1]Refer to Specimen Collection and Transport for details on appropriate clinical specimens.

Causative Agent
Corynebacterium diphtheriae (C. diphtheriae), a gram positive bacillus. Diphtheria is caused by toxigenic strains of the bacteria *C. diphtheriae* of gravis, mitis or intermedius biotypes.

Symptoms
The various clinical forms of diphtheria are caused by an exotoxin produced by toxigenic strains of the bacteria; all toxigenic strains produce an identical toxin. Toxin production occurs following infection of a *C. diphtheriae* strain by a corynebacteriophage containing the tox gene.

Non-toxigenic strains can also produce a mild, localized disease resembling that caused by toxigenic strains.

- Infections that are not apparent tend to outnumber clinical cases, and both toxigenic and non-toxigenic strains of *C. diphtheriae* may be harboured in the nasopharynx, skin, and other sites of asymptomatic carriers.
- Pharyngeal diphtheria is a febrile illness beginning with a low-grade fever, a sore throat, and a yellow-white discharge over the tonsils, uvula, and throat. This discharge becomes grey, patchy, and membranous and may involve the larynx, where it can present an airway obstruction, particularly in infants and young children. There may be marked edema of the neck (classic bull neck appearance).
- Nasal diphtheria is often a mild form of the disease and is characterized by one-sided nasal secretions.
- Diphtheria may also present as a cutaneous, vaginal, or conjunctival infection.
- Cutaneous or mucous membrane diphtheria is usually found in warmer climates or among the homeless and will present as a shallow ulcer coated with a pseudomembrane.

Complications

- Affects distant tissues and organs after 2 to 6 weeks, in particular cranial and peripheral motor and sensory palsies, and myocarditis.
- A case-fatality rate of 5% to 10% is reported for non-cutaneous diphtheria, with the highest rates among the very young and the elderly (Manitoba Health, 2001).

Incubation Period
Usually 2-5 days, sometimes as long as 10 days.

Reservoir/Source
Humans are the only reservoir - harboured in the nasopharynx, skin, and other sites.

Mode of Transmission

- Direct transmission of toxigenic strains or indirect transmission by transfer of the bacteriophage from a person infected with a toxigenic strain to a non-toxigenic strain in a carrier.
- Contact with nasopharyngeal secretions of a case or carrier.
- Rarely, contact with articles soiled with discharges from infected skin lesions.
- Raw milk has also served as a vehicle for transmission.

Period of Communicability

- Variable, until virulent bacilli have disappeared from discharges and lesions. For example:
  - effective antibiotic therapy promptly ends shedding within 4 days;
  - without treatment, infectivity usually last 2 weeks or less (seldom more than 4 weeks);
  - the rare chronic carrier may shed organisms for 6 months or more.

Specimen Collection and Transport
The diagnostic specimen is a throat swab in reduced charcoal transport medium.

Material for culture should be obtained by collecting throat swabs and placing them in Amies transport medium. Swabs should be taken from the inflamed areas of the throat and nasopharynx in symptomatic patients. Swabs should be taken for culture before antibiotic therapy is initiated. Confirmatory diagnosis requires isolation and identification of the organism, and toxigenicity testing, and may take several days.

If cutaneous diphtheria is suspected, swabs should be collected from the base of the lesion. Specimens should be transported as soon as possible.

Do not wait for laboratory results before initiating treatment.

Methods of Control/Role of Investigator

Prevention and Education
Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered and as well as provides information on high-risk groups and activities. As diphtheria is a vaccine-preventable illness, attention should be placed on immunization.

Immunization
Immunize infants, children and adults according to the recommended schedule. Refer to Saskatchewan Immunization Manual.[1]

Education

- Education should be provided regarding respiratory etiquette and measures to prevent transmission.
- Educate the public about the disease and the need for active immunization. Immunization information fact sheets can be used to guide discussion.

Management
See Attachment – Recommendations for the Management of Diphtheria Cases and Contacts Algorithm.

I. Case
Collaborate with the primary care provider to determine respective roles and responsibilities (e.g., contact tracing, education, and follow-up).

History

- Determine case status including a review of the immunization history. Do not wait for laboratory results before initiating treatment.
- Obtain travel history or history of immigration within the past week.
- Identify contacts (refer to Contact Definition).
- Refer to Attachment - Diphtheria Case Investigation Worksheet to guide follow-up.

[1] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Treatment/Supportive Therapy

- **Diphtheria Antitoxin** - For pharyngeal diphtheria, early administration of diphtheria antitoxin is recommended to neutralize the circulating diphtheria toxin. It should be given in the early stages if diphtheria is suspected. "The site and size of the diphtheria membrane, the degree of toxic effects, and the duration of illness are guides for estimating the dose of antitoxin" (American Academy of Pediatrics, 2009, p. 281). Dosage should be coordinated by the clinician, infectious disease (ID) specialist and Medical Health Officer (MHO). Diphtheria antitoxin can be obtained from Population Health Branch, Saskatchewan Ministry Health. See Appendix D - Publicly Funded Medications for Chemoprophylaxis/Treatment.
- Antimicrobial therapy is not a substitute for antitoxin treatment.
- Likewise, antitoxin treatment is not a substitute for antibiotic therapy (Health Canada, 1998).
- **Antimicrobial Therapy** - Treatment choices are governed by the most recent guidelines. The public health practitioner should direct any questions regarding the current treatment protocols to the physician or MHO. Refer to Heymann, other texts and clinical treatment guidelines for specific treatment details. See Appendix H - Sources for Clinical Treatment Guidelines. Heymann (2008) indicates the following:
  - Procaine penicillin G IM or parenteral erythromycin is recommended until the patient can swallow comfortably, at which point the treatment may be given orally. A total of 14 days treatment is recommended.
  - Supportive treatment, in hospital or home is advised under strict isolation involving routine contact precautions for cutaneous and droplet precautions in instances of pharyngeal until 2 consecutive throat cultures are negative for diphtheria bacilli. These cultures should be taken not less than 24 hours apart and not less than 24 hours after the completion of a 14-day course of antibiotics.
- For cutaneous diphtheria, the skin lesions should be cleaned with soap and water, and a course of oral antibiotics should be given for a 10-day period. Antitoxin may be of some use in cutaneous disease, because of toxic sequelae (American Academy of Pediatrics, 2009).

Immunization
Immunization against diphtheria should begin during convalescence because there is no guarantee that immunity to diphtheria is conferred by natural infection.

Exclusion
Exclude and isolate **all** cases from work, school, daycare, and other public environments using precautions appropriate to the site of infection until two cultures (nasal and pharyngeal) taken 24 hours apart and at least 24 hours after completion of a 14-day course of appropriate antibiotics, are negative.

Referrals
To the appropriate specialist(s) including an ID specialist.

II. Contacts/Contact Investigation

Refer to Attachment – Diphtheria Contact Investigation Worksheet to guide follow-up.

Contact Definition

- Close contacts are defined as:
  - household members;
  - friends, relatives, and caretakers who regularly visit the home;
  - kissing and/or sexual contacts;
  - those who share the same room at school or work;
  - healthcare staff exposed to oropharyngeal secretions of the infected person (staff who have taken appropriate isolation precautions need not be considered contacts).

Follow up of contacts involves:

Education

- All contacts (or their parents if children are contacts) should be provided with information on the disease, risk factors, prevention and necessary follow-up tests, treatments, and exclusion requirements.

Testing/Prophylaxis

- Collect appropriate screening and case-finding specimens (see Specimen Collection). Samples for culturing should be taken from nasal and pharyngeal swabs **before** antibiotic treatment is started (Health Canada, 1998).
  - A single intramuscular dose of benzethine penicillin G or a 7 to 10 day course of oral erythromycin is recommended for all close contacts exposed to diphtheria regardless of their immunization status (Heymann, 2008).
    - If carrier status is determined, refer to Carrier Management.
  - Follow-up surveillance should continue for 7 days. "All close contacts should be kept under daily surveillance for 7 days from the date of last contact with the case and assessed clinically for signs and symptoms of diphtheria" (Health Canada, 1998).

Immunization

- Assess the immunization status of all contacts.
- Previously immunized contacts who have not received a booster dose within 10 years should receive a booster dose of diphtheria toxoid.
- Under-immunized contacts should have a primary series initiated.

Exclusion

- Exclude under-immunized contacts from school, daycare, health care, and food handling until 2 cultures taken 24 hours apart and at least 24 hours after completion of a 14 day course of appropriate antibiotics, are negative.
- Exclude adult contacts from the workplace until bacteriologic examination proves them not to be carriers for those occupations that involve handling food (especially milk) or close association with under-immunized adults or children (Heymann, 2008).
- Keep all close contacts under active daily surveillance for signs and symptoms for 7 days. Refer to Attachment – Diphtheria Contact Investigation Worksheet. Exclude anyone who becomes symptomatic or whose cultures return positive (Heymann, 2008).

III. Carrier Management

Carrier Definition

One who harbours, and may disseminate, the bacterium without discernable clinical disease.

Testing

- Follow-up pharyngeal cultures should be obtained from contacts proven to be carriers at a minimum of 2 weeks after completion of therapy.
- If cultures are positive, an additional 10-day course of erythromycin should be given.

Treating

- For carriers, a single intramuscular dose of benzathine penicillin G (600,000 units for persons < 6 years of age, and 1.2 million units for persons ≥ 6 years of age), or 7 to 10 day course of oral erythromycin (40 mg/kg/day to a maximum of 1 g/day for children, and 1 g/day) divided in 4 doses for adults has been recommended (Heymann, 2008).

Immunization

- Ensure appropriate immunizations are up-to-date.

Exclusion

- Standard and droplet precautions should be observed for hospitalized carriers with cutaneous diphtheria until 2 negative cultures are obtained from lesions at least 2 weeks after completion of antibiotics.
- Carriers should be excluded from food handling and working with children who are under-immunized until 2 negative cultures have been obtained after completion of antibiotics.
- Carriers should pay strict attention to personal hygiene, particularly:
  - respiratory etiquette;
  - hand hygiene;
  - keeping infected wounds covered.

IV. Environment

Child Care Centre Control Measures

Although an outbreak of diphtheria would be rare, if it occurs the following should be implemented:

- Provide information (not personal information) to the parents of the children in the daycare or school. See Attachment – Diphtheria Template Letter to Parents.
- An immunization information sheet containing diphtheria can be provided and used as a guide.

Children who have not completed the primary series of immunization against diphtheria should begin, or finish the series. These children should be referred to their local public health office.

Institutional Control Measures

- Consultation between Public Health/MHO and infection control staff is important.
- Strict isolation of cases in hospital until two consecutive negative cultures are obtained from throat and nasopharyngeal swabs are obtained at least 24 hours apart and at least 2 weeks after completion of antibiotic therapy. If cultures are difficult to obtain, isolation should be not be discontinued until 14 days after the beginning of antibiotic therapy.
  - Droplet precautions should be used for pharyngeal diphtheria.
  - Contact precautions should be used for cutaneous diphtheria.

Epidemic Measures

Immunize the largest possible proportion of the population group involved especially infants and preschool children.

If unimmunized adults are affected, immunize the groups most affected and individuals at high risk of exposure to cases. Provide a second dose of vaccine one month later to ensure two doses are received.

Travellers to countries where epidemics occur should have their diphtheria status reviewed and updated when necessary (American Academy of Pediatrics, 2009).

References

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

Centers for Disease Control and Prevention. (2008). *Manual for the surveillance of vaccine-preventable diseases* (4th ed.). Atlanta, GA: Author. Retrieved October, 2010 from www.cdc.gov/**vaccines**/pubs/surv-**manual**/front-portion.pdf.

Government of Newfoundland and Labrador. (2010). *Disease control manual.* Retrieved October, 2010 from http://www.health.gov.nl.ca/health/publications/diseasecontrol/vpd_2010.pdf.

Health Canada. (1998). Guidelines for the control of diphtheria in Canada. *Canada Communicable Disease Report (CCDR), 24S3,* July 1998. Retrieved October, 2010 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/98vol24/24s3/index.html.

Health Canada. (1999). Infection control guidelines: Routine practices and additional precautions for preventing the transmission of infection in health care. *Canada Communicable Disease Report (CCDR), 25S4,* July 1999. Retrieved October, 2010 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Health Canada. (2002). Infection control guidelines: Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR), 28S1,* March 2002. Retrieved October, 2010 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

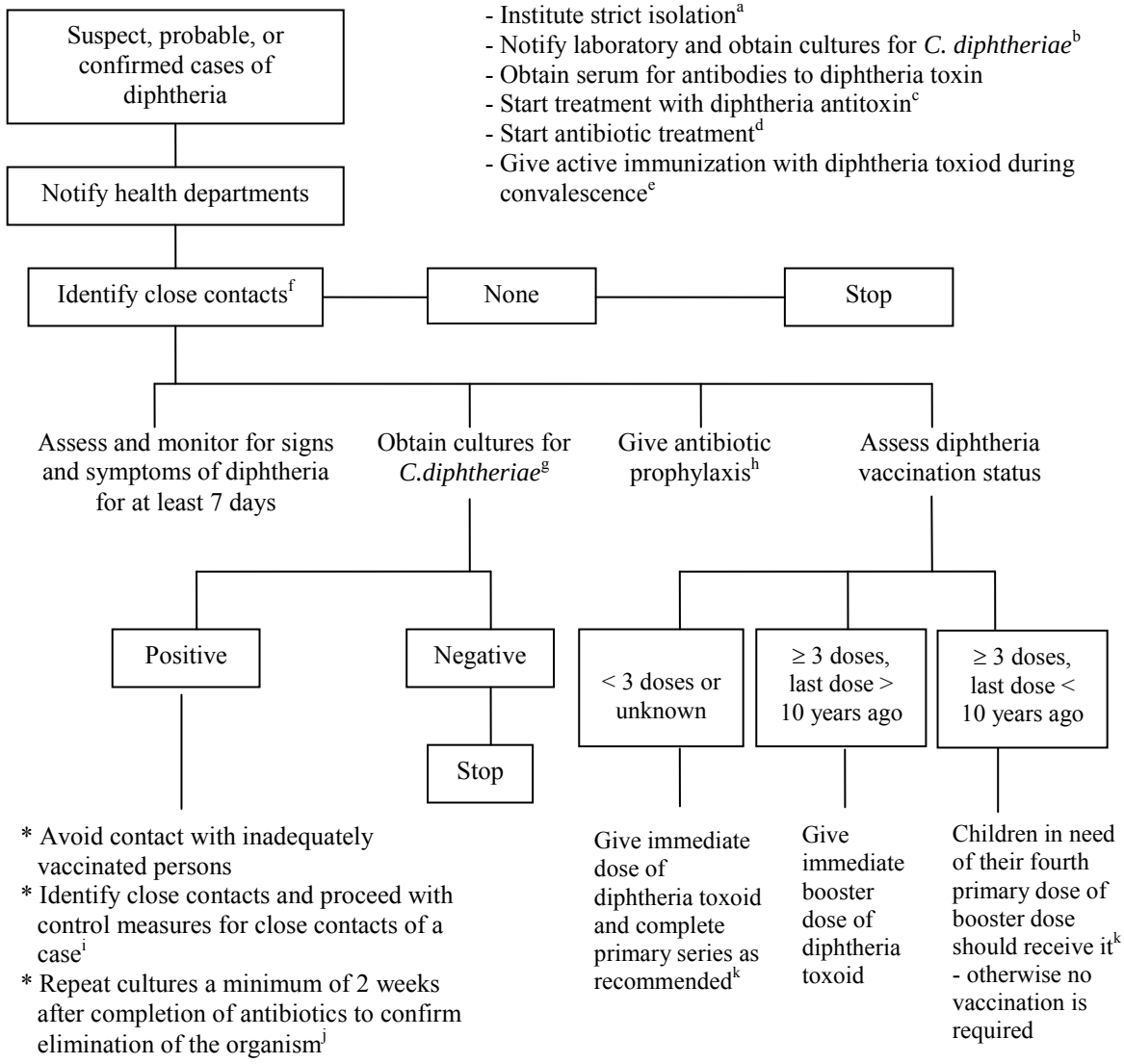
Manitoba Health. (2001). *Communicable disease management protocols: Diphtheria.* Retrieved October, 2010 from http://www.gov.mb.ca/health/publichealth/cdc/protocol/index.html.

Public Health Agency of Canada. (2006). *Canadian immunization guide* (7th ed.). Ottawa, Canada: Public Works and Government Services Canada.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2*, November 2009. Retrieved October, 2010 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Diphter-eng.php.

Diphtheria

Attachment – Recommendations for the Management of Diphtheria Cases and Contacts Algorithm



Adapted from CDC Diphtheria Worksheet which was based on Farizo et al. (24), Clinical Infectious Diseases 1993, 16:59-68.

a. Strict isolation with contact and droplet precautions for all potentially infectious cases, as well as a private room and the use of masks, gowns, and gloves for all persons entering the room. Maintain isolation until elimination of the organism is demonstrated by negative cultures of two samples obtained at least 24 hours apart after completion of antimicrobial therapy.
b. Both nasal and pharyngeal swabs should be obtained for culture.
c. The recommended dosage and route of administration of antitoxin depends on the extent and duration of disease. **Refer to Guidelines for the Control of Diphtheria in Canada at** http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/98vol24/24s3/24s3e_e.html **for detailed dosage recommendations for equine diphtheria antitoxin**.
d. Antibiotic therapy is not a substitute for antitoxin treatment. **Refer to Guidelines for the Control of Diphtheria in Canada for detailed antibiotic dosage recommendations for cases.** Eliminations of *C. diphtheriae* should be confirmed by two negative cultures of throat and nasopharyngeal swabs taken at least 24 hours apart, a minimum of 2 weeks after antibiotics are completed. Persistent carriage of the organism should be treated with an additional 10-day oral course of erythromycin with follow-up cultures.
e. Vaccination is required because clinical diphtheria does not necessarily confer immunity.
f. Close contacts include household members and other persons with a history of direct contact with a case (e.g., caretakers, relatives, or friends who regularly visit the home) as well as health-care personnel exposed to oral or respiratory secretions of a case.
g. Both nasal and pharyngeal swabs should be obtained for culture. Swabs should also be taken from any wounds or skin lesions.
h. Antibiotic therapy is not a substitute for antitoxin treatment. **Refer to Guidelines for the Control of Diphtheria in Canada for detailed antibiotic dosage recommendations for contacts and carriers.**
i. Control measures for contacts of a case should be given a higher priority than control measures for contacts of a carrier.
j. Eliminations of *C. diphtheriae* should be confirmed by two negative cultures of throat and nasopharyngeal swabs taken at least 24 hours apart, a minimum of 2 weeks after antibiotics are completed. Persistent carriage of the organism should be treated with an additional 10-day oral course of erythromycin with follow-up cultures.
k. Refer to the Saskatchewan Immunization Manual at http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx or NACI for recommendations for schedule of vaccination.

Diphtheria
Attachment – Diphtheria Case Investigation Worksheet

Please see the following pages for the Diphtheria Case Investigation Worksheet.

Diphtheria Case Investigation Worksheet

Shaded areas are mandatory for reporting to Saskatchewan Ministry of Health [Indicates field in iPHIS]

Please use YYYY/MM/DD for all dates

PATIENT INFORMATION

Date Reported	Name (Last, First)	HSN

Birth Date	Age	Sex	Pregnant	Ethnicity
		☐ Male ☐ Female ☐ Unknown	☐ Yes ☐ No ☐ Unknown	☐ Arab/West Asian ☐ Asian ☐ Black ☐ Inuit ☐ Latin-American ☐ Métis ☐ North American Indian ☐ South Asian ☐ White ☐ Unknown ☐ Other: _____

Address (Street and No.)	City	Province	Postal Code	Phone

If residential facility or daycare please indicate name:

Date Symptom Onset	Date First Diagnosis (clinical or lab diagnosis)	Date Hospitalized	History of immunization against diphtheria			
			Childhood primary series? ☐ Yes ☐ No ☐ Unknown	If < 18 years old, number of doses?	Boosters as adult? ☐ Yes ☐ No ☐ Unknown	Date of last dose _____ or ☐ Unknown

Description of Clinical Picture	Outcome	Diphtheria as cause of death:
	☐ Recovered, no residual effects ☐ Recovered, residual effects ☐ Unknown ☐ Died – Date: _____	☐ Primary ☐ Contributing ☐ Incidental

Symptoms

- ☐ Fever
- ☐ Sore throat
- ☐ Difficulty swallowing
- ☐ Change in voice
- ☐ Shortness of breath
- ☐ Weakness
- ☐ Fatigue
- ☐ Other

Signs

☐ Fever
If yes Temp ____ F/C

Membrane present
☐ Yes ☐ No
If yes, Sites
- ☐ Tonsils
- ☐ Soft palate
- ☐ Hard palate
- ☐ Larynx
- ☐ Nares
- ☐ Nasopharynx
- ☐ Conjunctive
- ☐ Skin

☐ Soft tissue swelling (around membrane)
Neck edema?
If yes
- ☐ Bilateral
- ☐ Left side only
- ☐ Right side only

If yes, Extent
- ☐ Submandibular only
- ☐ Midway to clavicle
- ☐ To clavicle
- ☐ Below clavicle

- ☐ Stridor
- ☐ Wheezing
- ☐ Palatal weakness
- ☐ Tachycardia
- ☐ EKG abnormalities

Complications

☐ Airway obstruction
Date of onset:
_____
☐ Intubation/traech required

☐ Myocarditis
Date of onset:
_____

☐ (Poly)neuritis
Date of onset:
_____

☐ Other
Describe:

LABORATORY

Specimen culture for diphtheria?	If Yes, date specimen obtained:	Culture result?	Name of lab performing culture:	If culture positive, biotype?
☐ Yes or ☐ No ☐ Unknown	_____ ☐ Unknown	☐ Positive ☐ Negative ☐ Unknown		☐ Mitis ☐ Gravis ☐ Intermedious ☐ Belfanti

If culture positive, results of toxigenicity testing?	Type of specimen? (check all that apply)	PCR result?
☐ Positive ☐ Negative ☐ Unknown ☐ Not done	☐ Clinical swab ☐ Piece of membrane ☐ *C. diphtheriae* isolate	☐ Positive ☐ Negative ☐ Unknown ☐ Not done

(please turn over)

ANTIBIOTICS

Treated with Antibiotics? ☐ Yes ☐ No ☐ Unknown

As an Outpatient? If yes, Date Initiated:	Name of Antibiotic:	Number of Days of Therapy:	Antibiotic Therapy in Hospital? ☐ Yes ☐ No	As an Inpatient? If yes, Date Initiated:	Name of Antibiotic:	Number of Days of Therapy:
_____	_____	_____		_____	_____ ___	_____

Were Antibiotics given in the 24 Hours before Culture?
☐ Yes ☐ No ☐ Unknown

ANTITOXIN INFO

To access Diphtheria Antitoxin, Special Access Program Form A* must be completed and returned to Saskatchewan Ministry of Health.

Date Requested: _____

Date Administered: _____

Amount of DAT administered:

_____ units

EXPOSURE

Country of Residence
☐ Canada
☐ Other

If Other, Country Name: _____

Date of Arrival to Canada _____ or ☐ Unknown

History of International Travel? (2 weeks Prior to Onset)
☐ Yes
☐ No
☐ Unknown

Country(s) Visited:	Dates	
_____	To: _____	From: _____
_____	To: _____	From: _____
_____	To: _____	From: _____

History of Interprovincial Travel? (2 weeks Prior to Onset)
☐ Yes
☐ No
☐ Unknown

Province(s) Visited:	Dates	
_____	To: _____	From: _____
_____	To: _____	From: _____
_____	To: _____	From: _____

Known Exposure to Diphtheria Case or Carrier?
☐ Yes
☐ No
☐ Unknown

Known Exposure to International Travelers?
☐ Yes
☐ No
☐ Unknown

Known Exposure to Immigrants?
☐ Yes
☐ No
☐ Unknown

CONFIRMATION & REPORTING

Has this Suspected Case been reported to the Saskatchewan Ministry of Health? If Yes, Date Reported: _____
☐ Yes
☐ No
☐ Unknown

Person Informed:	Phone:	Fax:
Reporting Physician:	Phone:	Fax:

Final Diagnosis	How was the Final Diagnosis Confirmed?	Final Case Status or Classification: ☐ Confirmed ☐ Probable ☐ Not a case

*http://www.hc-sc.gc.ca/dhp-mps/acces/drugs-drogues/index-eng.php

Signature: _____ Title: _____ Date: _____

Diphtheria
Attachment – Diphtheria Contact Investigation Worksheet

Please see the following pages for the Diphtheria Contact Investigation Worksheet.

Diphtheria Contact Investigation Worksheet

***Close Contact = household members; friends; relatives and caretakers who regularly visit the home; kissing and/or sexual contacts; those who share the same room at school or work; health-care staff exposed to oropharyngeal secretions of the infected person (staff who have taken appropriate isolation precautions need not be considered contacts).**

Close contacts that develop signs/ symptoms should be followed as a case – refer to Diphtheria Case Investigation Worksheet.

CONTACT INFORMATION

Name **Age** **Relation to case**

Contact Phone #

Active Surveillance for S/S	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Indicate Yes or No if S/S is present							

Vaccinated? ☐ Yes ☐ No ☐ Unknown
If vaccinated # of doses: ☐ ≤ 3 ☐ Unknown
Time since last dose: ☐ < 10 yrs ☐ > 10 yrs

Culture taken	Yes	No	Unknown	Culture Results	Positive	Negative	Date of Culture
Nasopharyngeal							
Oropharyngeal							

Antibiotic Prophylaxis: ☐ Yes ☐ No **Medication:**

Name **Age** **Relation to case**

Contact Phone #

Active Surveillance for S/S	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Indicate Yes or No if S/S is present							

Vaccinated? ☐ Yes ☐ No ☐ Unknown
If vaccinated # of doses: ☐ ≤ 3 ☐ Unknown
Time since last dose: ☐ < 10 yrs ☐ > 10 yrs

Culture taken	Yes	No	Unknown	Culture Results	Positive	Negative	Date of Culture
Nasopharyngeal							
Oropharyngeal							

Antibiotic Prophylaxis: ☐ Yes ☐ No **Medication:**

Name **Age** **Relation to case**

Contact Phone #

Active Surveillance for S/S	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Indicate Yes or No if S/S is present							

Vaccinated? ☐ Yes ☐ No ☐ Unknown
If vaccinated # of doses: ☐ ≤ 3 ☐ Unknown
Time since last dose: ☐ < 10 yrs ☐ > 10 yrs

Culture taken	Yes	No	Unknown	Culture Results	Positive	Negative	Date of Culture
Nasopharyngeal							
Oropharyngeal							

Antibiotic Prophylaxis: ☐ Yes ☐ No **Medication:**

Name **Age** **Relation to case**

Contact Phone #

Active Surveillance for S/S	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Indicate Yes or No if S/S is present							

Vaccinated? ☐ Yes ☐ No ☐ Unknown
If vaccinated # of doses: ☐ ≤ 3 ☐ Unknown
Time since last dose: ☐ < 10 yrs ☐ > 10 yrs

Culture taken	Yes	No	Unknown	Culture Results	Positive	Negative	Date of Culture
Nasopharyngeal							
Oropharyngeal							

Antibiotic Prophylaxis: ☐ Yes ☐ No **Medication:**

Name **Age** **Relation to case**

Contact Phone #

Active Surveillance for S/S	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Indicate Yes or No if S/S is present							

Vaccinated? ☐ Yes ☐ No ☐ Unknown
If vaccinated # of doses: ☐ ≤ 3 ☐ Unknown
Time since last dose: ☐ < 10 yrs ☐ > 10 yrs

Culture taken	Yes	No	Unknown	Culture Results	Positive	Negative	Date of Culture
Nasopharyngeal							
Oropharyngeal							

Antibiotic Prophylaxis: ☐ Yes ☐ No **Medication:**

Diphtheria
Attachment – Diphtheria Template Letter to Parents

Date

Dear Parent,

There has been a case of diphtheria diagnosed in the daycare/school that your child attends. Diphtheria is a rare disease which may cause fever, sore throat, and a yellow-white discharge over the back of the throat. An information sheet about diphtheria is included with this letter.

Public health will be reviewing immunization records for all the children and providing immunizations to any child who requires further immunization.

All children who have been in contact with diphtheria should have a throat swab and nasal swab collected and then should be started on preventive medication. Contact your family doctor to have swabs taken and antibiotics started.

If the lab tests indicate that your child is infected with diphtheria your physician will be providing advice about further treatment and testing.

If you have any questions or concerns contact the local Public Health office, your family physician, or the HealthLine at 1-877-800-0002.

Sincerely,

_____
Medical Health Officer

Phone: _____

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Ministry of Health: Immediate.

Public Health Follow-up Timeline: Immediate.

Public Health Purpose for Notification of invasive Group A Streptococcal (iGAS) Disease (adapted from Health Protection Surveillance Center

- To measure the burden of iGAS, identify populations at increased risk and provide a basis for epidemiologic studies;
- To ensure early detection of clusters/outbreaks of iGAS so effective control measures can be implemented;
- To prevent mortality and serious morbidity from iGAS through contact tracing and initiation of chemoprophylaxis;
- To monitor trends in iGAS;
- To monitor the effectiveness of prevention and control measures;
- To inform health care planning; to support ongoing research into sources, transmission, risk factors, pathogenesis and control of iGAS; and
- To inform the public and medical community about iGAS.

Surveillance Case Definition[1] (Public Health Agency of Canada, 2008)

Confirmed case	Laboratory confirmation of infection with or without clinical evidence of invasive disease:* • isolation of group A streptococcus (*Streptococcus pyogenes*) from a normally sterile site (blood, cerebrospinal fluid (CSF), pleural fluid, pericardial fluid, peritoneal fluid, deep tissue specimen taken during surgery [e.g., muscle collected during debridement for necrotizing fasciitis], bone or joint fluid excluding the middle ear and superficial wound aspirates [e.g., skin and soft tissue abscesses^]).

[1] Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

Probable case	Clinical evidence of invasive disease* in the absence of another identified etiology and with non-confirmatory laboratory evidence of infection: • isolation of group A streptococcus from a non-sterile site **OR** • positive group A streptococcus antigen detection.
*****Clinical evidence of invasive disease may be manifested as one or more of several conditions. These include: a) Streptococcal Toxic Shock Syndrome (STSS), which is characterized by hypotension (systolic blood pressure ≤ 90 mmHg in adults or < 5th percentile for age for children) and at least two of the following signs: i. Renal impairment (creatinine level ≥ 177 µmol/L for adults). ii. Coagulopathy (platelet count ≤ 100,000/mm3 or disseminated intravascular coagulation). iii. Liver function abnormality (SGOT [AST], SGPT [ALT], or total bilirubin ≥ 2x upper limit of normal). iv. Adult respiratory distress syndrome (ARDS). v. Generalized erythematous macular rash that may desquamate. b) Soft-tissue necrosis, including necrotizing fasciitis, myositis or gangrene. c) Meningitis.	
^ Wounds are not considered a sterile site with the exception of isolation of group A streptococcus (GAS) and the presence of necrotizing fasciitis and/or STSS.	

Pneumonia with isolation of GAS from a sterile site, or from a bronchoalveolar lavage (BAL) when no other cause has been identified, should be regarded as a form of invasive disease for the purposes of public health management; however, as BAL does not provide a sterile site specimen, the latter would not meet the national case definition and would not be nationally notifiable.

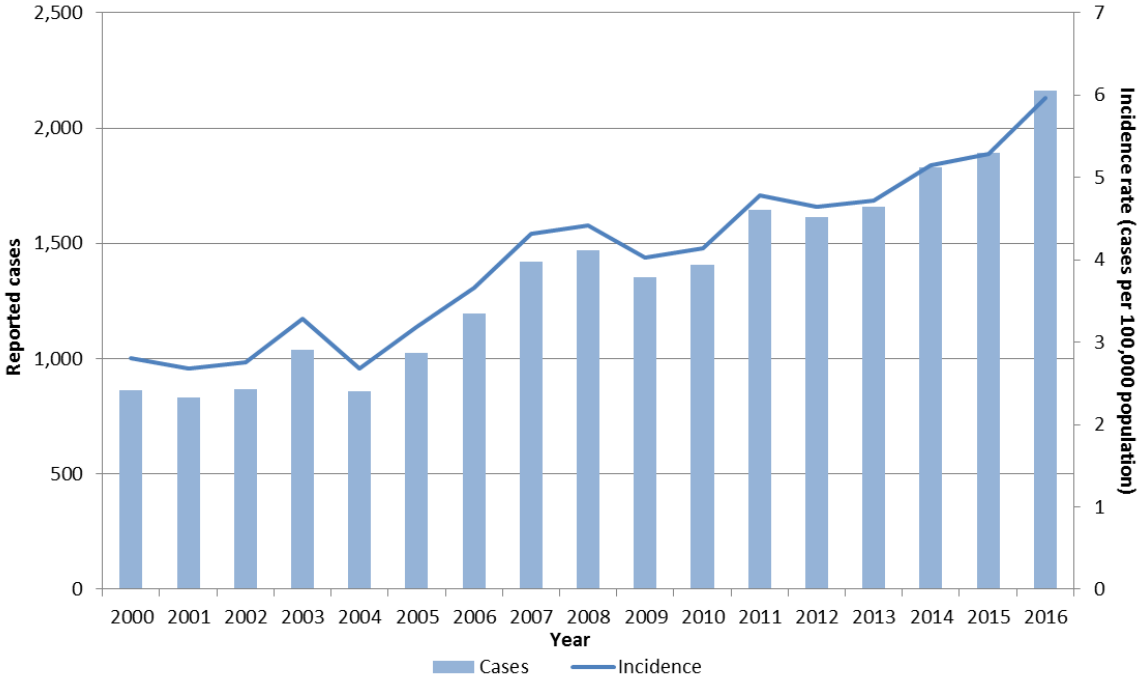
Epidemiology and Occurrence

iGAS in Canada[2]

Figure 1 shows the number of cases and incidence rates of iGAS reported to the Canadian Notifiable Disease Surveillance System from 2000 to 2016. The graph shows the steady increase in the incidence rate of iGAS; doubling between 2004 (2.7/100 000) and 2016 (6.0/100,000).

[2] National Epidemiologic Summary as of February 28, 2018

Figure 1. Number of cases and incidence rates of iGAS in Canada by year, 2000-2016



iGAS in Saskatchewan[3]

Figure 2 shows the number of cases and incidence rates of iGAS in Saskatchewan between 2004-2017. The upsurge in 2008, which was seen across the most westerly provinces and was related to Indigenous people, was not sustained over the following years.

Starting in 2013, a gradual increase in the iGAS trend was noted in Saskatchewan with a doubling of cases by 2017. No definitive reason has been established for this upward trend other than it reflects an upward trend reported in other Canadian provinces.

[3] Saskatchewan Ministry of Health (2018)

Figure 2. Number of cases and incidence rates of iGAS in Saskatchewan, 2004-2017

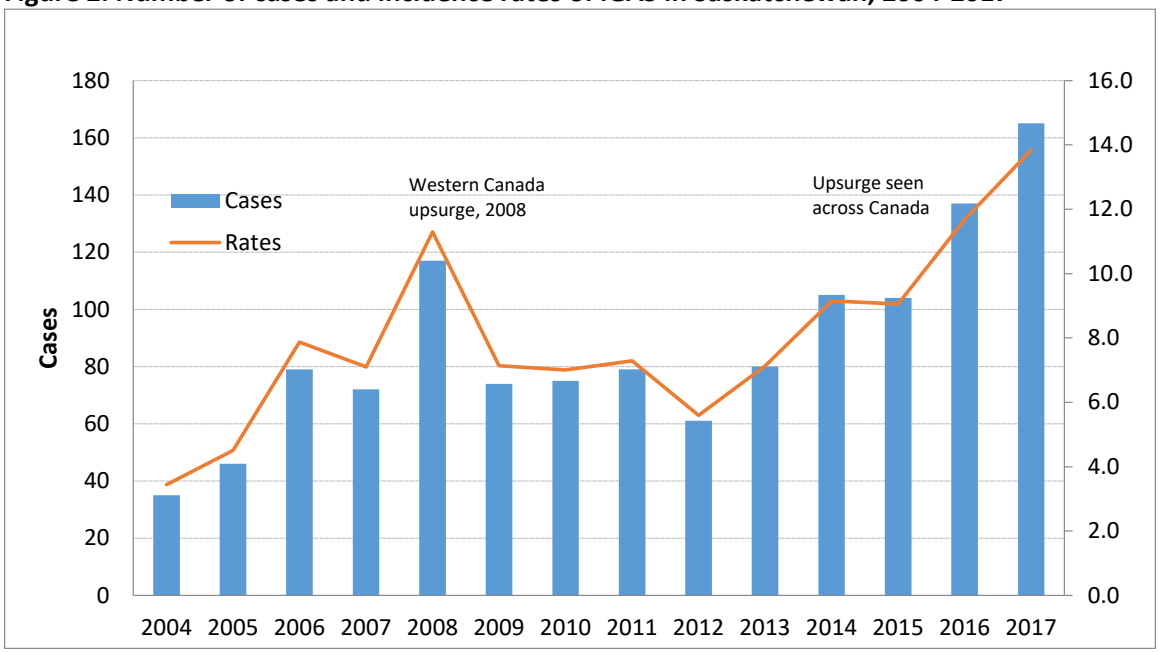
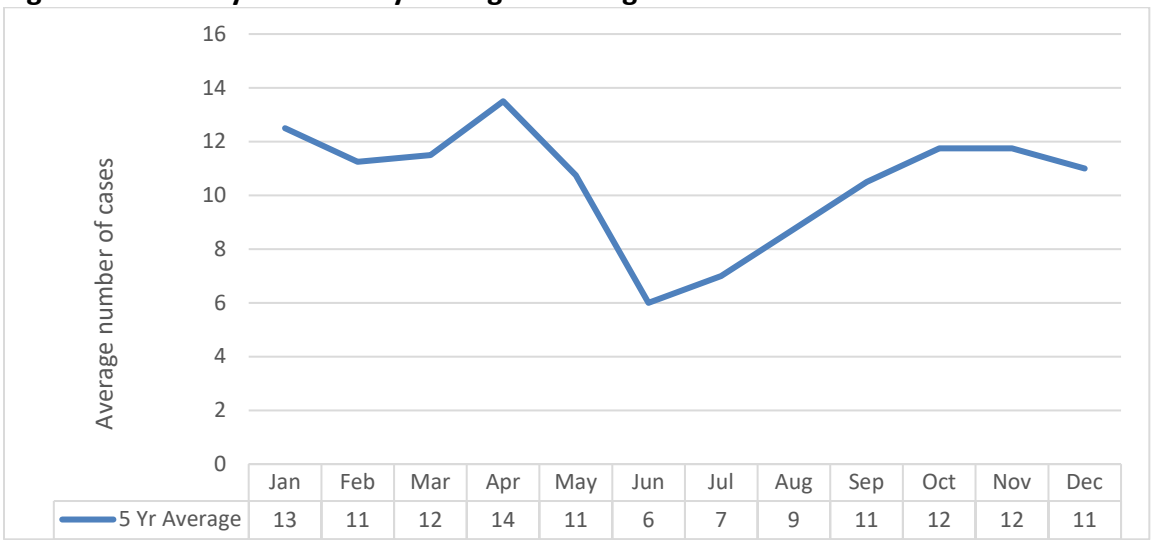


Figure 3 demonstrates the seasonal impacts and a lower incidence in the summer months when there is less crowding of individuals.

Figure 3. iGAS 5-year monthly average showing seasonal variation



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5 Yr Average	13	11	12	14	11	6	7	9	11	12	12	11

Additional Background Information

Causative Agent

Group A streptococcus – *Streptococcus pyogenes,* a gram-positive coccus.

Symptoms

- Early signs and symptoms of necrotizing fasciitis include: fever, severe pain, redness and swelling at the site of wound.
- Symptoms of STSS may include pain (abrupt in onset and severe), pneumonia, acute myocardial infarction, or pericarditis, fever, chills, myalgia, nausea, vomiting, diarrhea, confusion, clinical signs of soft tissue infection (localized swelling and erythema).
- Clinical evidence for STSS is outlined in the case definition, above.
- Refer to clinical textbooks for symptoms of other clinical presentations related to GAS (meningitis, etc.).

Reservoir/Source

Humans.

Incubation Period

The incubation period of iGAS infection has not been determined (Public Health Agency of Canada, 2006).

Period of Communicability

The specified period of infectivity of the index case is:

- 7 days prior to the onset of illness, until 24 hours after the start of treatment.

Mode of Transmission

- Large respiratory droplets.
- Direct person to person contact with patient and or carrier.

Risk Groups/Risk Factors
GAS infection can occur in anyone but risk of iGAS is significantly associated with the following:

- chronic conditions (HIV infection, cancer, heart disease, diabetes, lung disease);
- alcohol abuse;
- injection drug use;
- varicella;
- crowded living conditions;
- suboptimal hygiene practices;
- immunosuppressive therapy;
- elderly (65 years and older);
- systemic steroid use;
- Aboriginal persons.

Specimen Collection and Transport
To confirm the diagnosis of GAS, specimens should be cultured from:

- a sterile site (e.g., blood, CSF, joint fluid) or;
- an aspirate from a non-sterile site, in individuals with clinical signs of hypotension and/or invasive disease such as necrotizing fasciitis.

All GAS isolates from iGAS disease are to be sent to the Roy Romanow Provincial Laboratory (RRPL) for typing and screening for toxin genes. Characterization of the organism (emm type, whole genome sequencing) becomes important for monitoring virulence or identifying transmission patterns.

Public Health Investigation

I. Case

Refer to Attachment – Invasive Group A Streptococcal Disease Data Collection Worksheet to assist.

History

- Presentation of illness and for severity of disease.
- Health conditions that may render the individual more susceptible to invasive disease (see Risk Factors).
- Contact details - refer to Attachment - Contact Follow-up Form in the Respiratory and Direct Contact Introduction and General Considerations section.

Public Health Interventions

Assessment

- Assess for contacts as per Table 1.

Communication

- When clients are hospitalized, communication with hospital staff and or infection control staff is important.

Education

- All cases should be provided disease information as well as information on prevention and control measures including period of communicability.

Exclusion and Isolation

- Individuals are communicable until at least 24 hours after antibiotics are started.
- Strict enforcement of standard infection control practices including contact and droplet precautions. Refer to local Infection Control Manuals.

Immunization

- There is no immunization for GAS.
- If the case has any risk factors, they may be eligible for other immunizations. If not up-to-date, offer vaccines as appropriate.

Referrals

- Inform clients that supportive services (physiotherapy, occupational therapy, Home Care) are available if necessary. Refer client to primary caregiver for referrals.
- Consultation with the Medical Health Officer (MHO) may be required to determine if chemoprophylaxis is to be offered to contacts.

Treatment/Supportive Therapy

- For patient management, the client's physician is to consult an infectious disease specialist.
- Antibiotic treatment is required.
- Client may need to be hospitalized.
- In the case of necrotizing fasciitis, surgical intervention may be required.

II. Contacts/Contact Investigation

Contact Definition/Categorization

Table 1. Definition of Close Contacts
• Household contacts of a case who has spent at least 4 hours/day on average in the previous 7 days or 20 hours/week with the case. • Non-household persons who share the same bed with the case or had sexual relations with the case. • Persons who have had direct mucous membrane contact with the oral or nasal secretions of a case (e.g., mouth-to-mouth resuscitation, open mouth kissing) or direct contact with an open skin lesion of the case. • Injection drug users who have shared needles with the case.

Source: Guidelines for the Prevention and Control of Invasive Group A Streptococcal Disease, 2006.

In order to be considered a close contact, there must have been exposure to the case during the period of communicability (see above). School classmates (kindergarten and older), work colleagues, as well as social or sports contacts of a case are not usually considered close contacts, unless they fit into one of the above categories.

Public Health Interventions

Assessment

- Assess for symptoms.
- Assess for risk factors.

Education

All close contacts (irrespective of whether prophylaxis is given of confirmed cases of severe disease should be alerted to signs and symptoms of iGAS disease, and be advised to seek medical attention immediately should they develop febrile illness or any other clinical manifestations of GAS infection within 30 days of diagnosis in the index case.

Chemoprophylaxis

- Chemoprophylaxis is used to prevent disease in colonized individuals and in those who have recently been exposed, thereby decreasing transmission of a strain known to cause severe infection.
- **NOTE:** Chemoprophylaxis should only be offered to close contacts of a confirmed severe case (cases of STSS, soft-tissue necrosis including necrotizing fasciitis, myositis, or gangrene, meningitis, GAS pneumonia or other life-threatening conditions) or a confirmed case resulting in death (Public Health Agency of Canada, 2006).
- Chemoprophylaxis is not routinely recommended for contacts of cases that are not severe (i.e., bacteremia or septic arthritis). These cases often have milder disease

than those with invasive disease. Their contacts are also likely to have milder disease as well since there is consistency in type and severity of disease with particular strains of GAS.

- Refer to contact definition for listing of those who require prophylaxis. A close contact will be given prophylaxis if they were in contact with the case during the period of communicability (noted above).
- Even though the incubation period is not known, most subsequent cases occur within 7 days after last contact with an infectious case (Public Health Agency of Canada, 2006). Close contacts should ideally be given antibiotics within 24 hours of case identification; however it is still advisable for up to 7 days. The benefits of starting prophylaxis should be discussed with the MHO if it is beyond 7 days of last contact with the infectious case.
- Refer to Attachment - Recommended Chemoprophylaxis Regimens for Close Contacts.

Testing

- Not routinely done – Refer to Attachment - Investigation and Control Approaches for Long Term Care Facilities for the screening procedures for instances in long term care[4] (LTC) facilities.

Exclusion

- No need to exclude contacts from day care, school or work.

III. Environment

Table 2. Impetus for Action for Organization-based Outbreaks or Clusters	
Long-term care facility	▪ An incidence rate of culture-confirmed GAS infections > 1 per 100 residents per month, OR ▪ At least 2 cases of culture-confirmed infection in one month in facilities with less than 200 residents, OR ▪ An incidence rate of suspected GAS infections of > 4 per 100 residents per month.
Child care centre	▪ One severe case of iGAS disease in a child attending a child care centre.
Hospital	▪ One or more linked invasive or non-invasive GAS cases in either patients or staff occurring within one month of an iGAS case (see Annex 3 – National Guidelines, Oct 2006).

Source: Adapted from Guidelines for the Prevention and Control of Invasive Group A Streptococcal Disease, 2006.

[4] Adapted from Guidelines for the Prevention and Control of Invasive Group A Streptococcal Disease, October 2006.

Child Care Centre Control Measures

- Although outbreaks of iGAS disease occurring among children attending a child care centre are rare, when a case occurs the following needs to occur:
    - strict enforcement of standard infection control practices – refer to the Saskatchewan Ministry of Health Infection Control Manual for Child Care Facilities;[5]
    - details of the Child Care Centre (size, attendees, etc.) should be collected.

Institutional Control Measures

- Residents of LTC facilities are at increased risk of morbidity and mortality due to iGAS disease because of their older age and higher prevalence of underlying conditions.
- Strict enforcement of standard infection control practices including contact and droplet precautions are required. Refer to Local Infection Control Manual. In LTC facility outbreaks, the implicated strain is usually widespread within the facility and limited provision of chemoprophylaxis to close contacts is not the optimal approach. Refer to Attachment - Investigation and Control Approaches for Long Term Care Facilities for detailed information regarding investigation and control approaches that may be useful.

IV. Epidemic Measures

- Determine source and manner of spread.
- Investigate promptly the extent of the exposure.
- If there is exposure of groups like schools, LTCs, daycare centres, it may be necessary to administer preventative antimicrobial therapy to the whole group.
- Consider extensive consultation with various specialties including: infectious disease, laboratory medicine, Saskatchewan Ministry of Health, others as appropriate.

Prevention Measures

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk individuals and environments.

[5] http://www.saskatchewan.ca/live/births-deaths-marriages-and-divorces/starting-a-family/early-learning-and-child-care/child-care.

Education

- Good hygiene, especially hand washing is important to prevent the spread of bacteria.
- Provide information sheet, Attachment - Invasive Group A Streptococcal Disease.
- Non-severe cases will be dealt with on a case-by-case basis in consultation with the MHO.

Revisions

Date	Change
September 2018	• Updated to align with Panorama configuration • Incorporated the purpose for notification of cases to public health • Provided clarification in the case definition on the limited applicability of specimens from wounds. • Incorporated an Epidemiology and Occurrence section to the chapter. • Rearranged and updated the style into the new format of the Manual. • References reaffirmed or updated as necessary.

References

Health Protection Surveillance Centre (2006). The management of invasive group A streptococcal infections in Ireland. Retrieved June, 2018 from https://www.hpsc.ie/a-z/other/groupastreptococcaldiseasegas/publications/File,2080,en.pdf

Public Health Agency of Canada. (2006). Guidelines for the prevention and control of invasive group A streptococcal disease. *Canada Communicable Disease Report (CCDR), 32S2,* October 2006. Retrieved June, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/06vol32/32s2/index-eng.php.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance*. Canada Communicable Disease Report (CCDR), 35S2,* November 2009. Retrieved June, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Strep_A-eng.php.

Government of Saskatchewan

Streptococcal Invasive Disease (group A) Data Collection Worksheet

PANORAMA

Please complete **all** sections.

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection (if not the same):	

B) INVESTIGATION INFORMATION

SUBJECT SUMMARY->RESPIRATORY & DIRECT CONTACT ENCOUNTER GROUP->CREATE INVESTIGATION

Disease Summary Classification: CASE	**Date**	***Classification: CONTACT***	***Date***	***LAB TEST INFORMATION:***
☐ Confirmed	YYYY / MM / DD	☐ *Contact*	*YYYY / MM / DD*	*Date specimen collected:*
☐ Does Not Meet Case Definition	YYYY / MM / DD	☐ *Not a Contact*	*YYYY / MM / DD*	*YYYY / MM / DD*
☐ Person Under Investigation	YYYY / MM / DD	☐ *Person Under Investigation*	*YYYY / MM / DD*	*Specimen type:*
☐ Probable	YYYY / MM / DD			☐ *Blood* ☐ *CSF* ☐ *Other*

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province (specify where)	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD		

REPORTING NOTIFICATION Name of Attending Physician or Nurse:	Location:
Physician/Nurse Phone number:	Date Received (Public Health): YYYY / MM / DD
Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician ☐ Other_____	

Streptococcal Invasive Disease (group A) Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

C) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Acute respiratory distress syndrome (ARDS) - CXR/CT*		YYYY / MM / DD	**Muscle inflammation (myositis)**		YYYY / MM / DD
Arthritis - septic		YYYY / MM / DD	Necrosis - skin and tissue		YYYY / MM / DD
Cardiac - myocardial infarction		YYYY / MM / DD	**Necrotizing fasciitis**		YYYY / MM / DD
Cellulitis		YYYY / MM / DD	Confusion		YYYY / MM / DD
Chills		YYYY / MM / DD	Pain - severe		YYYY / MM / DD
Fever		YYYY / MM / DD	Cardiac - pericarditis		YYYY / MM / DD
Gangrene		YYYY / MM / DD	Pharyngitis (sore throat)		YYYY / MM / DD
Hypotension*		YYYY / MM / DD	Pneumonia		YYYY / MM / DD
Infection - soft tissue		YYYY / MM / DD	**Rash - erythematous macular ***		YYYY / MM / DD
Infection - wound		YYYY / MM / DD	**Renal impairment *** (refer to CDC Manual for parameters)		YYYY / MM / DD
Lab - liver function abnormality* (refer to CDC Manual for parameters)		YYYY / MM / DD	**Sepsis (e.g. bacteremia, septicemia, etc.)**		YYYY / MM / DD
Lab - platelet count low* (refer to CDC Manual for parameters)		YYYY / MM / DD	Skin - pain and swelling		YYYY / MM / DD
Meningitis		YYYY / MM / DD	**Streptococcal toxic shock syndrome (STSS)** Includes hypotension and 2 or more of the S/S with an *		YYYY / MM / DD
Other s/s					

D) INCUBATION AND COMMUNICABILITY

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Communicability for Case (period for transmission):
Earliest Possible Communicability Date: YYYY / MM / DD **Latest Possible Communicability Date**: YYYY / MM / DD

Communicability Calculation Details:

E) RISK FACTORS (RF followed by + impact the Immunization Forecaster)

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	YES	N – No NA – not asked U - Unknown	DESCRIPTION	YES	N – No NA – not asked U - Unknown
Chronic Medical Condition - Cardiac Disease +			**Medical Risk Factor** - Varicella	YYYY / MM / DD	
Chronic Medical Condition - Diabetes Mellitus +			**Medical Treatment** - Surgery/surgical wound	YYYY / MM / DD	
Chronic Medical Condition - Liver disease +			**Setting** - Crowded living conditions (>1 person per room excluding bathrooms)		
Chronic Medical Condition - Lung disease +			**Special Population** – Homeless +		
Chronic Medical Condition - Renal disease +			**Special Population** - Lives in a communal setting		
Contact to a known case (Add'l Info)	YYYY / MM / DD		**Special Population** - LTC Facility +		

Streptococcal Invasive Disease (group A) Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

DESCRIPTION	YES	N – No NA – not asked U - Unknown	DESCRIPTION	YES	N – No NA – not asked U - Unknown
Immunocompromised - HIV +			**Special Population** - Self-reported Indigenous identity		
Immunocompromised - Related to underlying disease or treatment			**Substance Use** - Alcohol		
Medical Risk Factor - Postpartum			**Substance Use** - Injection drug use (including steroids) +		
Medical Risk Factor History of injury (Add'l Info)	YYYY / MM / DD		Travel - Outside of Canada (Add'l Info)	YYYY / MM / DD	
Medical Risk Factor - Skin infection or dermatological condition	YYYY / MM / DD		Travel -Outside of Saskatchewan, but within Canada (Add'l Info)	YYYY / MM / DD	

F) TREATMENT

INVESTIGATION-> MEDICATIONS->MEDICATIONS SUMMARY

Medication *(Panorama = Other Meds) :* _____

Prescribed by:_____ Started on: YYYY / MM / DD

G) INTERVENTIONS

INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

Assessment:
☐ Assessed for contacts YYYY / MM / DD
Investigator name

Education/counselling: Investigator name
☐ Prevention/Control measures YYYY / MM / DD
☐ Disease information provided YYYY / MM / DD

Communication:
☐ Phone call attempted (day) YYYY / MM / DD
☐ Phone call attempted (evening) YYYY / MM / DD
☐ Home visit attempted YYYY / MM / DD
☐ Letter sent YYYY / MM / DD
☐ Text message sent YYYY / MM / DD
☐ Other communication (See Investigator Notes) YYYY / MM / DD
☐ Letter (See Document Management) YYYY / MM / DD
Investigator name

Immunization:
☐ Eligible Immunization(s) recommended YYYY / MM / DD
Investigator name

Isolation:
☐ Facility isolation YYYY / MM / DD ☐ Home isolation YYYY/MM/ DD
Investigator name

Referral
☐ Consult with MHO YYYY / MM / DD
Investigator name

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD
☐ Disease-Info/Prev-Cont/Assess'd for Contacts YYYY/ MM / DD

Other Investigation Findings:
☐ Investigator Notes YYYY / MM / DD
☐ Document Management

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

Streptococcal Invasive Disease (group A) Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

H) OUTCOMES *(optional except for severe influenza,* LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering	YYYY / MM / DD	☐ ICU/intensive medical care	YYYY / MM / DD	☐ Hospitalization	YYYY / MM / DD
☐ Recovered	YYYY / MM / DD	☐ Intubation /ventilation	YYYY / MM / DD	☐ Unknown	YYYY / MM / DD
☐ Fatal	YYYY / MM / DD	☐ Other _____	YYYY / MM / DD		

Cause of Death: (if Fatal was selected) _____

I) Transmission Events LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> QUICK ENTRY

Transmission Event ID (system-generated can be documented below	**Exposure Name**	**Setting type** (Select the most appropriate setting for the TE; if >1 select multiple settings will be entered into Panorama)	**Date/Time**	**# of contacts**
		☐Childcare worker/attendee ☐Health care setting ☐ Household ☐Sexual exposure ☐Type of community contact ☐ Congregate/communal living setting		
		☐Childcare worker/attendee ☐Health care setting ☐ Household ☐Sexual exposure ☐Type of community contact ☐ Congregate/communal living setting		
		☐Childcare worker/attendee ☐Health care setting ☐ Household ☐Sexual exposure ☐Type of community contact ☐ Congregate/communal living setting		
		☐Childcare worker/attendee ☐Health care setting ☐ Household ☐Sexual exposure ☐Type of community contact ☐ Congregate/communal living setting		
	iGAS Contacts – Inv ID# _____	☐Multiple Settings	YYYY / MM / DD to YYYY / MM / DD	

J) TOTAL NUMBER OF CONTACTS

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> TE HYPERLINK -> UNKNOWN/ANONYMOUS CONTACTS

Anonymous contacts:_____ (total number of individuals exposed)

Initial Report completed by:		**Date initial report completed:** YYYY / MM / DD

Drug	Dosage	Comments
First line - First generation cephalosporins: cephalexin, cephadroxil, cephradine	Children and adults: 25 to 50 mg/kg/day, **to a maximum of 1 g/day**, in 2 to 4 divided doses x 10 days	Recommended drug for pregnant and lactating women. Should be used with caution in patients with allergy to penicillin. Use of cephalosporins with nephrotoxic drugs (e.g. aminoglycosides, vancomycin) may increase the risk of cephalosporin-induced nephrotoxicity.
Second line - Erythromycin	Children: 5 to 7.5 mg/kg every 6 hours or 10 to 15 mg/kg every 12 hours (base) x 10 days (**to a maximum of the adult dose**) Adults: 500 mg every 12 hours (base) x 10 days	Erythromycin estolate is contraindicated in persons with pre-existing liver disease or dysfunction and during pregnancy. Sensitivity testing is recommended in areas where macrolide resistance is unknown or known to be ≥10%.
Second line - Clarithromycin	Children: 15 mg/kg/day in divided doses every 12 hours (**to a maximum of the adult dose)** Adults: 250 mg po bid x 10 days	Contraindicated in pregnancy. Sensitivity testing is recommended in areas where macrolide resistance is unknown or known to be ≥10%.
Second line - Clindamycin	Children: 8 to 16 mg/kg/day divided into 3 or 4 equal doses x 10 days (**to a maximum of the adult dose)** Adults: 150 mg every 6 hours x 10 days	Alternative for persons who are unable to tolerate beta-lactam antibiotics.

Source: Guidelines for the Prevention and Control of Invasive Group A Streptococcal Disease, 2006

All prophylactic regimes are administered orally and taken for 10 days.

Note: All persons who receive chemoprophylaxis should watch for signs and symptoms of invasive GAS disease, for 30 days after the diagnosis of invasive disease in the index patient.

Background

Residents of LTC facilities are at increased risk of morbidity and mortality due to iGAS disease because of their older age and higher prevalence of underlying conditions. When a culture-confirmed case of iGAS disease occurs in a LTC facility, there is a 38% likelihood that a second positive blood culture-confirmed case of the same strain will be detected in the facility within six weeks. A number of outbreaks of iGAS infections have been documented in LTC facilities. Infection is often spread through person-to-person contact, with clustering of cases by room or care unit in some instances. Staff may be a source of or conduit of infection either through poor infection control practices or asymptomatic carriage. However, hospital staff who are carriers are more likely to be the source of infection in outbreaks in acute care facilities, whereas outbreaks in LTC facilities are more often patient-propagated. In LTC facility outbreaks, the implicated strain is usually widespread within the facility and limited provision of chemoprophylaxis to close contacts is not the optimal approach.

Procedure

In addition to strict enforcement of standard infection control practices, the following approach may be useful in the investigation and control of iGAS disease in LTC facilities:

1. When a confirmed case of iGAS disease occurs in a LTC facility such as a nursing home, the facility should:
    a. Report the case to the local Medical Health Officer (MHO) or designate.
    b. Review the facility's nosocomial infection reports, for the previous 4 to 6 weeks, for culture-confirmed cases of GAS disease and cases of skin and soft tissue infections (e.g., pharyngitis and cellulitis). An excess of GAS infection and clinically compatible illness, or LTC facility outbreak, is defined in Table 2 Impetus for Action for Organization-based Outbreaks or Clusters.
    c. Assess the potential for a source of infection from outside the facility (e.g., regular visits from children who have recently been ill).

2. If an excess of GAS infection is identified, the following actions should be considered:
    a. Consult the local Infection Control Practitioner/MHO/CD Epidemiologist team, as to the most practical approach. This could comprise the concentric-circles approach, (i.e., begin screening the closest contacts and extending the investigation from there).
    b. Anyone colonized with GAS should receive chemoprophylaxis.
    c. Non-patient care staff[1] should be asked about possible recent GAS infections. Those with a positive history should be screened for GAS and those persons positive should be treated with antibiotics.
        - Treatment choices are governed by the most recent guidelines. The public health practitioner should direct any questions regarding the current treatment protocols to the physician or MHO. Refer to Heymann and other texts and clinical treatment guidelines for specific treatment details. See Appendix H - Sources for Clinical Treatment Guidelines.
    d. All GAS isolates should have further typing. This should be coordinated through the MHO and the Saskatchewan Disease Control Lab (SDCL). Culturing for a test of cure is recommended for individuals found to have the outbreak-related strain. Culturing for a test of cure is not necessary for individuals infected with a non-outbreak-related strain of GAS.
    e. Re-screen all GAS positive residents and staff including their throat and skin lesion(s) 14 days after the treatment has been started. If this screen is positive, the individual should be retreated with antibiotics and re-screened in 14 days. If still colonized, discontinue treatment unless the facility has an ongoing problem with GAS infection.
    f. Active surveillance for GAS infection should be initiated and continued for 1 to 2 months as determined by the local outbreak team.
    g. Appropriate specimens should be taken for culture to rule out GAS when suspected infections are detected by active surveillance.
3. If no excess is identified, especially if there is evidence of an outside source of infection for the index case, then active surveillance alone for 2 to 4 weeks to ensure the absence of additional cases is warranted.

[1] This includes maintenance and housekeeping staff for example.

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Ministry of Health: Within 72 hours.

Public Health Follow-up Timeline: Initiate within 48 hrs.

Public Health Purpose for Notification of *Haemophilus Influenzae* Disease
(adapted from British Columbia Center for Disease Control [2017])

- To minimize mortality and serious morbidity from *Haemophilus Influenzae* B;
- To rapidly identify close contacts of the case and to provide recommendations for appropriate preventive measures for close contacts so as to prevent further spread of infection and disease;
- To provide information about the disease, its transmission, and methods of prevention;
- To identify clusters or outbreaks of infection and to initiate appropriate prevention and control measures;
- To track epidemiology trends of meningococcal disease in Saskatchewan including risk factors and distribution;
- To monitor the effectiveness of prevention and control measures;
- To plan expansion or introduction of future immunization programs;
- To provide timely clinical care including diagnosis and treatment using current, evidence-based guidelines;
- To make timely and evidence informed actions on outbreaks; and
- To inform the public and medical community about *Haemophilus Influenza* disease.

Information

Table 1. Differences between *Haemophilus Influenzae* Invasive B (Hib) and Non-Hib Typeable Strains

	Hib	**Non-Hib Typeable Strains a,c,d,e,f**
Reportable	Yes	Yes
Public Health Follow-Up	Yes	No
Invasive Disease	More common	Less common

Communicability	Not considered communicable after 24-48 hours of effective antimicrobial therapy	Unknown
Hospitalized Patients	Routine and droplet precautions until 24 hours after initiation of antimicrobial therapy	Not defined
Treatment	Third generation cephalosporin or chloramphenicol in combination with ampicillin	No defined regimen. Ceftriaxone and cefotaxime have been used successfully
Management of Contacts	Recommended	Not recommended
Prevention	Vaccine	No vaccine

Source: Manitoba Health Communicable Disease Management Protocol, 2007.

Surveillance Case Definitions[1] (Public Health Agency of Canada, May 2008)

Table 2. *Haemophilus Influenzae* B Invasive Disease

Confirmed Case	Clinical evidence[1] of invasive disease with laboratory confirmation of infection: • isolation of *H. influenzae* (serotype b) (Hib) from a normally sterile site^ **OR** • isolation of *H. influenzae* (serotype b) from the epiglottis in a person with epiglottitis.
Probable Case	Clinical evidence of invasive disease with laboratory evidence of infection: • demonstration of *H. influenzae* type b antigen in cerebrospinal fluid **OR** • demonstration of *H. influenzae* DNA in a normally sterile site **OR** • buccal cellulitis or epiglottitis in a child < 5 years of age with no other causative organisms isolated.
[1]Clinical illness associated with invasive disease due to *H. influenzae* includes meningitis, bacteraemia, epiglottitis, pneumonia, pericarditis, septic arthritis and empyema.	

^Includes: blood, cerebrospinal, joint, pleural, pericardial, or peritoneal fluid.

[1] Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

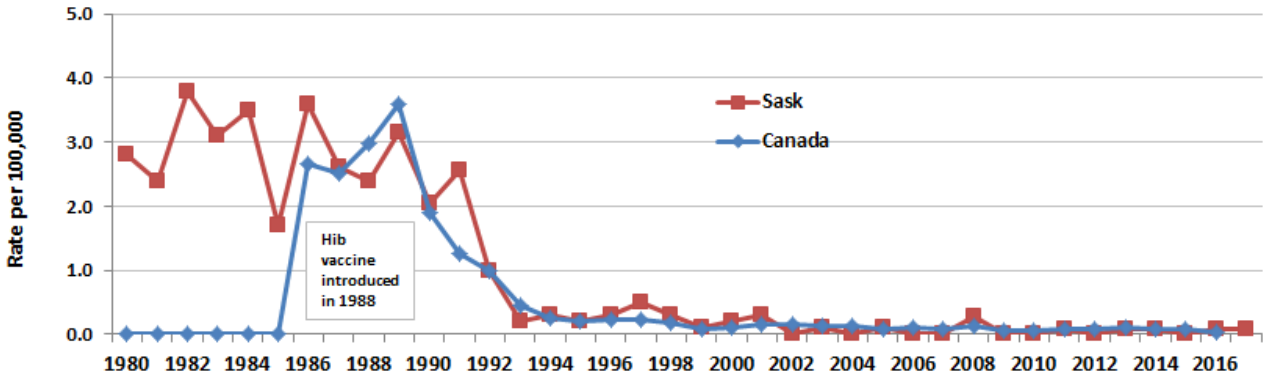
Table 3. *Haemophilus Influenzae* Non-B Invasive Disease

Confirmed Case	Clinical evidence[1] of invasive disease with laboratory confirmation of infection: • isolation of *H. influenzae* (serotype a,c,d,e,f, undifferentiated and non-typeable isolates) from a normally sterile site **OR** • isolation of *H. influenzae* (serotype a,c,d,e,f, undifferentiated and non-typeable isolates) from the epiglottis in a person with epiglottitis.
[1]Clinical illness associated with invasive disease due to *H. influenzae* includes meningitis, bacteraemia, epiglottitis, pneumonia, pericarditis, septic arthritis and empyema.	

Epidemiology and Occurrence

Saskatchewan introduced Hib vaccine in 1988 resulting in a dramatic decline in reported cases. The highest number of cases were reported in 1984 and 1986 (36 cases), mainly infants. The average number of reported cases in the pre-vaccine era was 21 cases per year; the yearly average over the decades 1998 - 2017 was about one case per year (19 cases). These are largely unimmunized children. Between 1979 and 1993 there were 96 deaths and there have been no reported deaths caused by invasive Hib since then.

Figure 1. *H.Influenza* Rates Saskatchewan and Canada before and after Immunization Program



Additional Background Information

Causative Agent

Haemophilus influenzae, a gram-negative coccobacilli. Encapsulated strains are classified into sub-types. Serotype b (Hib) is the most pathogenic.

Symptoms

Illnesses often caused by *H. influenzae* type b include meningitis, epiglottitis, pneumonia, and bacteremia.

Symptoms include fever, lethargy, drowsiness, rapid or difficult breathing, sore throat, stiff neck and bulging fontanelles in infants. Most cases are in children 2 months to 4 years of age (Heymann, 2015; American Academy of Pediatrics, 2015).

Reservoir/Source

Upper respiratory tract of humans.

Incubation Period

Unknown, probably variable, and possibly as short as 2-4 days.[2]

Period of Communicability

As long as organisms are present, asymptomatic carriage may occur indefinitely in up to 2-5% of children. Communicability ends within 24-48 hours after the beginning of antibiotic therapy.

Mode of Transmission

Person-to-person from direct contact or droplet contact of oral or nasal secretions, e.g., saliva, nasal mucus, or respiratory secretions.

Specimen Collection and Transport

If invasive disease, blood cultures and CSF specimens should be submitted as per local lab specimen collection and transport guidelines.

[2] Most "secondary" cases in families usually occur within 2 weeks and in childcare settings within 60 days. However, this may be transmission from an asymptomatic carrier rather than the index case.

Public Health Investigation

I. Case

Refer to Attachment – *Haemophilus Influenzae* Type B (invasive) Data Collection Worksheet to assist.

History

- Onset of illness, presentation and treatment (with what and when) – to determine incubation period and period of communicability which helps to identify the possible source and contacts to be followed.
- Review immunization history of the case.
- Determine case status including a review of the immunization history. Do not wait for specific typing results before initiating public health follow-up.
- Identify contacts (refer to contact definition).
- Determine if case has underlying medical conditions or falls into a risk category.

Public Health Interventions

Assessment

- Assess for contacts - Aggressive contact tracing, identification, and appropriate management, is the foundation to the prevention of secondary cases. Refer to Contact Definition.
- Obtain names, addresses, and phone numbers of all possible contacts. This information may need to be obtained from someone close to the case.

Communication

- Letters can be sent to classrooms and other group settings where individual contact tracing is not required to inform them of the exposure, symptom monitoring and when to seek medical attention (see Sample letter)

Education

- All cases should be provided disease information as well as information on prevention and control measures including period of communicability and avoiding contact with vulnerable individuals.

Immunization

- Ensure the client's entire immunization status is up-to-date once they have recovered.[3]

[3] Life-long immunity is expected following natural infection with Hib in individuals who were older than 24 months at the time of the disease. Take the opportunity to update any other immunizations that the client is eligible for.

- Grabenstein (2011) indicates that children with invasive Hib disease, when younger than 24 months, may not develop adequate anticapsular antibodies and remain at risk for a subsequent episode of the disease. After recovery from this illness episode, these children should be re-vaccinated with Hib vaccine according to age at presentation as if they have not been previously immunized. Children who were older than 24 months of age at time of disease do not need to be immunized as they should develop a protective immune response.
- Refer to Saskatchewan Immunization Manual – Chapter 5[4]

Isolation

- Respiratory isolation for 24 hours following initiation of appropriate antibiotic treatment

Referrals

- When clients are hospitalized, communication with hospital staff and or infection control staff is important.
- Inform clients that supportive services (physiotherapy, occupational therapy, Home Care) are available if necessary. Refer client to primary caregiver for referrals.

Treatment/Supportive Therapy

The public health practitioner should direct any questions regarding the current treatment protocols to the physician or Medical Health Officer (MHO). The following serves as a reference for the public health investigator:

- *Antibiotic treatment is require. For patient management the client's physician should consult an infectious disease specialist.*
- *In addition to therapeutic antibiotics, the case should receive chemoprophlaxis with rifampin before hospital discharge unless the infection was treated with an antibiotic that is effective in eliminating Hib colonization (American Academy of Pediatric, 2009 and Heymann, 2008). Refer to Attachment – Rifampin Chemoprophylaxis Dosage Guide for Haemophilus influenzae Type b for information on dosing.*

[4]https://www.ehealthsask.ca/services/Manuals/Documents/Ch.%205%20Immunization%20Schedules%20Aug%202018.pdf

II. Contacts/Contact Investigation

Contact Definition (American Academy of Pediatrics, 2009)

- Contacts are defined as:
  - a person residing with the case of invasive Hib disease
    OR
  - non-residents who have spent 4 or more hours per day with the index case for at least 5 of the 7 days preceding the day of hospital admission of the case.
- Complete the Attachment – Contact Follow-up Form in the Respiratory and Direct Contact Introduction and General Considerations for all identified contacts.
- Consult with the MHO immediately to determine whether rifampin chemoprophylaxis and/or Hib immunization is necessary.

Public Health Interventions

Assessment

- Assess for symptoms.

Chemoprophylaxis

When indicated, prophylaxis should be initiated as soon as possible given that most secondary cases in households occur during the first week after hospitalization of the index case. As some secondary cases occur later, initiation of prophylaxis seven days or more after hospitalization of the index case may still be of some benefit (American Academy of Pediatrics, 2009). Discuss with the MHO.

Recommended for:

1. **All household contacts**, regardless of age, in the following circumstances:
   - household with at least 1 contact younger than 4 years of age who is unimmunized or incompletely immunized[5] for age;
   - household with a child younger than 12 months of age if the child has not received the primary series of three doses;
   - household with an immunocompromised child, regardless of that child's Hib immunization status (i.e., even if fully immunized).

[5] Complete immunization is determined by the age at when they received their first dose, their current age and the number of doses received to date. Please refer to the Saskatchewan Immunization Manual for further details: http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx

2. **Preschool/daycare contacts (including staff)**, regardless of age, when **2** or more cases of invasive Hib disease have occurred within 60 days among attendees.
   - If the index case attends preschool or day care, and the decision is to provide rifampin to all contacts, inform all parents of the situation. Together with the facility operator, plan and provide parent education about invasive Hib disease. It is especially important to discuss contraindications and side effects of rifampin.
3. **The case**, if younger than 2 years of age or is a member of a household with a susceptible contact, and who had been treated with a regimen other than cefotaxime sodium or ceftriaxone sodium; chemoprophylaxis usually is provided just before discharge from hospital (American Academy of Pediatrics, 2009).

   Chemoprophylaxis MAY be considered in the following situations at the discretion of the Medical Health Officer:
   - Health care workers who have administered mouth-to-mouth resuscitation to the case (British Columbia Centre for Disease Control, 2005).

Testing

- Contacts of an index case should **not** be swabbed for culture of Hib prior to initiating rifampin chemoprophylaxis since the result has no bearing on the decision to administer rifampin.

Immunization

- Post-exposure Hib immunization is not known to decrease the risk of transmission. Rather, the situation presents an opportunity for completion of Hib immunization of contacts.
- Offer immunization to contacts less than 60 months of age who are unimmunized or not completely immunized[6] for age and to individuals older than 5 years of age who have chronic conditions associated with increased risk of invasive Hib disease. Refer to Saskatchewan Immunization Manual[5] – Chapter 5: Immunization Schedules and Chapter 7: Immunization of Special Populations).

Exclusion

- Any individual who is eligible to receive prophylaxis should be isolated at home until 24 hours after prophylaxis has been initiated.

[6] Complete immunization is determined by the age at when they received their first dose, their current age and the number of doses received to date. Please refer to the Saskatchewan Immunization Manual for further details: http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspxl.

- New attendees to a daycare should not be permitted until rifampin prophylaxis has been completed.
- Persons entering a setting (new staff and attendees) where rifampin is being given should also receive it and be excluded as above.

III. Environment

Child Care Centre/Schools Control Measures

Ensure each parent receives information about Hib disease. See Attachment – Sample Fact Sheet on *Haemophilus Influenzae* Type B Disease.

Management of the centre. Three situations may occur:

1. If **one case** of invasive Hib disease occurs in a centre with one child under 24 months attending:
   - Notify and educate staff and parents of contacts of the case to be alert for anyone with fever, sore throat, headache, stiff neck, drowsiness, rapid or difficult breathing, excessive irritability, or symptoms at the site of infection. Seek prompt evaluation by a physician for any ill child.
   - The centre director must notify public health if any additional children become ill.
   - The advisability of rifampin prophylaxis in exposed childcare groups with unimmunized or incompletely immunized children is controversial. Discuss this with the MHO.
   - Notify parents of other childcare centre attendees of the occurrence of a case of Hib disease (see the appropriate Attachment – Sample Letter about *Haemophilus Influenzae* Type B Invasive Disease – Prophylaxis Recommended or Sample Letter about *Haemophilus Influenzae* Type B Invasive Disease – Prophylaxis NOT Recommended).
   - Assess immunization status of children.
   - Recommend age-appropriate Hib immunization for all incompletely immunized or unimmunized children.
2. If **one case** of invasive Hib disease occurs in a centre and all children in the centre are at least 24 months of age, regardless of immunization status:
   - Educate parents and staff to be alert for anyone with fever, sore throat, headache, stiff neck, drowsiness, rapid or difficult breathing, excessive irritability, or symptoms at the site of infection. Seek prompt evaluation by a physician for any ill child.

- Notify all parents of the occurrence of a case of Hib disease (see Attachment – Sample Letter about *Haemophilus Influenzae* Type B Invasive Disease – Prophylaxis NOT Recommended).
- The centre director must notify public health if any additional children become ill.
- Do not recommend prophylaxis or vaccine.

3. If **two or more cases** of invasive Hib disease occur within 60 days and incompletely immunized children attend the centre, carry out the same procedures as for one case but prophylaxis for all attendees and staff is recommended.
   - Notify all parents of the occurrence of a case of Hib disease (see Attachment – Sample Letter about *Haemophilus Influenzae* Type B Invasive Disease – Prophylaxis Recommended).
   - Absent attendees should be contacted to determine if they are contacts/cases.
   - All new attendees entering a setting where rifampin has been used within two months must be age-appropriately immunized (Government of Manitoba, 2007).
   - See Chemoprophylaxis section.

IV. Epidemic Measures
Not applicable

Prevention and Education

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization

- Immunize infants, children and adults according to the recommended schedule. Refer to Saskatchewan Immunization Manual.[7]
- Complete immunization is determined by the age at when they received their first dose, their current age and the number of doses received to date. Please refer to the Saskatchewan Immunization Manual[2] for further details.

[7] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx .

Education

- Educate the public about the disease and the need for active immunization.
- Immunization information fact sheets can be used to guide discussion.
- Education should be provided regarding respiratory etiquette and measures to prevent transmission.

Revisions

Date	Change
September 2018	• Updated to align with Panorama configuration; • Clarified the purpose for notification of cases to public health; • Incorporated an Epidemiology and Occurrence section into the chapter; • Incorporated *Haemophilus Influenzae* Infection (invasive) Data Collection Worksheet; • Rearranged and updated the style into the new format of the Manual. • Implemented boxes to draw attention to treatment and chemoprophylaxis information.

References:

Alberta Health and Wellness. (2005). *Public health notifiable disease management guidelines: Haemophilus influenzae*. Retrieved September, 2018 from http://www.health.alberta.ca/professionals/notifiable-diseases-guide.html.

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

British Columbia Centre for Disease Control. (2005). *BCCDC Communicable disease control manual: Haemophilus influenzae type b.* Retrieved June, 2012 from http://www.bccdc.ca/NR/rdonlyres/7AE56F39-C179-434C-80E7-C0304D91AAA7/0/Epid_GF_Hib_Sept_2005.pdf.

Canadian Pharmacists Association. (2006). *Compendium of pharmaceuticals and specialties (CPS): The Canadian drug reference for health professionals.* Ottawa, Canada: Author.

Grabenstein, J. D. (2010) *Immunofacts: Vaccines and immunologic drugs 2011* (36th revision). St. Louis, MO: Wolters Kluwar Health.

Health Canada. (1999). Infection control guidelines – Routine practices and additional precautions for preventing the transmission if infection in health care. *Canada Communicable Disease Report (CCDR), 25S4,* July 1999. Retrieved November, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Mandell, G. L., Bennett, J. E., Dolin, R. (2000). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (5th ed.). Philadelphia, PA: Churchill Livingstone.

Manitoba Health. (2007). *Communicable disease management protocols: Invasive Haemophilus influenza disease.* Retrieved September, 2018 from http://www.gov.mb.ca/health/publichealth/cdc/protocol/ihd.pdf.

Public Health Agency of Canada. (2006). *Canadian immunization guide* (7th ed.). Ottawa, Canada: Public Works and Government Services Canada.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR*), *35S2*, November 2009. Retrieved November, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/index-eng.php.

Government of Saskatchewan

PANORAMA

Haemophilus inflenzae infection (invasive) Data Collection Worksheet

Please complete **all** sections.

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of investigation if not the same:	

B) INVESTIGATION INFORMATION

LHN-> SUBJECT SUMMARY-> RESPIRATORY & DIRECT CONTACT ENCOUNTER GROUP-> CREATE INVESTIGATION

Disease Summary Classification: CASE	**Date**	***Classification: CONTACT***	***Date***	***LAB TEST INFORMATION:***
☐ Confirmed	YYYY / MM / DD	☐ *Contact*	*YYYY / MM / DD*	*Date specimen collected:*
☐ Does Not Meet Case	YYYY / MM / DD	☐ *Not a Contact*	*YYYY / MM / DD*	*YYYY / MM / DD*
☐ Person Under Investigation	YYYY / MM / DD	☐ *Person Under Investigation*	*YYYY / MM / DD*	*Specimen type:*
☐ Probable	YYYY / MM / DD			☐ *Blood* ☐ *Urine* ☐ *Stool*

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province (specify where)	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD		

REPORTING NOTIFICATION Name of Attending Physician or Nurse**:**	Location:
Physician/Nurse Phone number:	Date Received (Public Health): YYYY / MM / DD

Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician ☐ Other_____

Haemophilus inflenzae infection (invasive) Data Collection Worksheet

Please complete **all** sections**.**

Panorama Client ID: _____
Panorama Investigation ID: _____

C) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Arthritis - septic		YYYY / MM / DD	Lethargy (fatigue, drowsiness, weakness, etc)		YYYY / MM / DD
Bulging fontanelle		YYYY / MM / DD	**Meningitis**		
Cardiac - pericarditis		YYYY / MM / DD	Neck stiffness (nuchal rigidity)		YYYY / MM / DD
Cellulitis		YYYY / MM / DD	Confusion		YYYY / MM / DD
Dyspnea (shortness of breath)		YYYY / MM / DD	**Pneumonia**		YYYY / MM / DD
Epiglottitis		YYYY / MM / DD	Respiratory compromise		YYYY / MM / DD
Fever		YYYY / MM / DD	**Sepsis (e.g. bactremia, septicemia, etc.)**		YYYY / MM / DD
Infection - empyema		YYYY / MM / DD			
Other s/s					

D) INCUBATION AND COMMUNICABILITY

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):
Earliest Possible Exposure Date: YYYY / MM / DD **Latest Possible Exposure Date**: YYYY / MM / DD

Exposure Calculation details:

Communicability for Case (period for transmission):
Earliest Possible Communicability Date: YYYY / MM / DD **Latest Possible Communicability Date**: YYYY / MM / DD

Communicability Calculation Details:

E) RISK FACTORS

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	Yes Start Date	N, NA, U	Add'l Info
Contact - Daycare	YYYY / MM / DD TE		
Contact to a known case (Add'l Info)	YYYY / MM / DD AE		
Special population – Attends Childcare	YYYY / MM / DD TE		
Special population – Attends school	YYYY / MM / DD TE		
Travel - Outside of Canada (Add'l Info)	YYYY / MM / DD TE		
Travel - Outside of Saskatchewan, but within Canada (Add'l Info)	YYYY / MM / DD TE		

F) IMMUNIZATION HISTORY INTERPRETATION SUMMARY

LHN -> INVESTIGATION-> IMMUNIZATION HISTORY INTERPRETATION SUMMARY

Interpretation Date: YYYY / MM / DD

Interpretation of Disease Immunity: ☐ IOM - Fully immunized (for age) ☐ IOM - Partially immunized

☐ IOM – Unimmunized ☐ IOM - Unclear immunization history **Valid doses received**: _____ **Doses needed**: _____

Reason: ☐ IIOM – Interpretation of history by investigator

Haemophilus inflenzae infection (invasive) Data Collection Worksheet

Please complete **all** sections

Panorama Client ID: _____
Panorama Investigation ID: _____

G) TREATMENT

INVESTIGATION-> MEDICATIONS->MEDICATIONS SUMMARY

Medication *(Panorama = Other Meds)* : _____

Prescribed by:_____ Started on: YYYY / MMM / DD

H) INTERVENTIONS

INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

Assessment:
☐ Assessed for contacts YYYY / MM / DD
Investigator name

Isolation:
☐ Facility isolation YYYY / MM / DD Investigator name
☐ Home isolation YYYY / MM / DD Investigator name

Communication:
☐ Other communication (See Investigator Notes) YYYY / MM / DD
Investigator name
☐ Letter (See Document Management) YYYY / MM / DD
Investigator name
☐ Letter YYYY / MM / DD
Investigator name

Testing:
☐ Laboratory testing recommended YYYY / MM / DD
Investigator name

Treatment:
☐ Treatment not recommended YYYY / MM / DD
Investigator name

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD
☐ Disease-Info/Prev-Cont/Assess'd for Contacts YYYY/ MM / DD

Other Investigation Findings:
☐ Investigator Notes ☐ See Document Management

Education/counseling: Investigator name
☐ Prevention/Control measures YYYY / MM / DD
☐ Disease information provided YYYY / MM / DD

Referral:
☐ Consultation with MHO ☐ Primary Care Provider
☐ Infectious Disease Specialist

Immunization:
☐ Eligible immunizations recommended YYYY / MM / DD
☐ Disease-specific immunization recommended YYYY / MM / DD
☐ Disease-specific immunization given YYYY / MM / DD
Investigator name

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

Haemophilus inflenzae infection (invasive) Data Collection Worksheet

Please complete **all** sections

Panorama Client ID: _____
Panorama Investigation ID: _____

I) OUTCOMES *(optional except for severe influenza,*

LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering	YYYY / MM / DD	☐ ICU/intensive medical care	YYYY / MM / DD	☐ Hospitalization	YYYY / MM / DD
☐ Recovered	YYYY / MM / DD	☐ Intubation /ventilation	YYYY / MM / DD	☐ Unknown	YYYY / MM / DD
☐ Fatal	YYYY / MM / DD	☐ Other _____	YYYY / MM / DD		

Cause of Death: (if Fatal was selected) _____

J) Transmission Events

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> QUICK ENTRY

Transmission Event ID	Exposure Name	Setting type (Consider the following settings for TE; if >1 select "multiple settings" in Panorama)	Date/Time	# of contacts
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities (e.g daycare)		
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities(e.g daycare)		
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities (e.g daycare)		
	Hib Contacts – Inv ID# _____	☐Multiple Settings	YYYY / MM / DD to YYYY / MM / DD	

K) TOTAL NUMBER OF CONTACTS

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> TE HYPERLINK -> UNKNOWN/ANONYMOUS CONTACTS

Anonymous contacts:_____ (total number of individuals [including groups that 1:1 follow-up is not required or is not feasible])

1. **What is *Haemophilus influenzae* type b disease?**
   - *Haemophilus influenzae* type b (Hib) is a bacterial infection that can cause deadly brain infections and other serious infections like meningitis (swelling of the covering of the brain and spinal cord), blood infections, pneumonia (lung infection), and infections of other parts of the body.

2. **How is Hib disease spread?**
   - Hib is carried in the nose and throat of children and adults who may be healthy or have mild symptoms. It is then spread to another person through contact with discharges or droplets from the nose or mouth through activities such as kissing, sharing food, utensils, or glasses, or coughing directly on someone.

3. **What will decrease the risk of getting Hib disease?**
   - The best way to prevent infection with Hib is through immunization.
   - Hib vaccine is recommended for all children starting at 2 months of age. Children need a total of 4 shots, given at 2, 4, 6, and 18 months. This vaccine is included in routine immunization provided by Saskatchewan Ministry of Health. Make sure your child's immunizations are up to date.

4. **What are the signs and symptoms of Hib disease?**
   - Hib infections are sometimes difficult to recognize. In general, any infection that seems more serious than usual should be brought to a doctor's attention. Symptoms to look for are:
     - fever;
     - drowsiness;
     - stiff neck;
     - rapid or difficult breathing;
     - loss of appetite;
     - skin or joints that are red, tender, or swollen.
   - If you child develops any of these symptoms, see a doctor immediately for treatment.

5. **How is Hib disease diagnosed?**
   - Lab tests look for the bacteria from various sites (blood, cerebrospinal fluid, etc.) from individuals who are ill.

6. **How is Hib disease treated?**

- Hib is treated with antibiotics. Treatment with antibiotics should be started immediately to reduce serious complications.

7. Who should receive preventive treatment?

- Medications to prevent getting or spreading Hib may be needed for those who live in the same house with a child who had Hib disease, and for children and employees in childcare settings. Check with your local public health office for advice.

8. What are the long-term complications of Hib disease?

- Hib can infect the throat and then can spread causing meningitis, pneumonia, or ear, skin, joint, or blood infections.
- If Hib meningitis occurs, death occurs in one out of 20 children and permanent brain damage in 10-30 % of the survivors.

9. Who is at risk of getting Hib disease?

- Since the vaccine was introduced, the disease usually occurs in children who are too young to be immunized or children who have not finished their immunizations.

For more information contact:
Your local public heath office,
OR your physician or nurse practitioner,
OR the HealthLine at 1-877-800-0002.

References:
American Academy of Pediatrics, 2009.
Control of Communicable Disease Manual, Heymann (2008).

Date

Dear Parent/Guardian:

This letter is to let you know that your child had contact with a child who has been diagnosed with an infection caused by *Haemophilus influenzae* type b (Hib). Hib is a bacteria ("germ") that causes serious infections. More information about Hib is included in the attached Fact Sheet.

Hib infections are sometimes difficult to recognize. In general, any infection that seems more serious than usual should be brought to a doctor's attention. Symptoms to look for:

- drowsiness;
- stiff neck;
- rapid or difficult breathing;
- extreme irritability;
- skin or joints that are red, tender, or swollen.

Notify Public Health at _____ if your child becomes ill with any of the symptoms listed above.

The risk of your child getting this illness is low and Public Health is NOT recommending that your child receive any medicine. Further you should watch your child for fever, excessive sleepiness, trouble breathing, stiff neck, sore throat, or joint or skin infection. Call your doctor immediately if your child becomes sick.

Your child may have received immunizations for Hib as an infant. You should however make sure your child's immunizations are up to date. This will help protect your child. If you have other children under 5 years of age that have not been completely immunized for Hib, they should receive the vaccine.

If either you or your physician require(s) further information, please call _____
Yours sincerely,

_____

Medical Health Officer

Date

Dear Parent/Guardian:

This letter is to let you know that your child had contact with a child who has been diagnosed with an infection caused by *Haemophilus influenzae* type b (Hib). Hib is a bacteria ("germ") that causes serious infections. More information about Hib is included in the attached Fact Sheet.

Hib infections are sometimes difficult to recognize. In general, any infection that seems more serious than usual should be brought to a doctor's attention. Symptoms to look for:

- drowsiness;
- stiff neck;
- rapid or difficult breathing;
- extreme irritability;
- skin or joints that are red, tender, or swollen.

Notify Public Health at _____ if your child becomes ill with any of the symptoms listed above.

Because your child was at the daycare with an infected child, he or she is considered a "close contact." Public Health recommends that all close contacts be given medication to prevent further spread of the disease. Please contact us as soon as possible. The most common medication recommended to prevent infection is called rifampin.

Your child may have received immunizations for Hib as an infant. You should however make sure your child's immunizations are up to date. This will help protect your child, but he or she still needs to take medication and should be watched carefully for signs and symptoms. If you have other children under 5 years of age that have not been completely immunized for Hib, they should receive the vaccine.

If you have any questions please call _____

Sincerely,

_____

Medical Health Officer

Dosage Guide based on the noted weight in kg below. **Calculate dose based on exact weight. Maximum dose 600 mg once every 24 hrs x 4 days (doses).**										
Weight in kg ***Dosage by age***	**5**	**6**	**7**	**8**	**9**	**10**	**15**	**20**	**25**	**30** Max or adult dose
<1 mo of age *10 mg/kg* *(25 mg/ml suspension)*	2.0 ml	2.4 ml	2.8 ml	3.2 ml	3.6 ml	4.0 ml				
>1 mo of age *20mg/kg* *(25 mg/ml suspension)*	4.0 ml	4.8 ml	5.6 ml	6.4 ml	7.2 ml	8.0 ml	12.0 ml	16 ml	20 ml	24 ml

Recommendations

1. Use the appropriate weight-specific dose noted in the first column in the chart above for infants and children.
2. Rifampin Pediatric Suspension can be prepared as follows:
   - **Add contents of 3 – 300mg caps or 6 – 150 mg caps of Ripampin to 36 mls of simple syrup to yield a 25 mg/ml suspension.**
   - **SHAKE WELL.**
3. Store prepared suspension and simple syrup at room temperature because of their tendency to crystallize if refrigerated.
4. Discard prepared suspension after treatment course is completed. Preparation expires after 28 days.
5. As much as possible, use only one preparation form per client (i.e., capsule(s) only, or suspension only).
6. Give client a Rifampin information sheet. See Appendix F – Patient Information Sheets – Rifampin

Note:

- Rifampin is contraindicated in pregnancy. Discuss Ceftriaxone dose with MHO.
- If necessary, discuss alternative treatments with MHO for non-pregnant adults.

Respiratory and Direct Contact

Influenza

Notification Timeline:

From Lab/Practitioner to Public Health:

Facility based: Immediate.
Community based: Immediate.

From Public Health to Ministry of Health:

Individual case reporting not applicable.
Initial outbreak report within 24 hours.
Final report within 30 days of completing the investigation.

Public Health Follow-up Timeline:

Facility based: Within 24 hours.
Community based: No follow-up required.

Information

Case Definition (Public Health Agency of Canada, May 2008)

Confirmed Case	Clinical illness* with laboratory confirmation of infection: • isolation of influenza virus from an appropriate clinical specimen **OR** • demonstration of influenza virus antigen in an appropriate clinical specimen **OR** • significant rise (e.g., 4 fold or greater) in influenza IgG titre between acute and convalescent sera **OR** • detection of influenza virus RNA.

*Clinical illness defined as influenza-like illness (ILI) is characterized as acute onset of respiratory illness with fever and cough and with one or more of the following:

- sore throat;
- arthralgia;
- myalgia;
- prostration that could be due to influenza virus.

In children under 5, gastrointestinal symptoms may also be present. In patients under 5, or 65 and older, fever may not be prominent.
Note: Illness associated with novel influenza viruses may present with other symptoms.

Respiratory and Direct Contact

Influenza

Causative Agent
Three strains of influenza virus exist: they are type A, B, and C. Influenza types A and B are associated with epidemics. Emergence of completely new subtypes (antigenic shift) occurs at irregular intervals and occurs only with type A viruses. They are responsible for pandemics and result from the unpredictable recombination of human, swine, or avian (usually duck) antigens. The relatively minor antigenic changes (i.e., antigenic drift) of A and B viruses, that are responsible for frequent epidemics and regional outbreaks, occur constantly.

Symptoms
Acute upper respiratory tract infection (URTI) characterized by fever and chills; headache; malaise; myalgia; prostration; sore throat and cough. Abdominal pain, nausea, and vomiting may also be present. Refer to Case Definition and ILI for details.

Incubation Period
Usually 1-3 days.

Reservoir/Source
Primarily humans. Birds and mammalian reservoirs such as swine are likely sources of new human subtypes thought to emerge through genetic reassortment.

Mode of Transmission
- Breathing droplets that have been sneezed or coughed into the air by someone with influenza, or having the droplets land on the surface of your eye.
- Shaking hands with an infected person or touching a contaminated surface, and then touching your own eyes, nose or mouth.

Period of Communicability
Contagious from 24 hours before the onset of symptoms to 3-5 days after peak symptoms appear.

Specimen Collection and Transport
The recommended specimens for diagnosis of influenza are nasopharyngeal specimens collected on a flocked swab or a vigorous throat swab taken within the first 48 hours of infection. Refer to Saskatchewan Disease Control Laboratory (SDCL) Compendium of Tests at http://sdcl-testviewer.ehealthsask.ca/. The specimen should reach the lab in 24 hours.

Each specimen is tested by three methods:

1. PCR for influenza viruses;
2. the rapid DFA (direct fluorescent antibody) microscopy;
3. virus isolation in tissue culture cells.

All specimens are tested by PCR within 24 hours of receipt. If PCR is negative, DFA and culture results will be available within 5 days of receipt of specimen.

Methods of Control/Role of Investigator

Prevention and Education

- Refer to the National Committee on Immunization Statement on Influenza Vaccination for the current season at http://www.phac-aspc.gc.ca/naci-ccni/index-eng.php.
- Eligible persons should be immunized annually because of declining immunity and change in virus variants.
- Refer to Saskatchewan Ministry of Health's annual influenza immunization statement for recommendations on risk groups, dosages and schedules.
- Adults do not benefit from multiple doses in the same year; reimmunization may be considered in outbreak situations or for high-risk travellers; discuss with the Medical Health Officer (MHO).
- Educate the public about the disease: transmission, symptoms, and preventive measures especially hand hygiene and cough etiquette.
- Encourage immunization of health care workers. Lower mortality in long-term care facilities has been demonstrated in institutions where health care workers are immunized than in those where they were not.
- Administration of influenza vaccine to international travellers should be considered – refer to Saskatchewan International Travel Manual.

Surveillance

- Enhanced laboratory surveillance is conducted through a network of local physicians across the province. Specimens are submitted to the Virology Section of SDCL from patients presenting with influenza-like symptoms.
- Surveillance through emergency rooms, HealthLine inquiries and sentinel physicians are useful measures to monitor influenza-like activity in the community.
- Active community surveillance is done in all Health Jurisdictions by Public Health and reported weekly to the Population Health Branch, Ministry of Health on the Attachment – Community Influenza-Like Illness Weekly Surveillance Form. Sentinel institutions such as schools, long-term care facilities and workplaces provide weekly reports of absenteeism/illness related to influenza-like illness.
- Outbreak reports, especially in long term care facilities, should be e-mailed to Population Health Branch, Ministry of Health at CDC@health.gov.sk.ca.
    - The initial report should come within 24 hours of the outbreak being declared.
    - The final report is to be submitted within 30 days of the conclusion of the outbreak. See Attachment – Outbreak Notification and Summary Report Form in the Outbreaks section of this manual.
    - Entry of individuals into the electronic case management system (iPHIS) is not required.

Management

I. Case

History

Determine risk for institutional spread – i.e., resident or worker in a health care facility.

Immunization

Offer relevant immunizations if eligible.

Treatment/Supportive Therapy

- Supportive care for symptoms is all that is indicated for most cases of influenza.

- An appropriate antiviral may be effective in reducing the duration of the illness when initiated by the attending physician within 48 hrs of the onset of signs and symptoms.
- Refer to most recent recommendations from Saskatchewan Ministry of Health and Public Health Agency of Canada (PHAC).
- Antibiotic therapy is not indicated unless bacterial complications arise.
- Because of the association with Reye's syndrome, salicylates (e.g., Aspirin) should be avoided in children with influenza.

Exclusion

- See Epidemic Measures.
- For additional information on infection prevention and control measures for individuals in health care facilities – refer to Regional Infection Control Manual.
- Health Care Workers (HCWs) – refer to Regional Management of Employees and Other Health Care Workers during Influenza Outbreaks in Health Care Facilities.

Referrals

Not applicable.

II. Contacts/Contact Investigation

See Epidemic Measures.

III. Environment

Child Care Centres/Institutional Control Measures

- Child care centres – refer to the Saskatchewan Ministry of Health Infection Control Manual for Child Care Facilities.[1]
- Health care facilities – refer to regional infection control manual.

Epidemic Measures

- Refer to Attachment – Community Influenza-Like Illness Weekly Surveillance Form which includes definitions of ILI and outbreaks.
- Child care centre (CCC) control measures:

[1] http://www.saskatchewan.ca/live/births-deaths-marriages-and-divorces/starting-a-family/early-learning-and-child-care/child-care.

- Educate as per Prevention and Education section above.
- Children with influenza or influenza-like illness should not attend until the child has been without fever (without the use of fever reducing medications) for 24 hours (Centers for Disease Control, July 2009).
- For CCC with children under 5 years, review immunization records of those under 5 years of age and offer influenza if eligible.

- Institutional control measures:
  - Educate as per Prevention and Education section above.
  - Persons in the community with influenza or influenza-like illness should not visit until 5 days after onset of symptoms. Exceptional circumstances should be discussed with facility manager and MHO.
  - Every effort should be made to control influenza outbreaks within institutions to optimize the protection of the patients, staff and the community. The use of antivirals has been used to control outbreaks. Refer to the current year's Saskatchewan Ministry of Health Coverage for the Use of Oseltamivir for the Management of Influenza Outbreaks in Special Care Homes.
  - Infection control measures included in the region's infection control manual should be reviewed with staff.
  - Ensure cases are reported to local public health.

Refer to the Outbreaks section of the manual for additional details about managing an outbreak.

NOTE: The MHO is the only designated Public Health Official legislated to declare and/or end an outbreak.

Pandemic Measures
See local, provincial, national pandemic plans.

References

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

Centers for Disease Control. (2008). *Influenza (flu): Preventing the spread of influenza (the flu) in child care settings: Guidance for administrators, care providers, and other staff.* Retrieved August 2011 from www.cdc.gov/flu/professionals/pdf/childcaresettings.pdf.

Health Canada. (1999). Infection control guidelines – Routine practices and additional precautions for preventing the transmission if infection in health care. *Canada Communicable Disease Report (CCDR)*, *25S4*, July 1999. Retrieved August 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Health Canada. (2002). Infection control guidelines – Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR), 28S1*, March 2002. Retrieved August 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Public Health Agency of Canada. (2006). *Canadian immunization guide* (7th ed.). Ottawa, Canada: Public Works and Government Services Canada.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2,* November 2009. Retrieved August, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Influ_lab-eng.php.

Public Health Agency of Canada. (2008). *Influenza: Understanding pandemic influenza*. Retrieved August 2011 from http://www.phac-aspc.gc.ca/influenza/pdf/lang/english_understanding_fact_sheet.pdf.

Public Health Agency of Canada. (2011). *Influenza*. Retrieved August 2011 from http://www.phac-aspc.gc.ca/influenza/index-eng.php.

Government of Saskatchewan

Influenza Data Collection Worksheet

Please complete the following sections:

Severe - intensive medical care - **Sections D, F, G, and I;**

Novel - **Sections D, E, F, H, I, J, K and L;**

PANORAMA

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

LHN ->SUBJECT SUMMARY-> RESPIRATORY & DIRECT CONTACT ENCOUNTER GROUP-> CREATE INVESTIGATION

Disease Summary Classification: CASE	**Date**	***Classification: CONTACT***	***Date***	***LAB TEST INFORMATION:***
☐ Confirmed	YYYY / MM / DD	☐ *Contact*	*YYYY / MM / DD*	*Date specimen collected:*
☐ Does Not Meet Case Definition	YYYY / MM / DD	☐ *Not a Contact*	*YYYY / MM / DD*	*YYYY / MM / DD*
☐ Person Under Investigation	YYYY / MM / DD	☐ *Person Under Investigation*	*YYYY / MM / DD*	*Specimen type:*
☐ Probable	YYYY / MM / DD			☐ *Nasopharyngeal* ☐ *Swab*

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province (specify where)	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD		

REPORTING NOTIFICATION Name of Attending Physician or Nurse:	Location:
Physician/Nurse Phone number:	Date Received (Public Health): YYYY / MM / DD
Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician ☐ Other_____	

C) DISEASE EVENT HISTORY

LHN-> INVESTIGATION->DISEASE SUMMARY (UPDATE)->DISEASE EVENT HISTORY

Site / Presentation:	☐ Severe - intensive medical care	**Complete sections D, F, G, and I for Severe Cases;**
	☐ Novel	**Complete sections D, E, F, H, I, J, K and L;**
	☐ Other	

Influenza Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

D) SIGNS & SYMPTOMS

INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Acute onset of symptoms		YYYY / MMM / DD	Muscle inflammation (myositis)		YYYY / MMM / DD
Acute respiratory distress syndrome (ARDS)		YYYY / MMM / DD	Myalgia (muscle pain)		YYYY / MMM / DD
Arthralgia		YYYY / MMM / DD	Nasal congestion		YYYY / MMM / DD
Bronchiolitis		YYYY / MMM / DD	Neurologic - delerium		YYYY / MMM / DD
Cardiac - myocarditis		YYYY / MMM / DD	Otitis media		YYYY / MMM / DD
Chills		YYYY / MMM / DD	Pain - abdominal		YYYY / MMM / DD
Coryza or rhinitis		YYYY / MMM / DD	Pharyngitis (sore throat)		YYYY / MMM / DD
Cough		YYYY / MMM / DD	Pneumonia - CXR/CT		YYYY / MMM / DD
Croup (laryngotracheobronchitis)		YYYY / MMM / DD	Prostration		YYYY / MMM / DD
Dyspnea (shortness of breath)		YYYY / MMM / DD	Respiratory compromise		YYYY / MMM / DD
Encephalitis		YYYY / MMM / DD	Respiratory failure - requiring mechanical ventilation		YYYY / MMM / DD
Fever		YYYY / MMM / DD	Reye's syndrome		YYYY / MMM / DD
Gastrointestinal symptoms		YYYY / MMM / DD	Seizures		YYYY / MMM / DD
Headache		YYYY / MMM / DD	Sinusitis		YYYY / MMM / DD
Malaise		YYYY / MMM / DD			YYYY / MMM / DD

E) INCUBATION AND COMMUNICABILITY

FOR NOVEL INFLUENZA ONLY

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):
Earliest Possible Exposure Date: YYYY / MM / DD
Latest Possible Exposure Date: YYYY / MM / DD

Exposure Calculation details:

Communicability for Case (period for transmission):
Earliest Possible Communicability Date: YYYY / MM / DD
Latest Possible Communicability Date: YYYY / MM / DD

Communicability Calculation Details:

F) RISK FACTORS

FOR NOVEL AND SEVERE INFLIUENZA ONLY

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	Start date Yes	N, NA, U	Add'l Info
Access to healthcare services > 4 hours by road			
Chronic Medical Condition - Cardiac Disease+			
Chronic Medical Condition - Diabetes Mellitus+			
Chronic Medical Condition - Lung Disease+			
Chronic Medical Condition - Malignancies/Cancer+			
Chronic Medical Condition - Morbid Obesity			
Chronic Medical Condition - Neurological conditions that impede the clearance of respiratory/oral secretions+			
Chronic Medical Condition - Other (add'l info)			
Chronic Medical Condition - Renal Disease+			
Contact to a known case (add'l info)	YYYY / MM/DD		
Exposure - Second hand smoke			
Immunocompromised - Related to underlying disease or treatment			
Immunocompromised - Transplant Candidate or Recipient - Solid Organ/Tissue+			
Setting - Crowded living conditions (>1 person per room excluding bathrooms)			

Influenza Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

DESCRIPTION	Start date Yes	N, NA, U	Add'l Info
Special Population - Attends childcare			
Special Population - Homeless+			
Special Population - Lives in a communal setting			
Special Population - LTC Facility+			
Special Population - Pregnancy			
Special Population - Self-reported Indigenous identity			
Substance Use - Alcohol			
Substance Use - Injection drug use (including steroids)+			
Substance Use - Tobacco			
Travel - Outside of Canada (Add'l Info)	YYYY / MM/DD AE		
Travel - Outside of Saskatchewan, but within Canada (Add'l Info)	YYYY / MM/DD AE		

G) IMMUNIZATION HISTORY INTERPRETATION SUMMARY

LHN -> INVESTIGATION-> IMMUNIZATION HISTORY INTERPRETATION SUMMARY

Interpretation Date: YYYY / MM / DD

Interpretation of Disease Immunity: ☐ Disease Case - Fully immunized (for age) ☐ Disease Case - Partially immunized

☐ Disease Case – Unimmunized ☐ Disease Case - Unclear immunization history **Valid doses received**: _____

Reason:

☐ Interpretation of history by investigator

H) INTERVENTION

LHN -> INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

Assessment:
☐ Assessed for contacts YYYY / MM / DD
Investigator name

Isolation:
☐ Facility isolation Investigator name YYYY / MM / DD
☐ Home isolation Investigator name YYYY / MM / DD

Communication:
☐ Other communication (see Investigator Notes) YYYY / MM / DD
Investigator name
☐ Letter (See Document Management) YYYY / MM / DD
Investigator name

Other Investigation Findings:
☐ Investigator Notes YYYY / MM / DD
☐ See document management YYYY / MM / DD

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD
☐ Disease-Info/Prev-Cont/Assess'd for Contacts YYYY/ MM / DD

Quarantine:
☐ Quarantine YYYY / MM / DD
Investigator name

Education/counselling: Investigator name
☐ Prevention/Control measures YYYY / MM / DD
☐ Disease information provided YYYY / MM / DD

Testing:
☐ Lab testing recommended YYYY / MM / DD
Investigator name

Exclusion: Investigator name
☐ Work YYYY / MM / DD ☐ Preschool YYYY / MM / DD
☐ School YYYY / MM / DD ☐ Daycare YYYY / MM / DD

Referral:
☐ Consultation with MHO Investigator name YYYY / MM / DD
☐ Primary Care Provider Investigator name YYYY / MM / DD
☐ Infection prevention and Control Investigator name YYYY / MM / DD

Immunization: Investigator name
☐ Eligible Immunization recommended YYYY / MM / DD
☐ Disease-specific immunization recommended YYYY / MM / DD
☐ Disease-specific immunization given YYYY / MM / DD

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

Influenza Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

I) OUTCOMES

LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering YYYY / MM / DD ☐ ICU/intensive medical care YYYY / MM / DD ☐ Hospitalization YYYY / MM / DD
☐ Recovered YYYY / MM / DD ☐ Intubation /ventilation YYYY / MM / DD ☐ Unknown YYYY / MM / DD
☐ Fatal YYYY / MM / DD ☐ Other _____ YYYY / MM / DD

Cause of Death: (if Fatal was selected) _____

J) Acquisition Event

LHN-> INVESTIGATION-> EXPOSURE SUMMARY-> ACQUISITION EVENT SUMMARY -> QUICK ENTRY

Acquisition Event ID:_____

Exposure Name: _____

Acquisition Start YYYY / MM / DD to **Acquisition End:** YYYY / MM / DD

Location Name: _____

Setting Type

☐ Travel ☐ Health care setting ☐ Public facilities ☐ Recreational facilities ☐ Most likely source

K) Transmission Events

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> QUICK ENTRY

Transmission Event ID	Exposure Name	Setting type (Consider the following settings for TE; if >1 select "multiple settings" in Panorama)	Date/Time	# of contacts
		☐ Congregate/Communal living ☐ Health Care setting ☐ Type of community contact ☐ Household Exposure ☐ Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐ Congregate/Communal living ☐ Health Care setting ☐ Type of community contact ☐ Household Exposure ☐ Public facilities	YYYY / MM / DD to YYYY / MM / DD	
	influenza Contacts – Inv ID# _____	☐ Multiple Settings	YYYY / MM / DD to YYYY / MM / DD	

L) TOTAL NUMBER OF CONTACTS

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> TE HYPERLINK -> UNKNOWN/ANONYMOUS CONTACTS

Anonymous contacts:_____ (total number of individuals [including groups that 1:1 follow-up is not required or is not feasible])

Initial Report completed by:		**Date initial report completed:** YYYY / MM / DD

Influenza
Attachment – Community Influenza-like Illness Weekly Surveillance Form

Please see the following page for the Community Influenza-like Illness Weekly Surveillance Form.

Saskatchewan

Ministry of Health

Population Health Branch

3475 Albert Street
Regina, Canada
S4S 6X6

To:	Disease Prevention Unit
Fax:	(306) 787-9576
E-mail:	cdc@health.gov.sk.ca

COMMUNITY INFLUENZA-LIKE ILLNESS WEEKLY SURVEILLANCE FORM

Name of RHA:	**Surveillance date:** (dd/mm/yy)
Reported by:	**Ph:**

ACTIVITY LEVEL THIS WEEK (check one):

0. ☐ Community sentinel sites report no influenza-like activity at all.

1. ☐ Sporadically occurring influenza-like illness but **no** lab confirmations.

2. ☐ Sporadically occurring influenza-like illness when there has been **at least one** laboratory confirmed influenza case but **no outbreaks** detected.

3. ☐ At least one lab confirmed influenza in your health region together with ILI **outbreak(s)** in schools, worksites or a **laboratory confirmed** influenza **outbreak(s)** in a residential institution(s). Re-emergent school outbreaks are considered NEW if there has been an intervening 8 weeks of Level 0-2 ILI activity in the community.

The following influenza/ influenza-like outbreaks had their **ONSET** at some point during this surveillance week. List only those outbreaks meeting this criterion.

Town/City where outbreak is located	Health Region outbreak number

Outbreak reporting for influenza follows the same protocol as for all other outbreaks. This table **does not** constitute an outbreak notification. An outbreak notification form must still be submitted on each outbreak from a communicable disease.

FAX OR E-MAIL THIS COMPLETED FORM BY 4 PM EACH THURSDAY. THANK YOU.

ILI is the acute onset of respiratory illness with fever and cough and with one or more of the following: sore throat, arthralgia, myalgia, or prostration which could be due to influenza virus. In children under 5, gastrointestinal symptoms may also be present. In patients under 5 or 65 and older, fever may not be prominent.

Reviewed each influenza season

Respiratory and Direct Contact

Legionellosis

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.
From Public Health to Ministry of Health: Within 3 days.
Immediate if outbreak is suspected or if single nosocomial or occupational case.

Public Health Follow-up Timeline: Initiate within 24 to 48 hours.

Information

Case Definition (Public Health Agency of Canada, May 2008)

Table 1. National Case Definition for Legionellosis	
Confirmed Case	Clinical illness* with laboratory confirmation of infection: • isolation of *Legionella* species or detection of the antigen from respiratory secretions, lung tissue, pleural fluid or other normally sterile fluids **OR** • a significant (e.g., fourfold or greater) rise in *Legionella* species IgG titre between acute and convalescent sera **OR** • IgG titre > 1:128 against *Legionella* species **OR** • demonstration of *L. pneumophila* antigen in urine
Probable Case	Clinical illness* with demonstration of *Legionella* species DNA.
*Legionellosis comprises two distinct illnesses: Legionnaires' disease, characterized by fever, myalgia, cough and pneumonia, and Pontiac fever, a milder illness without pneumonia.	

Causative Agent
Some species of *Legionella*, a genus of Gram-negative bacilli. Over 35 species have been described, but most cases of legionellosis are caused by *L. pneumophila* serogroup 1.

Symptoms
Legionellosis is an acute bacterial infection and there are two manifestations recognized: Legionnaire's disease and Pontiac fever.

Initial Symptoms for both Manifestations	Pontiac Fever[1]	Legionnaire's Disease
• Fever and chills. Temperatures can reach 39°C-40.5°C. • Myalgia. • Anorexia. • Malaise. • Headache. • Nonproductive cough, abdominal pain and diarrhea may also be present.	• No pneumonia or multi system involvement. • Patients generally recover in two to five days without treatment.	• Chest x-ray is usually consistent with pneumonia. • May progress to multi-system failure with confusion, disorientation, increasing respiratory distress and disseminated legionellosis. • Death may occur especially in persons with pre existing medical conditions or a depressed immune system.

Incubation Period

- Legionnaire's disease 2-10 days usually 5-6 days.
- Pontiac fever 5-66 hours, usually 24-48 hours.

Reservoir/Source

The bacterium is ubiquitous in nature and is primarily aquatic. Hot water systems (i.e., showers), air conditioning cooling towers, evaporative condensers, humidifiers, whirlpool spas, respiratory therapy devices and decorative fountains have all been implicated in causing disease and outbreaks.

[1] Believed to be caused by a reaction to inhaled antigen rather than bacterial invasion. Pontiac fever has only been recognized during outbreaks.

The bacteria have been isolated from water found in the previously mentioned areas as well as from water in taps, hot tubs, and from creeks, ponds and the soil of their banks. It has been known to survive for months in tap and distilled water. The organism can survive for years in water at 2°C to 8°C and is resistant to usual levels of chlorination (Mandell, 2000).

Mode of Transmission
It is most commonly associated with water-droplet transmission from cooling towers. *Legionella* are transmitted directly from the environment to humans with the most common source thought to be aerosolization of water containing *L. pneumophila*.

Risk Groups/Risk Factors
Illness occurs most frequently with increasing age (most cases are at least 50 years of age), especially in persons who smoke and in those:

- with diabetes mellitus;
- with chronic lung disease;
- that require intubation;
- with renal diseases or;
- with malignancy and;
- who are immunocompromised especially solid organ transplant recipients.

The disease is rare in those under 10 years of age; however, nosocomial infection in neonates has been reported. Several outbreaks have occurred among hospitalized patients. Unrecognized infections are common (Alberta Health and Wellness, 2007).

Period of Communicability
Person to person transmission of these bacteria has not been documented.

Specimen Collection and Transport

- Urine for *L. pneumophila* serogroup 1 antigen in a sterile specimen container.
- Bronchoalveolar lavage (BAL).
- Urine and BAL should be refrigerated during transport.
- Blood for serology in a plain tube (red top).

Methods of Control/Role of Investigator

Prevention and Education

- All devices and equipment that contain, produce, or distribute water or water aerosols must be properly maintained. This may involve draining systems that are not in use, mechanically cleaning systems to remove scale and sediment, and using biocides to limit the growth of *Legionella* (Heymann, 2008).
- Environmental sampling and routine surveillance for this organism is not recommended due to the ubiquitous nature of the organism, the multiplicity of potential sources in the environment, likely recolonization of environmental sources, and the frequency of environmental bacteria in the absence of clinical disease.
- Bacteria can normally be found in the environment with the absence of clinical illness (Alberta Health and Wellness, 2007).

Management

I. Case

History

Source of infection

Inquire about:

- possible exposures to air conditioners, humidifiers, etc., where they work or live;
- presence of other people with similar symptoms to determine if a common source exposure is present.

With the identification of a single laboratory-confirmed case in a health care facility initiate an investigation. This is especially important in facilities serving highly susceptible, immunocompromised patients.

For outbreaks in any other facility, search for:

- common exposures amongst cases;
- common possible environmental source(s) of infection.

Treatment/Supportive Therapy

Cases with Pontiac fever generally recover spontaneously in two to five days without treatment.

- Antibiotics:
  Treatment choices are governed by the most recent guidelines. The public health practitioner should direct any questions regarding the current treatment protocols to the physician or Medical Health Officer. See Appendix H - Sources for Clinical Treatment Guidelines.

Heymann (2008, p. 339) indicates the following:

- "The recommended treatment for Legionnaire's disease is either a respiratory fluoroquinolone, such as levofloxacin, or a newer marcrolide (azithromycin). Observational studies suggest that levofloxacin may be more effective than macrolides, especially in severe cases. Rifampicin has been used as an adjunct in patients failing standard therapy, but data to support this approach are lacking. Penicillin, the cephalosporins and the aminoglycosides are ineffective."

Exclusion
None.

Immunization
Not applicable.

Referrals
Infection control should be notified if the case occurs in a health care facility (acute or long-term).

II. Contacts/Contact Investigation

- Inquire about additional cases in household or school/business setting to determine if a common environmental source exists.
- Quarantine and immunization of contacts are not applicable.

III. Environment

Environmental prevention and control measures (e.g., cleaning, maintenance, decontamination, superheating, superchlorination, etc.) should be referred to the Public Health Inspector Manager/Environmental Health Officer and will likely require engineering expertise.

Infection Control Measures
Routine/Standard precautions are recommended.

Epidemic Measures

- In epidemic situation, investigation of common exposures and possible environmental sources of infection is required.
- Decontamination of implicated sources may be necessary and expert advice may be required.
- Culturing from environmental sources should only be considered once cases have been confirmed.

References

Alberta Health and Wellness. (2007). *Public health notifiable disease management guidelines*: *Legionellosis* Retrieved February, 2011 from http://www.health.alberta.ca/professionals/notifiable-diseases-guide.html.

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

Anti-Infective Review Panel. (2001). *Anti-infective guidelines for community-acquired infections*. Toronto, Canada: MUMS Guideline Clearinghouse.

Centers for Disease Control and Prevention. (2006). *CDC yellow book: Health information for international traveller.* Atlanta, GA: Elsevier Publishing.

Health Canada. (2002). Infection control guidelines: Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR)*, *28S1*, March 2002. Retrieved February, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Health Canada. (2001). Construction-related nosocomial infections in patients in health care facilities: Decreasing the risk of *Aspergillus*, *Legionella* and other infections. *Canada Communicable Disease Report (CCDR*), *27S2:1-42*, July 2001. Retrieved February, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/01pdf/27s2e.pdf.

Health Canada. (1999). Infection control guidelines: Routine practices and additional precautions for preventing the transmission if infection in health care. *Canada Communicable Disease Report (CCDR), 25S4,* July 1999. Retrieved February, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Last, J. M., & Wallace, R. R. (1992). *Public health and preventive medicine* (13th ed.). Norwalk, CT: Appleton and Lange.

Mandell, G. L., Bennett, J. E., & Dolin, R. (Eds.). (2000). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (5th ed.). Philadelphia, PA: Churchill Livingstone.

Manitoba Health. (2001). *Communicable disease management protocols: Legionellosis.* Retrieved February, 2011 from http://www.gov.mb.ca/health/publichealth/cdc/protocol/index.html.

Public Health Agency of Canada. (2006). *Canadian immunization guide* (7th ed.). Ottawa, Canada: Public Works and Government Services Canada.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR*), *35S2*, November 2009. Retrieved February, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Legion-eng.php.

Respiratory and Direct Contact

Leprosy (Hansen's Disease)

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.
From Public Health to Ministry of Health: Within 2 weeks.

Public Health Follow-up Timeline: Initiate within 72 hours.

Information

Case Definition (Public Health Agency of Canada, May 2008)

Table 1. National Surveillance Case Definition for Leprosy (Hansen's Disease)	
Confirmed Case	Clinical evidence of illness (see symptoms) with laboratory confirmation: • positive acid fast stain with typical morphology for *Mycobacterium leprae* **OR** • histopathological report from skin or nerve biopsy compatible with leprosy
Probable Case	Clinical illness (see symptoms) in a person who is epidemiologically linked to a confirmed case

Causative Agent
Mycobacterium leprae.

Symptoms (Public Health Agency of Canada, May 2008)
Tuberculoid or paucibacillary disease: one or a few well-demarcated, hypopigmented and anesthetic skin lesions, frequently with active, spreading edges and a clearing centre; peripheral nerve swelling or thickening may also occur.

Lepromatous or multibacillary disease: erythematous papules and nodules or an infiltration of the face, hands and feet with lesions in a bilateral and symmetrical distribution that progress to thickening of the skin and loss of normal hair distribution, particularly on the face (madarosis).

Borderline (dimorphous): skin lesions characteristic of both the tuberculoid and lepromatous forms.

Indeterminate: early lesions, usually hypopigmented macules, without developed tuberculoid or lepromatous features.

Incubation Period
9 months to 20 years. Tuberculoid is an average of 4 years, and 8 years for the lepromatous form. Rarely seen in children under 3 years.

Reservoir/Source
Humans are the reservoir of proven significance however it has been shown that the armadillo, mangabey monkey and chimpanzee can be infected.

Mode of Transmission
Transmission is person to person with nasal secretions, normally containing the highest bacterial load, often causing infection when spread to the skin or respiratory tract of another. Close contact is necessary for transmission. Untreated multibacillary leprosy (high levels of bacillus) has been proven to be the major source of human transmission.

Risk Groups/Risk Factors
- Leprosy is a disease of poverty.
- Approximately 95% of people are genetically immune to infection with *M. leprae.*
- HIV clients are not at increased risk of becoming infected.

Period of Communicability
Clinical and laboratory evidence suggest that infectiousness is lost in most instances within a day of beginning treatment with multidrug therapy (Heymann, 2008).

Specimen Collection and Transport
For specimen collection instructions, consult with Saskatchewan Disease Control Laboratory (SDCL) Medical Director at (306) 787-8636.

Methods of Control/Role of Investigator

Prevention and Education
Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

- The best preventive measure is early diagnosis and treatment of cases.
- Health education should stress the importance of effective multi-drug therapy, the non-infectivity of persons under continuous treatment and the importance of completing therapy.

Management

I. Case

History

- No public health interventions are required; communicability is low, particularly after initiation of treatment.
- Persons with leprosy require medical follow-up from an infectious diseases specialist.
- Manage infectious persons with routine infection control precautions. Handwashing is the most effective measure to prevent transmission when caring for patients.
- Hospitalization is reserved only for managing reactions, surgical correction of deformities and the treatment of ulcers resulting from the anesthesia of the extremities.

Treatment/Supportive Therapy

- Consultation with an infectious disease specialist, internist, dermatologist or pediatrician is recommended. See Appendix H - Sources for Clinical Treatment Guidelines.
  - Multi-drug chemotherapy is necessary for all patients. There is widespread prevalence of dapsone resistance, and the emerging resistance to rifampin.

Exclusion:

No restrictions in employment or attendance at school are indicated for persons whose disease is regarded as non-infectious.

II. Contacts/Contact Investigation

Household and other close contacts should be examined initially, and then annually for at least 5 years. Consult specialist.

- Manage infectious persons with routine infection control precautions. Handwashing is the most effective measure to prevent transmission when caring for patients.
- Chemoprophylaxis is not recommended.

III. Environment

Isolation of cases and quarantine of individuals is not necessary and often leads to stigmatization. No restrictions for employment or school are indicated.

Epidemic Measures

Not applicable.

References

Alberta Health and Wellness. (2005). *Public health notifiable disease management guidelines*: *Leprosy.* Retrieved February, 2011 from http://www.health.alberta.ca/professionals/notifiable-diseases-guide.html.

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Last, J. M., & Wallace, R. R. (1992). *Public health and preventive medicine* (13th ed.). Norwalk, CT: Appleton and Lange.

Manitoba Health. (2001). *Communicable disease management protocol manual: Leprosy.* Retrieved February, 2011 from http://www.gov.mb.ca/health/publichealth/cdc/protocol/index.html.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2,* November 2009. Retrieved February, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Lepr-eng.php.

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.
From Public Health to Ministry of Health: Within 72 hours.

Public Health Follow-up Timeline: Immediate.

Public Health Purpose for Notification of Measles

- To prevent transmission of measles from imported cases;
- To prevent mortality and serious morbidity from measles through contact tracing;
- To track epidemiology trends of measles in Saskatchewan including risk factors and distribution;
- To monitor the effectiveness of prevention and control measures;
- To make timely and evidence informed actions on outbreaks; and
- To inform the public and medical community about measles.

Surveillance Case Definition[1] (Public Health Agency of Canada, 2013)

Confirmed Case (Public Health Agency of Canada, 2013)	Laboratory confirmation of infection in the absence of recent immunization [a] with measles-containing vaccine: • isolation of measles virus from an appropriate clinical specimen [b] **OR** • detection of measles virus ribonucleic acid (RNA) [c] **OR** • seroconversion or a significant (e.g., fourfold or greater) rise in measles immunoglobulin G (IgG) titre by any standard serologic assay between acute and convalescent sera **OR** • positive serologic test for measles immunoglobulin M (IgM) antibody using a recommended assay[d] in a person who is either epidemiologically linked to a laboratory-confirmed case or has recently travelled to an area of known measles activity. **OR** Clinical illness in a person with an epidemiologic link to a laboratory-confirmed case.

[1] Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

Probable Case (Public Health Agency of Canada, 2013)	Clinical illness • in the absence of appropriate laboratory tests **OR** • in the absence of an epidemiologic link to a laboratory-confirmed case **OR** • in a person who has recently travelled to an area of known measles activity.
Clinical Case Saskatchewan-specific case definition, adapted from Public Health Agency of Canada, 2008)	Clinical illness is characterized by all of the following features: • fever of 38.3° C or greater; • cough, coryza or conjunctivitis; • generalized maculopapular rash for at least 3 days.
[a] The most frequent reaction to measles-mumps-rubella (MMR) immunization is malaise and fever (with or without rash) occurring 6-23 days after immunization. However, this should be determined for each case, as these reactions and the timeframe can vary (Pubic Health Agency of Canada, 2012). [b] See Specimen Collection and Transport [c] Confirmation of genotype is required in recently vaccinated individuals (within the past 45 days) to determine if illness is related to wild virus or vaccine-related. [d] IgM serology has the potential for false-positive findings. If the clinical presentation is inconsistent with a diagnosis of measles or in the absence of recent travel/exposure history, IgM results must be confirmed by the other listed confirmatory methods. Most acute measles cases develop IgM after 3 days post rash onset. Therefore, a suspected measles case in which serum collected ≤ 3 days after rash onset initially tests IgM negative should have a second serum specimen collected > 3 days after onset for retesting for IgM. Further strain characterization is indicated for epidemiologic, public health and control purposes.	

Refer to Specimen Collection and Transport for further details about interpretation of lab results in the context of past immunization for measles.

Epidemiology and Occurrence

Measles became reportable in Canada in 1924 (PHAC). Prior to the development of a vaccine (1924 to 1958), an average of 45,000 cases were reported annually. Through the use of vaccines, Canada eliminated measles in 1998 (PHAC, 2013), however sporadic cases and outbreaks continue as a result of importations (PHAC, 2018). To achieve herd immunity, the recommended 2-dose immunization coverage rate is ≥ 95% (PHAC, 2014). While Canada's overall coverage is high, pockets of susceptible individuals and communities remain so the risk of domestic transmission following an importation of measles remains a reality.

Saskatchewan
UNDER CONTRUCTION

Table 1. Evolution of the Measles Immunization Program in Saskatchewan

1966	Measles vaccine introduced for ages 1-3 (Lirugen - live, further attenuated)
1970	Measles vaccine extended to ages 1-7 (ATTENUVAX - live, further attenuated)
1970	Rubella vaccine for grade 7 girls. (MERUVAX and MERUVAX-II); Cendevax (rubella vaccine) used ~1970-72
1970-1975	Rubella vaccine for grade 1 students (MERUVAX)
1971	Rubella vaccine available to physicians for susceptible women at premarital exams
1979	MMR vaccine for age 1 year
1981 - 1982	Review of measles immunization for children ages 1-14, followed by program to raise coverage to > 98%
Fall 1991 to 1992	Mass MMR immunization for teen-aged boys in high schools and post-secondary institutions
Fall 1996	• Second dose Measles & Rubella (MR) added to 18 months. • Catch-up program included school entry, Grade 6 and 8.
Spring 1997	MR immunization of Grades 9-12
2001	MMR used exclusively for all 1st and 2nd doses; MR discontinued by Berna
2003 - 2004	2 dose mumps catch-up in Grade 6
2007 - 2013	2-dose mumps catch-up for eligible Grade 12 students
2008 - 2013	2-dose mumps catch-up for eligible Grade 8 students
2011 - 2013	2nd dose provided to eligible Grade 6 students
May 2013	Adult born since Jan. 1, 1970 eligible for 2 MMR doses

Saskatchewan Immunization Manual (2018)

Additional Background Information

Causative Agent

Measles virus, an RNA virus, a member of the family paramyxovirus, genus *Morbillivirus*.

Symptoms

Measles is an acute, highly communicable disease with a prodrome that lasts two to four days (range one to seven days). The prodrome is characterized by fever followed by conjunctivitis, coryza, or cough.

- Koplik spots on the buccal mucosa are considered pathognomic for measles. They occur one to two days before the rash.

- A characteristic red maculo-papular rash appears on the third to seventh day beginning behind the ear and on the face. The rash gradually spreads downwards to the trunk and then the extremities. The skin lesions are usually discrete but may become confluent.
- Fever often rises as the rash appears. The rash may last four to seven days and often fades in the same sequence as it appears.
- Symptoms are more severe in infants and they are more likely to experience complications.
- Immunocompromised individuals experience more severe disease and may have a prolonged course. These individuals may not develop the characteristic rash.
- Other symptoms of measles include anorexia, diarrhea (especially in infants), and generalized lymphadenopathy.
- Individuals who have been previously exposed to measles antigen (e.g., previously vaccinated), may have a modified clinical presentation (Centers for Disease Control and Prevention, 2018).

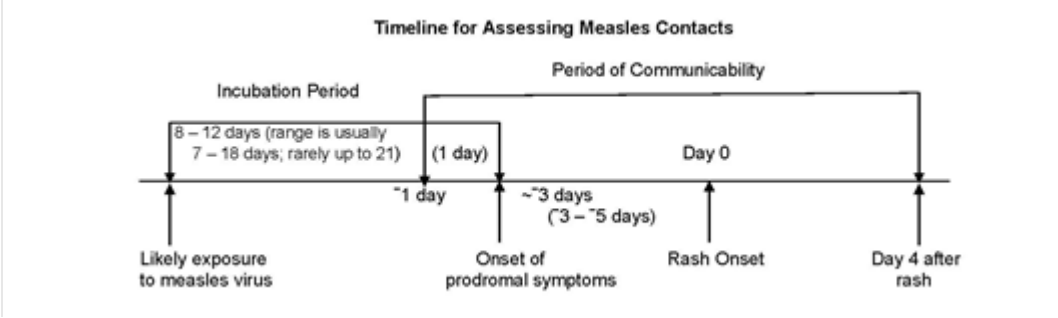
Complications (Heymann, 2015)
- Pneumonia (6%), encephalitis (0.1%), otitis media (7%), seizures (0.7%), diarrhea (8%), and laryngotracheobronchitis (croup).
- Very rarely, sub-acute sclerosing panencephalitis (SSPE) develops 7-10 years after infection as a late sequelae (Centers for Disease Control and Prevention, 2018).
- The case-fatality rate can be as high as 10-30% in developing countries (typically 3-5%); it is approximately 0.1-0.2% in Canada.

Reservoir
- Humans.

Incubation Period
- About 10 days (range 7 to 18 days) from exposure to onset of fever.
- Usually 14 days until rash appears (range 9 to 21 days).

Period of Communicability
- Measles is highly communicable, with greater than 90% secondary attack rates among susceptible persons.
- Cases are infectious from one day before onset of prodrome, usually about four days before onset of the rash, and continue until four days after rash onset (Heyman, 2015).

- Maximum communicability occurs from onset of prodrome through the first three to four days of rash.



Mode of Transmission

- Large respiratory droplets.
- Airborne transmission via droplet nuclei has been documented.
- Direct person-to-person contact with the nasal or throat secretions of the infected person.
- Indirect contact with articles freshly soiled with the respiratory secretions.

Risk Factors

Risk factors are associated with individual susceptibility and settings that create opportunities for acquisition or transmission to others.

- Non-immune individuals.
- Immunocompromised individuals.
- Infants.
- Health care workers (HCWs).
- Students at post-secondary institutions.
- Travellers.
- Military personnel.
- Infection during pregnancy is associated with an increased frequency of spontaneous abortion, premature labor and preterm birth and low birth weight.

Specimen Collection and Transport

When sending specimens for measles testing, laboratory requisitions should be clearly marked “suspect case of measles” to facilitate rapid testing. When an outbreak number has been assigned, the outbreak number should be included on the requisition and the transport tote should be marked that outbreak specimens are included.

Molecular isolation/detection[2] of the virus is preferred to confirm the diagnosis of suspected measles cases because of the complications in interpreting positive IgM serology in the absence of an epidemiological link to a confirmed case and the contradictory serological results in previously immunized individuals (Public Health Agency of Canada, 2013). There is no single laboratory test capable of confirming with confidence 100% of true measles cases. Therefore, to confirm the diagnosis the following specimens should be submitted to Roy Romanow Provincial Laboratory (RRPL):

- Urine, throat and nasopharyngeal secretions for isolation of measles virus:
    - Collect nasopharyngeal swab or aspirate, or a throat swab as soon as possible after the onset of the rash (within four to seven[3] days). Place in viral transport medium.
    - Collect approximately 50 ml of urine within seven days after the onset of rash.
- Serum sample for measles IgM and IgG (acute and convalescent):
    - IgM response begins with onset of rash and will persist for one to two months.
    - IgG response begins about one week after the onset of rash and will persist for a lifetime.
    - Convalescent sera should be drawn 10 to 30 days after the initial serology to assess the rise in IgG titre (seroconversion).

Negative results do not definitively rule out measles because both methods are affected by timing of specimen collection and quality of handling.

Treatment/Supportive Therapy

- There is no specific treatment available for measles.
- Supportive therapy as indicated.
- Vitamin A supplementation of children with measles has been associated with decreased morbidity and mortality rates. The World Health Organization (WHO) currently recommends vitamin A for all children with acute measles, regardless of their country of residence. Vitamin A for measles is administered once daily for two days at the following doses:
    - 200 000 IU for children 12 months of age or older;
    - 100 000 IU for children six through 11 months of age;

[2] Isolation permits measles virus genotyping which provides confirmation of epidemiologic data showing measles virus transmission routes and the differentiation of wild-type from vaccine strain measles virus in cases where vaccine may be implicated in serious illness.

[3] Measles virus may be still detected after seven days from the onset of rash, but with rapidly decreasing sensitivity.

- 50 000 IU for infants younger than six months of age (American Academy of Pediatrics, 2015).

Public Health Investigation

I. Single Case/Household Cluster

- All reports of probable and laboratory-confirmed measles cases should be investigated immediately. Refer to Attachment – Measles Data Collection Worksheet to assist.

History

- Determine measles immunization history including number of doses, date(s) administered,[4] and type of vaccine.
- Determine if there is an opportunity for acquisition through:
  - history of travel (seven to 21 days before onset of rash), or contact (seven to 21 days before onset of rash) with a person who had recent travel.
  - contact with a confirmed or probable case of measles.
- Health conditions that may render the individual more susceptible to infection or alter the period of communicability (e.g. immunocompromised).
- Identify opportunities for transmission events and contacts exposed during the infectious period, which includes four days prior to and four days after the rash appears:
  - household;
  - daycare/school;
  - workplaces;
  - health care facilities[5] (including physicians' offices and waiting rooms).
- Identify locations, dates, times and details of any event the case has attended during the infectious period. This includes gatherings of all sizes in both public and private forums such as:
  - social or religious functions;
  - sports activities;

[4] "The occurrence of measles-like illness in recently vaccinated persons can pose particular difficulties. Fever and rash are known to occur 6-12 days post-vaccination in a small percent of vaccinated persons. A positive measles IgM test cannot be used to confirm the diagnosis of measles in persons with measles-like illness who received measles vaccine 6-45 days before onset of rash due to the measles IgM antibody response to the vaccine. Specimens for viral isolation should be obtained in addition to serologic testing (see Specimen Collection and Transport section above); isolation of wild type measles virus would allow confirmation of the case. In the absence of strain typing to confirm wild type infection, cases in persons with measles-like illness who received measles vaccine 6-45 days before onset of rash should be classified as confirmed cases only if a) they meet the clinical case definition, and b) they are epidemiologically linked to a laboratory-confirmed case (Centers for Disease Control and Prevention, 2013, pp 7-9).

[5] In acute care settings, Infection Control and Occupational/ Employee Health should also be involved.

  - shopping excursions;
  - concerts;
  - conferences and meetings.
- Identify routes, dates, times and details of public transportation (flights, buses, taxis, etc.).
  - Obtain details about the public transportation involved (e.g., company of carrier, seating information, depots/terminals/gates involved, etc.).

Public Health Interventions

Assessment

- Assess for contacts paying particular attention to vulnerable contacts as per Table 3.

Communication

- Letters can be sent to classrooms and other group settings where individual contact tracing is not required (i.e. involving school age and adults where there are no vulnerable contacts) to inform them of the exposure, symptom monitoring and when to seek medical attention (see Sample letter).

Education

- All cases should be provided disease information as well as information on prevention and control measures including period of communicability and avoiding contact with vulnerable individuals.

Exclusion and Isolation

Exclusion and isolation of cases should be implemented as outlined in Table 2.

Table 2. Exclusion Requirement for Confirmed, Probable, Clinical Cases and Persons Under Investigation for Measles

Context	Exclusion Requirement	Timeframe
Community Settings.	Self-isolation at home. Exclude from daycare, schools, and workplaces. Avoid exposing non-household contacts (i.e. no outside visitors)	Immediately and up to and including four days after onset of rash.
Hospitalized Settings[6] 1. Immunocompetent patients.	Airborne precautions.	Immediately and up to and including four days after onset of rash (Public Health Agency of Canada, 2013).
2. Immuncompromised patients.	Airborne precautions.	**Immediately and for the duration of illness because viral excretion is expected to be prolonged** (Public Health Agency of Canada, 2013).

Immunization
Immunization of case is not indicated.
Referrals
Not applicable.

II. Contacts/Contact Investigation

Identification of contacts and contact investigation should proceed immediately and should be re-evaluated once laboratory results are available. Contact Investigation Worksheet should be used to support investigation.

Contacts should be prioritized based on individual and public health risk including:

- high risk contacts;
- employees in health care settings (direct and indirect patient care staff);
- other susceptible contacts;
- public exposures.

[6] Refer to Health Care Facility Control Measures for further details and additional measures to be taken with cases.

Table 3. Contact Definitions (Adapted from Public Health Agency of Canada, 2013)

A. Contact

A contact is defined as any individual who has:

- spent any length of time in a room or enclosed space with a measles case during that case's infectious period (i.e., from one day before onset of prodrome, usually about four days before onset of the rash, and continue until four days after rash onset approximately four days before rash onset to four days after rash onset); or
- spent time in a room occupied by an infectious measles case in the previous two hours.[7]

Person-by-person contact investigation should include:

1. household contacts;
2. in a daycare/educational facility – all employees, volunteers, students, bus drivers, members of a sports team or club;
3. in a workplace – individuals who share the same schedule or office location as the case;
4. in a health care facility – individuals who shared the same room, waiting room or exam room and did not use appropriate protection (i.e., N95 respirator). NOTE: This is not limited to patients in these settings but includes anyone attending appointments with the patient.

B. High Risk Contacts

- Infants <1 year of age.
- Pregnant women.
- Immunocompromised individuals.

C. Susceptible Contacts

Employees in health care and daycare settings are considered susceptible if they have:

- NO laboratory evidence of immunity, AND
- NO documented evidence of two doses of measles-containing vaccine (given at the appropriate interval as outlined in the Saskatchewan Immunization Manual for vaccine type [MMR or MMRV]).

Non-health care/daycare workers[8], may be susceptible if they have:

- NO laboratory evidence of immunity, AND
- NO documented evidence of two doses of measles-containing vaccine (given at the appropriate interval as outlined in the Saskatchewan Immunization Manual for vaccine type [MMR or MMRV]), AND
- NO history of measles disease.

See Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts for further assessment and management

[7] This would include doctors' offices, emergency departments, waiting rooms, classrooms, laboratories, locker rooms, etc. **There is no minimum duration of time for which the case must be present in the room.**

[8] Based on review of Saskatchewan Disease Control Laboratory data in February 2014, approximately 93% of samples tested from individuals born prior to 1965 indicated immunity for measles, while approximately 83% of samples from persons born between 1965 and1980 indicated immunity to measles. Factors to consider include age, history of exposure to measles, and availability of medical records.

Public Health Interventions

Assessment

Assessment varies by setting:

Employees in Health Care Settings Who Are Contacts

- Advise the employee to notify the Occupational/Employee Health services as well as Infection Prevention and Control for the facility in which they work so they can:
    - Review immunization records and immune status for all employees (both direct and indirect patient care staff), support public health exclusion requirements as necessary and monitor for suspicious cases within their facility. See Figure 4, Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.

Employees in Child Care Centers Who Are Contacts

- Vaccination history should be reviewed for all employees in daycare settings and appropriate action taken as per Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.

Individuals Exposed in Public Venues

Gatherings apply to events of any size in both public and private fora. They can include (but are not limited to) social or religious functions, sports activities, shopping excursions, concerts, conferences and meetings as well as public transit.

Communication

- Person by person investigation of high-risk contacts should include direct notification where possible.
- Identifiable contacts should, at a minimum, be provided with a letter that includes all details as outlined in education.
- When exposures involve individuals that cannot be identified in public settings, news, social media as well as public health websites should be used to communicate the exposure setting to the public.
    - Details to be provided in the messaging include dates and times (including two hours after the infected individual vacated the venue). Attachment – Information for People who May Have Been Exposed to Measles in a Public Facility should be used in the messaging or, at a minimum, be made available so exposed individuals have relevant information about measles and what to do if they develop symptoms.

Education

Close contacts of confirmed cases should be educated about measles and the signs and symptoms of measles. They should also be advised:

- that measles is communicable to others 4 days before the onset of the rash and until 4 days after the rash appears. They should be advised to use self-isolation (work, school, travel and other activities)
- to limit new or further exposure to other individuals and
- to call ahead to their health care provider's office if signs and symptoms appear so arrangements can be made to see the patient in a way that reduces the chance of exposing other individuals to measles.

Refer to Attachment – Template Letter to Measles Contacts. Refer to Attachment – Infection Prevention and Control Measures in Physicians' Offices and Attachment – Infection Prevention and Control Measures for Patients Suspected or Known to be Infected with Measles for infection prevention and control measures in these settings.

Exclusion

- Exclusion of susceptible contacts that meet the criteria in Table 3 (A) is outlined in Figures 1–6, Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.
- Exclusion should be applied in all circumstances where the contact may be exposing other susceptible individuals who have not yet been exposed (this includes work or school settings, organized groups and activities and public places including public transit).
- When exclusion is recommended, it should apply:
- From five days after first exposure and up to 21 days after last exposure; or
  - Until serological confirmation of immunity is provided.
- If the contact develops symptoms compatible with measles, exclusion criteria for cases should be applied.
- When Ig has been provided, extend the exclusion period to 28 days after the last exposure.

Immunoprophylaxis

- There are limited data on the effectiveness of measles vaccine or immune globulin (Ig) for the prevention of measles. The use of either of these products may provide some protection or alter the clinical course of disease when provided within the timeframes outlined in Table 1, Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts, (Centers for Disease Control and Prevention, 2018).
- Post-exposure vaccination is preferable to the use of Ig whenever feasible to prevent secondary cases. In addition, contact follow-up provides an opportunity to improve vaccination coverage in general.

- Figures 1-6 in Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts outline the appropriate immunoprophylaxis recommendations based on the age and setting of contacts based on their immunization history.

Testing

- Routine screening for immune status of contacts is not recommended except for those contacts who are employees in health care settings or patients in hospital settings as outlined in Figures 4–5, Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.
- No laboratory testing for measles required if asymptomatic.
- Confirmatory testing is recommended for contacts that develop symptoms.

III. Environment

Child Care Centre/Schools Control Measures

Strict enforcement of infection control measures – refer to Saskatchewan Ministry of Health Infection Control Manual for Child Care Facilities.[9]

Recommendations for the facility and attendees/employees must be individualized based on the characteristics and operations of the daycare/school and the susceptibility of the population in attendance.

- The school or child care centre must report immediately to public health any person suspected of having or diagnosed with measles.
- Contact tracing must be completed. Information about staff, attendees, must be obtained as soon as possible so immunization records can be reviewed to determine their susceptibility and their need for post-exposure immunoprophylaxis (see Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts). Provide Attachment – Template Letter to Schools or Group Exposed to a Measles Case.
- Inform parents of the need for unimmunized/under immunized children to be immunized immediately.
- Contacts should be excluded as outlined in Figures 1-3 Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.
- Individuals who attend the daycare but were not present during the exposure period (i.e. are not considered contacts) should not return to daycare until their immunizations have been brought up to date for age. However, the risks and benefits of returning to daycare need to be considered and exclusion may be indicated until transmission within the facility can be ruled out.

[9] http://www.saskatchewan.ca/live/births-deaths-marriages-and-divorces/starting-a-family/early-learning-and-child-care/child-care.

- Individuals who have been absent should be contacted in order to discover if they have become ill with measles. Prioritize those who have been absent for three or more days.
- Case finding for the source, concurrent and secondary cases should be targeted to one incubation period before (i.e. 21 days) the current case and for 21 days after the onset of rash of the last case in the setting.
- Evaluate parents and siblings of attendees to detect cases and identify susceptible individuals. Those who are susceptible should be immunized as per the Saskatchewan Immunization Manual.[10]

Health Care Facilities Control Measures

Health care workers (HCWs)[11] have an increased risk of exposure to measles and should have proof of immunity or adequate protection upon employment. See Chapter 7, Section 3.2 (Health Care Workers) of the Saskatchewan Immunization Manual[12] and other relevant Saskatchewan Ministry of Health policies/memos.

- All individuals suspected of having or diagnosed with measles must be reported immediately to the local public health office and infection control.
- Strict enforcement of infection prevention and control measures. See Attachment – Infection Prevention and Control Precautions for Patients Suspected or Known to be Infected with Measles and to the Authority's Infection Control Manual for additional details.
    - Airborne precautions in addition to Routine/Standard precautions should be taken immediately from the time measles diagnosis is being considered up to an including four days after onset of rash (Public Health Agency of Canada, 2013).
    - Immunocompromised patients should be isolated for the duration of their illness (Public Health Agency of Canada, 2013)
- Provide measles-containing vaccine to susceptible contacts (or Ig to high risk susceptible contacts) according to Figure 4–5, Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.
- Employees in health care settings who are contacts should be managed as per Figure 4, Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.

[10] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx
[11] Health care workers should be considered as ALL employees in health care settings. This includes direct and indirect patient care staff.
[12] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7.pdf .

- Patients in health care settings who are contacts should be managed as per Figure 5, Attachment – Immunoprophylaxis and Exclusion Considerations for Contacts.
- Public Health should ensure that:
    - all susceptible contacts (Table 3), have been immunized as soon as possible;
    - no further cases of related illness have been detected (over the subsequent 21 day period).
    - If a person acquired measles while in hospital, a case finding for the source investigation should be conducted in partnership with public health and infection control.

Outpatient Departments (including Lab and Radiology)/Physicians' Offices

Physicians' offices have been identified as the setting for transmission of secondary cases of measles. Strict application of infection prevention and control measures are required to reduce further transmission.

When measles is circulating in the community, contacts should be instructed to call ahead to their health care providers' office so arrangements can be made to reduce the risk of exposing others. In addition to staff using personal protective equipment, the following practical measures can be used[13]:

- arrange to see patients with clinical signs of measles at the end of the day;
- provide signage and procedural masks at the entrance instructing patients to don a mask before entering the facility;
- immediately take patients to a separate examination room and only allow staff who have been immunized to interact with the patient;
- ensure the exam room used by the patient is not used by other patients for two hours after the patient leaves the facility (regardless if the room is cleaned by an immune employee before the 2 hour period lapses).
- Susceptible staff should be immunized as soon as possible.

IV. Epidemic Measures

- Immediate reporting (within 24 hours) of probable and clinical cases or persons under investigation for measles.
- Determine source and manner of spread.
- Determine extent of exposure and transmission.

13 See Attachment – Infection Prevention and Control Measures in Physicians' Offices.

- If there is exposure of groups like schools, health care facilities, daycare centres, etc., it may be necessary to implement a coordinated immunization program for all unimmunized and incompletely immunized individuals to limit spread. The decision for this will be made in consultation with the Medical Health Officer and Saskatchewan Ministry of Health.
    - If vaccine supply is limited, priority should be given to young children for whom the risk is greatest.
- In institutional settings all individuals without adequate protection should be immunized (Heymann, 2015).
- In community-wide outbreaks, alternative measures such as broad immunization catch up programs may be considered.

Prevention Measures

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization

- Routine immunization of children with two doses of a measles containing vaccine in accordance with the recommended schedule in the Saskatchewan Immunization Manual.[14] One dose of measles-containing vaccine given after the first birthday is 95% effective in preventing measles. Most cases of vaccine failure following one dose occur in individuals who had an inadequate immune response to the vaccine and are not related to waning immunity (American Academy of Pediatrics, 2015).
- Non HCWs born in Canada prior to 1965[15] are presumed to have natural immunity to measles.
- Those born in 1965 or later who have not had one dose of measles vaccine or have not had natural measles infection should be vaccinated for measles as per the Saskatchewan Immunization Manual.[3]

[14] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx
[15] Saskatchewan Disease Control Laboratory data indicates susceptibility in those borne in 1965 or later. This differs from the PHAC year of presumed natural immunity of prior to 1970.

Education

- Education should be provided regarding respiratory etiquette and measures to prevent transmission.
- Educate the public about the disease and the need for active immunization for measles. Immunization information fact sheets[16] can be used to guide discussion.

[16] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx .

Revisions

Date	Change
May 2018	• Updated to align with Panorama configuration • Clarified the purpose for notification of cases to public health • Incorporated an Epidemiology and Occurrence as a placeholder and included Saskatchewan Immunization program history from Sask Immunization Manual to provide context. • Rearranged and updated the style into the new format of the Manual. • References reaffirmed or updated as necessary.

References

American Academy of Pediatrics. (2015). *Red book: 2015 Report of the Committee on Infectious Diseases* (30th ed.). Elk Grove Village, IL: Author.

Butler, K., Cafferkey, M., Cronin, M., Doyle, R., & Jennings, P. (2002). *Recommendations of Measles Sub-Committee of the Scientific Advisory Committee NDSC: Guidelines for control of measles in Ireland*. National Disease Surveillance Centre, October, 2002. Retrieved March, 2014 from http://www.clinical-virology.org/pdfs/eire_guidelines.pdf.

Centers for Disease Control and Prevention. (2015). *Epidemiology and prevention of vaccine-preventable diseases* (13th ed.). Atkinson, W., Hamborsky, J., McIntryre, L., & Wolfe, S. (Eds.). Washington, DC: Public Health Foundation. Retireved August, 2018 from https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html

US Centers for Disease Control and Prevention. (2018). *Manual for the surveillance of vaccine preventable diseases: Chapter 7: Measles.* Retrieved August, 2018 from http://www.cdc.gov/vaccines/pubs/surv-manual/chpt07-measles.html#vaccination_2013.

Health Canada. (1995). Guidelines for control of measles outbreaks in Canada. *Canada Communicable Disease Report (CCDR), 21-21*, November 1995. Retrieved June, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/95pdf/cdr2121e.pdf.

Health Canada. (1999). Infection control guidelines – Routine practices and additional precautions for preventing the transmission if infection in health care. *Canada Communicable Disease Report (CCDR), 25S4*, July 1999. Retrieved June, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Health Canada. (1999). Measles surveillance: Guidelines for laboratory support, *Canada Communicable Disease Report (CCDR), 25-24*, December 1999. Retrieved June, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr2524.pdf.

Health Canada. (2002). Infection control guidelines – Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR), 28S1,* March 2002. Retrieved June, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Heymann, D. L. (Ed.). (2015). *Control of communicable diseases manual* (20th ed.). Washington, DC: American Public Health Association.

Mandell, G. L., Bennett, J. E., & Dolin, R. (Eds.). (2000). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (5th ed.). Philadelphia, PA: Churchill Livingstone.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2*, November 2009. Retrieved August, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Measles_Rougeole-eng.php.

Public Health Agency of Canada. (2018). *Canadian immunization guide* (Evergreen ed.). Ottawa, Canada: Public Works and Government Services Canada. Retrieved August, 2018 http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php#toc.

Public Health Agency of Canada. (2013). Guidelines for the prevention and control of measles outbreaks in Canada. *Canada Communicable Disease Report (CCDR), 39ACS-3*, September 2013. Retrieved August, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/13vol39/acs-dcc-3/index-eng.php.

Public Health Agency of Canada (PHAC). Notifiable Diseases On-Line. 2015. Available from: diseases.canada.ca/notifiable/charts?c=pl

Tunis MC, Salvadori MI, Dubey V, Baclic O, on behalf of the National Advisory Committee on Immunization (NACI). Updated NACI recommendations for measles post-exposure prophylaxis. Can Commun Dis Rep 2018;44(9):226-30. Retrieved September, 2018 from https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2018-44/issue-9-september-6-2018/article-7-naci-recommendation-pep.html

Measles Data Collection Worksheet

Please complete **all** sections.

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

SUBJECT SUMMARY-> RESPIRATORY &DIRECT CONTACT ENCOUNTER GROUP->CREATE INVESTIGATION

Disease Summary Classification: CASE:	**Date**	***Classification: CONTACT:***	***Date***	***LAB TEST INFORMATION:***
☐ Confirmed	YYYY / MM / DD	☐ *Contact*	*YYYY / MM / DD*	*Date specimen collected:* *YYYY / MM / DD* *Specimen type:* ☐ *Blood* ☐ *Urine* ☐ *Throat* ☐ *Nasopharyngeal*
☐ Does Not Meet Case	YYYY / MM / DD	☐ *Not a Contact*	*YYYY / MM / DD*	
☐ Person Under Investigation	YYYY / MM / DD	☐ *Person Under Investigation*	*YYYY / MM / DD*	
☐ Probable	YYYY / MM / DD			
☐ Clinical	YYYY / MM / DD			

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD	(Specify where)	YYYY / MM / DD

REPORTING NOTIFICATION Name of Attending Physician or Nurse:	Location:
Provider's Phone number:	Date Received (Public Health): YYYY / MM / DD

Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician ☐ Other_____

Measles Data Collection Worksheet

Please complete **all** sections

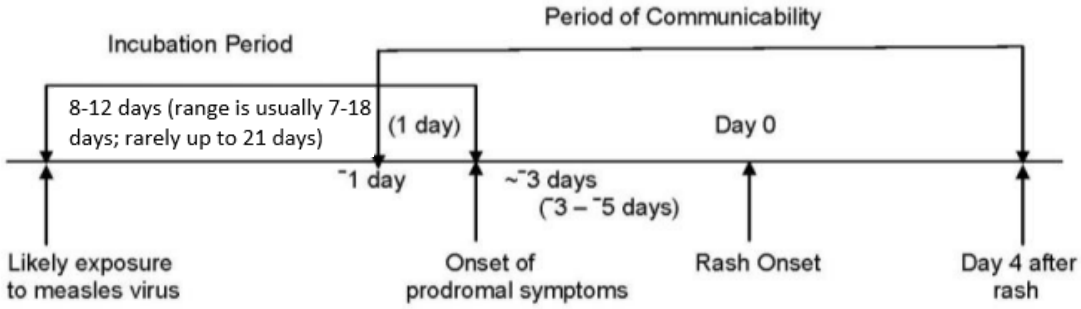
Panorama Client ID: _____
Panorama Investigation ID: _____

C) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Conjunctiva - inflammation (conjunctivitis)		YYYY / MMM / DD	Koplik spots		YYYY / MMM / DD
Coryza or rhinitis		YYYY / MMM / DD	Lymphadenopathy - generalized		YYYY / MMM / DD
Cough		YYYY / MMM / DD	Pain – photophobia (light sensitivity)		YYYY / MMM / DD
Fever		YYYY / MMM / DD	**Rash – maculopapular (3 days)**		YYYY / MMM / DD
Other s/s					

Timeline for Assessing Measles Contacts



D) INCUBATION AND COMMUNICABILITY

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):
Earliest Possible Exposure Date: YYYY / MM / DD **Latest Possible Exposure Date**: YYYY / MM / DD

Exposure Calculation details:

Communicability for Case (period for transmission):
Earliest Possible Communicability Date: YYYY / MM / DD **Latest Possible Communicability Date**: YYYY / MM / DD

Communicability Calculation Details:

E) RISK FACTORS (RF followed by + impact the Immunization Forecaster)

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	State Date Yes	N, NA, U	Add'l Info
Contact - At risk population (international travellers or immigrants)	YYYY / MM/DD		
Contact – Persons with similar symptoms	YYYY / MM/DD		
Contact to a known case (Add'l Info)	YYYY / MM/DD		
Immunocompromised - Related to underlying disease or treatment	YYYY / MM/DD		
Occupation - Health Care Worker - IOM Risk Factor	YYYY / MM/DD TE		
Special Population - Attends childcare	YYYY / MM/DD TE		
Special Population - Attends school	YYYY / MM/DD TE		
Special Population - Lives in a communal setting	YYYY / MM/DD TE		
Special Population - Post secondary education institution	YYYY / MM/DD TE		
Travel - Outside of Canada (Add'l Info)	YYYY / MM/DD AE/TE		
Travel - Outside of Saskatchewan, but within Canada (specify)_	YYYY / MM/DD AE/TE		
Other risk factor (Add'l Info)	YYYY / MM/DD		

Measles Data Collection Worksheet

Please complete **all** sections

Panorama Client ID: _____
Panorama Investigation ID: _____

F) IMMUNIZATION HISTORY INTERPRETATION SUMMARY

LHN -> INVESTIGATION-> IMMUNIZATION HISTORY INTERPRETATION SUMMARY

Interpretation Date: YYYY / MM / DD

Interpretation of Disease Immunity: ☐ IOM - Fully immunized (for age) ☐ IOM - Partially immunized

☐ IOM – Unimmunized ☐ IOM - Unclear immunization history **Valid doses received**: _____ **Doses needed**: _____

Reason:

☐ Previous disease ☐ Previous responder/Previous history of immunity ☐ Date Of Birth

☐ IOM - Interpretation of history by investigator

G) INTERVENTIONS

INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

Assessment:
☐ Assessed for contacts YYYY / MM / DD
Investigator name

Immunization: Investigator name
☐ Eligible Immunization recommended YYYY / MM / DD
☐ Disease-specific immunization recommended YYYY / MM / DD
☐ Disease-specific immunization given YYYY / MM / DD

Communication:
☐ Other communication (see Investigator Notes) YYYY / MM / DD
Investigator name
☐ Letter (See Document Management) YYYY / MM / DD
Investigator name

Isolation:
☐ Facility isolation YYYY / MM / DD
Investigator name
☐ Home isolation YYYY / MM / DD
Investigator name

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD
☐ Disease-Info/Prev-Cont/Assess'd for Contacts YYYY/ MM / DD

Other Investigation Findings:
☐ Investigator Notes YYYY / MM / DD
☐ Document Management YYYY / MM / DD

Education/counselling:
☐ Prevention/Control measures YYYY / MM / DD
Investigator name
☐ Disease information provided YYYY / MM / DD
Investigator name

Quarantine:
☐ Quarantine YYYY / MM / DD
Investigator name

Exclusion: Investigator name
☐ Work YYYY / MM / DD ☐ Preschool YYYY / MM / DD
☐ School YYYY / MM / DD ☐ Daycare YYYY / MM / DD

Testing:
☐ Lab testing recommended YYYY / MM / DD
Investigator name

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

Measles Data Collection Worksheet

Please complete **all** sections

Panorama Client ID: _____
Panorama Investigation ID: _____

H) OUTCOMES *(optional except for severe influenza,* LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering YYYY / MM / DD ☐ ICU/intensive medical care YYYY / MM / DD ☐ Hospitalization YYYY / MM / DD
☐ Recovered YYYY / MM / DD ☐ Intubation /ventilation YYYY / MM / DD ☐ Unknown YYYY / MM / DD
☐ Fatal YYYY / MM / DD ☐ Other _____ YYYY / MM / DD

Cause of Death: (if Fatal was selected) _____

I) EXPOSURES

Acquisition Event INVESTIGATION-> EXPOSURE SUMMARY-> ACQUISITION EVENT SUMMARY > QUICK ENTRY

Acquisition Event ID:_____

Exposure Name: _____

Acquisition Start YYYY / MM / DD to **Acquisition End:** YYYY / MM / DD

Location Name: _____

Setting Type

☐ Travel ☐ Health care setting ☐ Public facilities ☐ Recreational facilities ☐ Most likely source

Transmission Events

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> QUICK ENTRY

Transmission Event ID	Exposure Name	Setting type (Consider the following settings for TE; if >1 select "multiple settings" in Panorama)	Date/Time	# of contacts
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
	Measles – Inv ID# _____	☐Multiple Settings	YYYY / MM / DD to YYYY / MM / DD	

J) TOTAL NUMBER OF CONTACTS

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> TE HYPERLINK -> UNKNOWN/ANONYMOUS CONTACTS

Anonymous contacts:_____ (total number of individuals [including groups that 1:1 follow-up is not required or is not feasible])

Initial Report completed by:		**Date initial report completed:** YYYY / MM / DD

Please see the following pages for the Letter Template to a Measles Case.

<DATE>

<MR./MS. NAME OF CASE>
<ADDRESS>
<CITY SK POSTAL CODE>

Re: Temporary Exclusion from Work and Public for <INDIVIDUAL> until <DATE>

Dear <MR./MS. NAME OF CASE>

As we have discussed, you are <SUSPECTED/CONFIRMED> to have measles disease. Because this is a very contagious disease, all precautions need to be taken to prevent possible spread of infection to others. You are considered to be contagious from <DATE> to <DATE>.

Your assistance is important to prevent spreading this disease to individuals who have not been immunized or who have not had the disease previously. This means that you are required to remain in your home (not to be out in public or at school/work) until <DATE>. This also means that during this time, there cannot be visitors in the home. **Should you require medical attention, it is important to call ahead to your health care provider so they can plan to see you in a way that reduces the chance of exposing other individuals to measles.**

Thank you for your cooperation in identifying individuals and locations where people may have been exposed to measles and for your cooperation during this period. We appreciate that you are doing your best to prevent further spread of infection. Please feel free to call < PHONE NUMBER> as needed.

The Medical Health Officer has authority under *The Public Health Act, 1994* of Saskatchewan to enforce compliance with this requirement.

Sincerely,

<NAME OF PUBLIC HEALTH DESIGNATE>
<TITLE>

cc: Medical Health Officer

Table 1. Vaccination or Immune Globulin (Ig) for Susceptible Contacts – See Table 2 (Person-by-person contact investigation)

If measles vaccine is given within 72 hours of exposure, it may provide some protection.
Do not delay providing vaccine to contacts that are not up-to-date, even if >72 hours have lapsed in order to provide protection from future exposures. Immune globulin is available in two products:

- IMIg (intramuscular immune globulin)
- IVIg (intravenous immune globulin)

Population	Time since Exposure to Measles	
	≤ 72 hours	**73 hours – 6 days**
Susceptible infants 0-6 months of age;	IMIg (0.5 mL/kg)	
Susceptible immunocompetent infants 6-12 months of age;	MMR vaccine	IMIg (0.5 mL/kg)
Susceptible immunocompetent persons 12 months of age or older	MMR vaccine series	
susceptible pregnant women	IVIg (400 mg/kg) OR IMIg (0.5 mL/kg) to maximum of 15 mL (limited protection if 30 kg or more);	
immunocompromised individuals 6 months of age or older;*	IVIg (400 mg/kg) OR IMIg 0.5 mL/kg to maximum of 15 mL (limited protection if 30 kg or more);	
Individuals with confirmed measles immunity	N/A	

* Ig is recommended for immunocompromised individuals for whom measles vaccination is contraindicated and past measles vaccination is no longer considered to be effective as outlined in the Saskatchewan Immunization Manual, Chapter 7.[1]

Source: Canada Communicable Disease Report, 2018 (Tuvis)

The following figures outline when vaccine or immune globulin should be provided to different populations and when exclusion/self-isolation should be implemented.

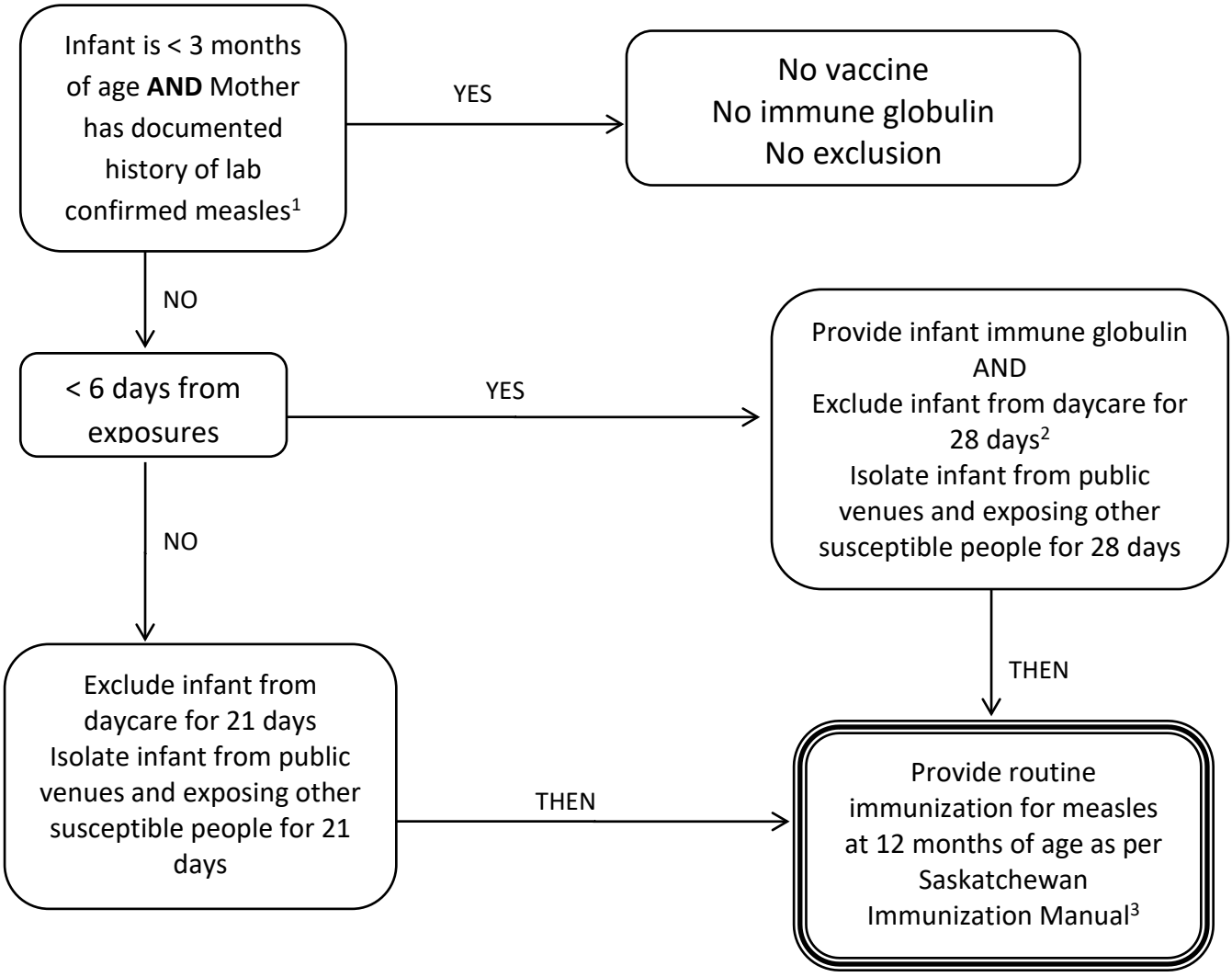
When exclusion is recommended, it should apply:

- From five days after first exposure and up to 21 days after last exposure; or
- Until serological confirmation of immunity is provided.

If a contact develops symptoms compatible with measles, exclusion criteria for cases should be applied. When Ig has been provided, extend the exclusion period to 28 days after the last exposure.

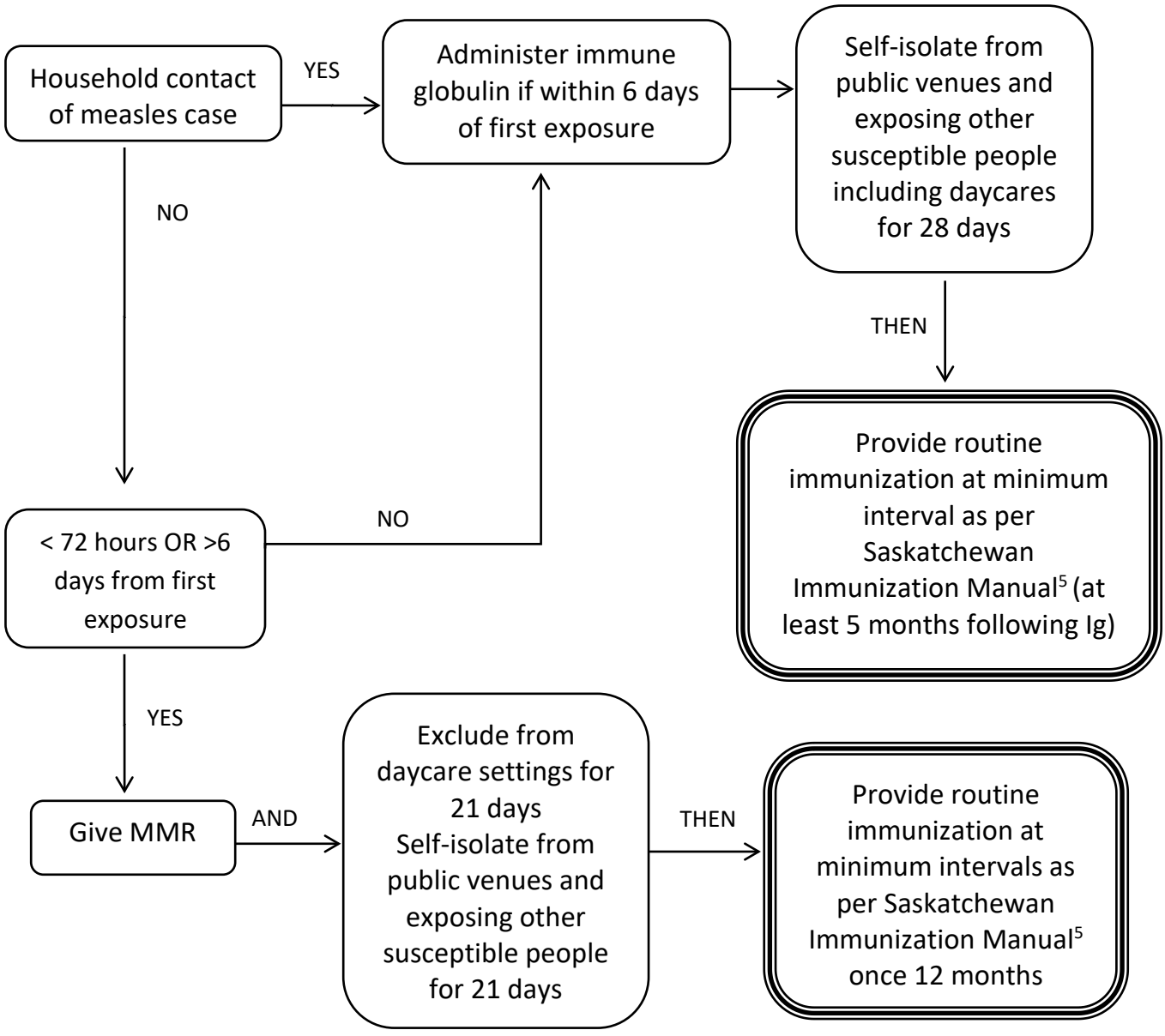
[1] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7

Figure 1. Infants < 6 months of age



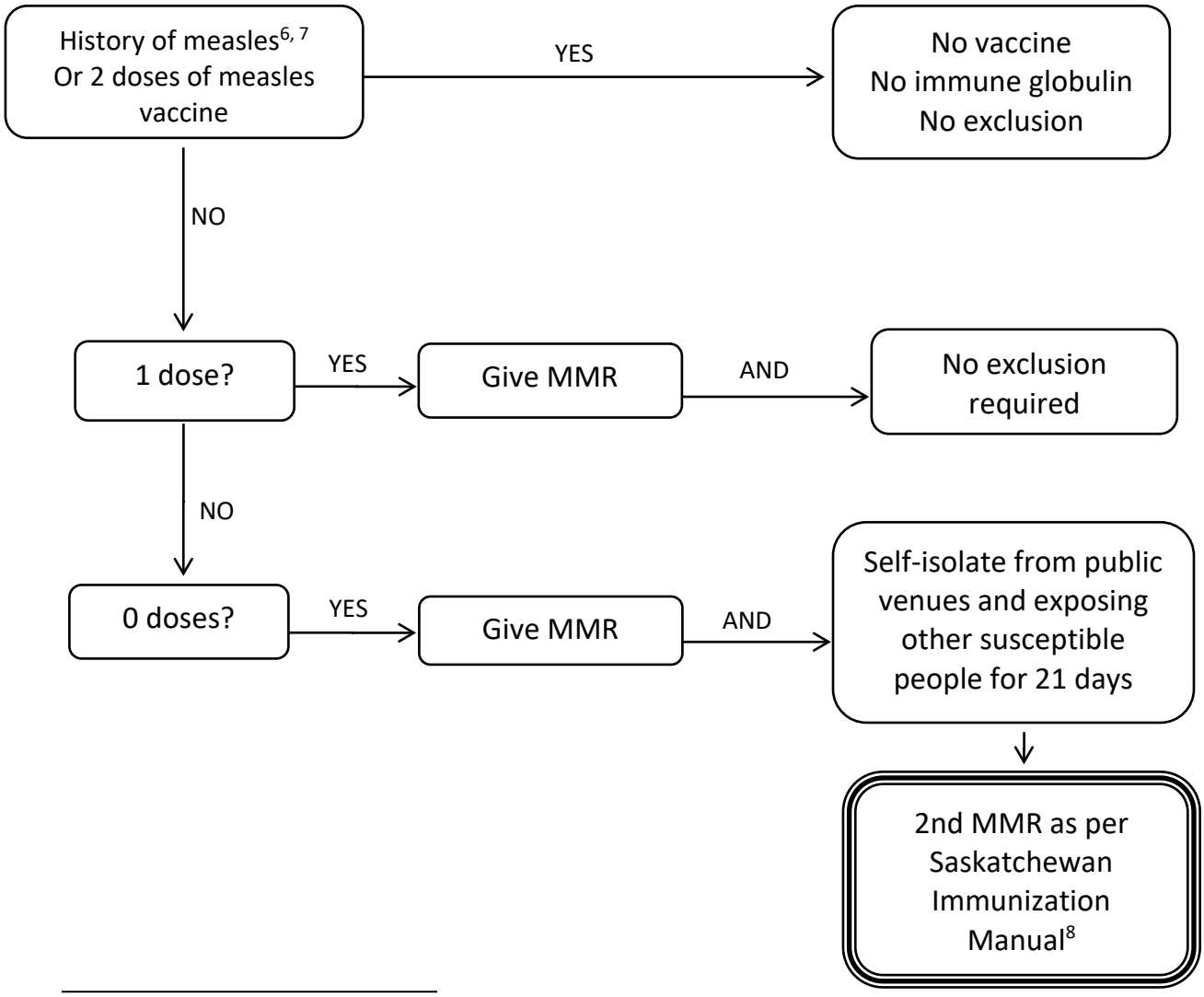
[1] Maternal antibodies from vaccination wane more quickly than antibodies from natural infection. Considering the vulnerable population, immune globulin is recommended for infants < 3 months if mother's immunity is vaccine-induced.
[2] Immune globulin may not prevent measles, and may cause a longer incubation period up to 28 days
[3] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter5

Figure 2. Infants 6 month to <12 months of age[4]



[4] No previous measles-containing vaccine previously provided for travel or past measles exposure.
[5] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter5

Figure 3. Immunocompetent Children and Adults (Non-Health Care Settings)

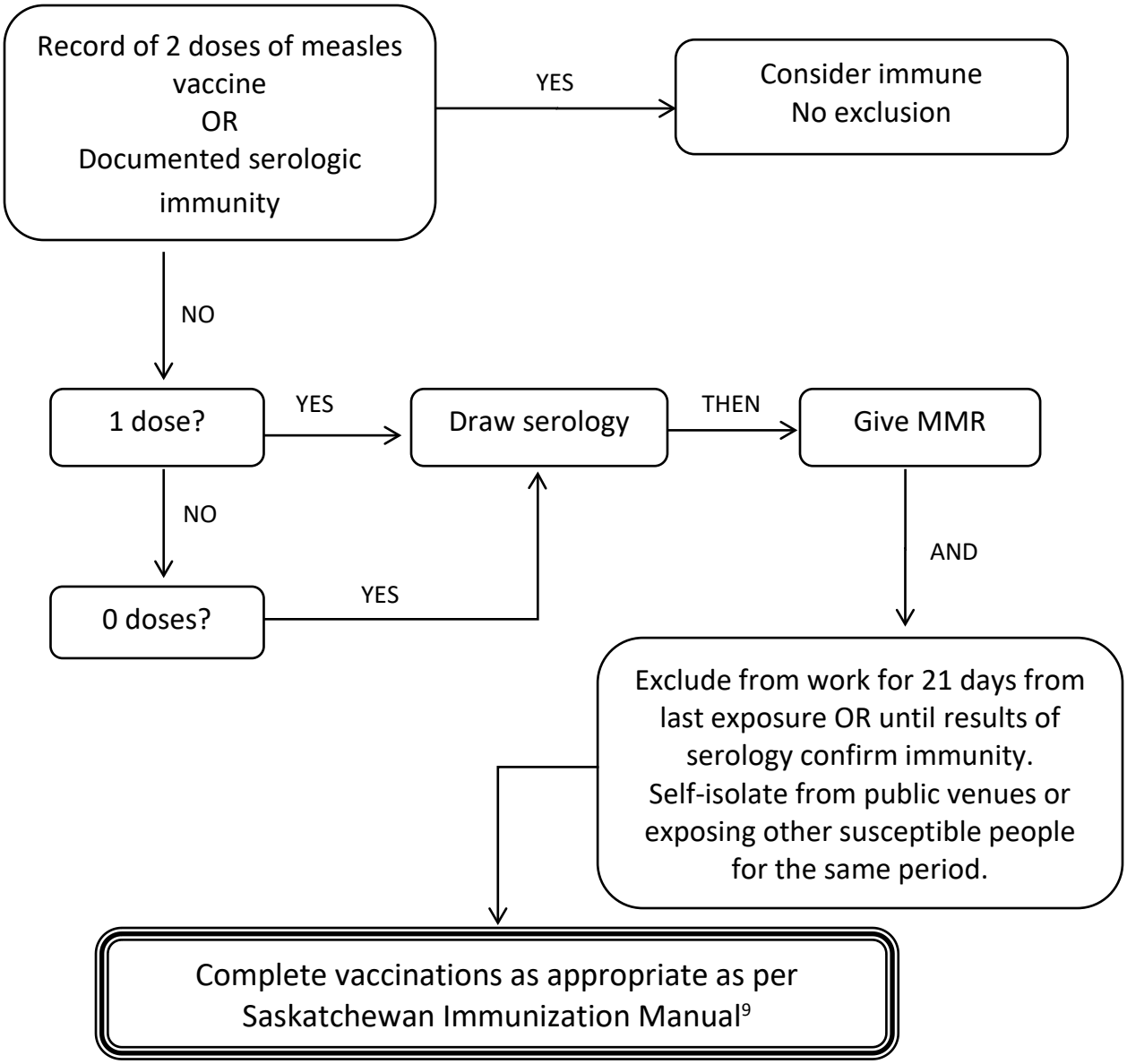


[6] Based on review of Saskatchewan Disease Control Laboratory data in February 2014, approximately 93% of samples tested from individuals born prior to 1965 indicated immunity for measles, while approximately 83% of samples from persons born between 1965 and 1980 indicated immunity to measles. Factors to consider include age, history of exposure to measles, and availability of medical records.

[7] Clinical judgement is required to determine if documentation is necessary.

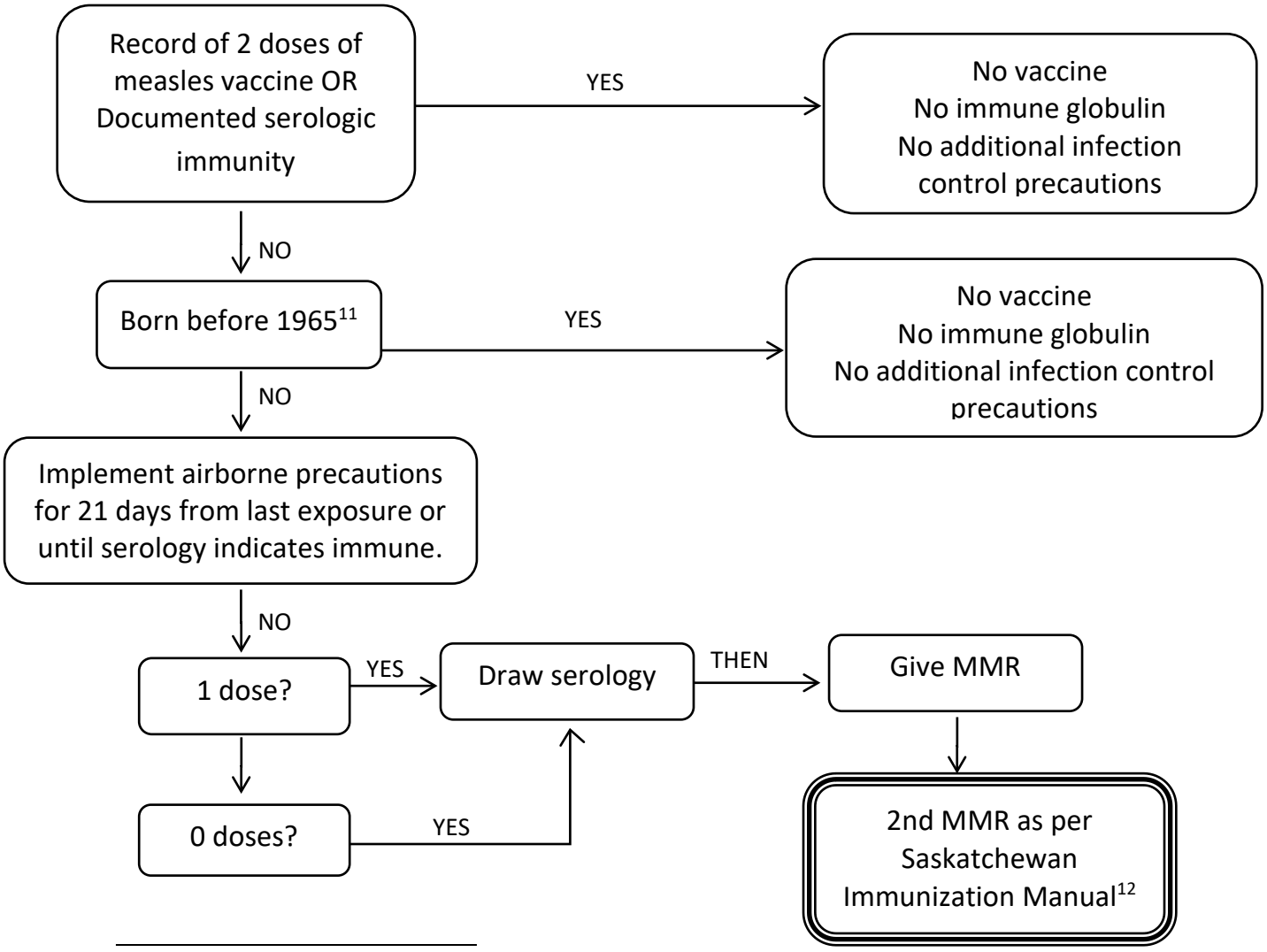
[8] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter5 and http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7

Figure 4. Health Care Settings – All Employees



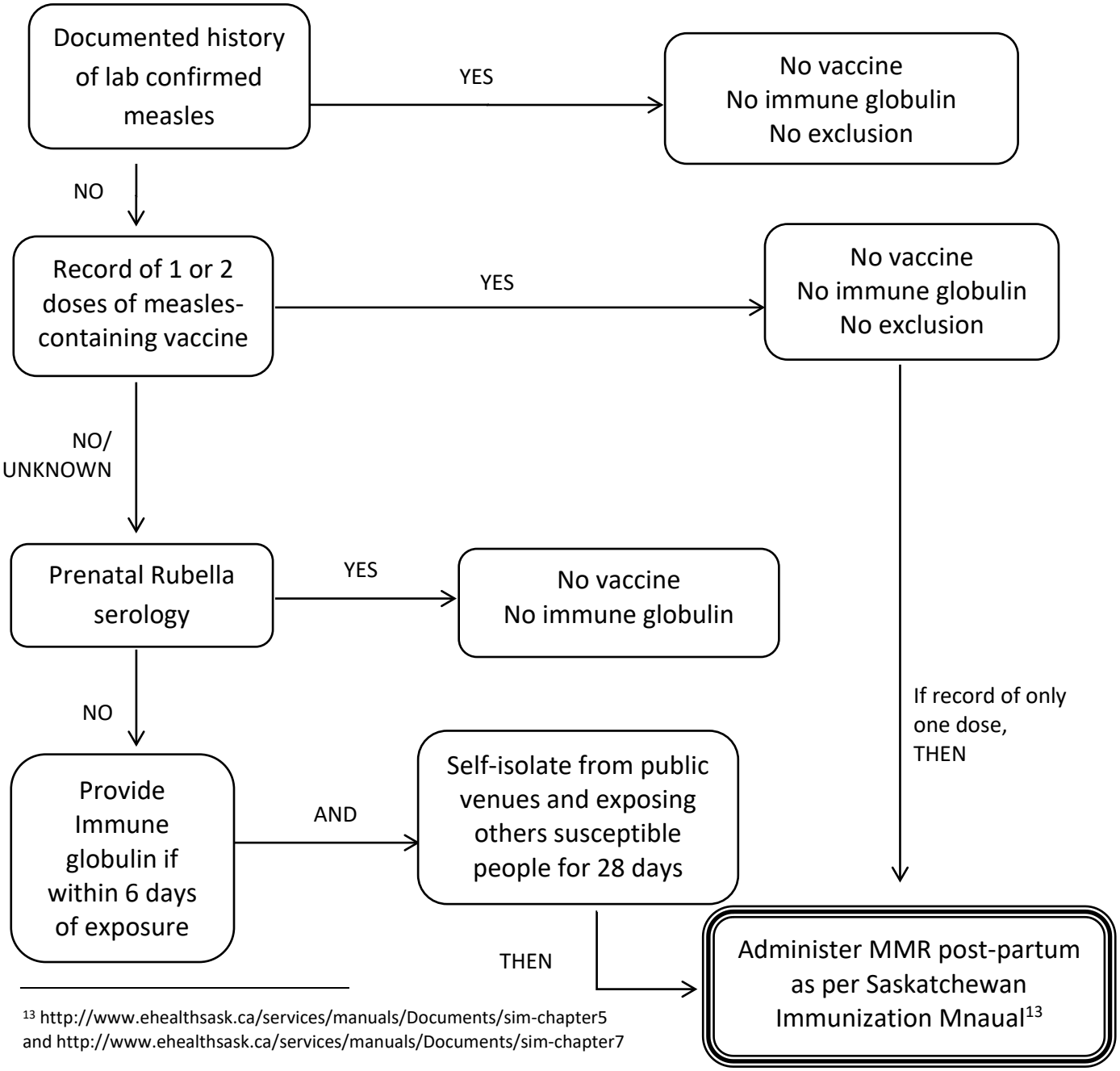
[9] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7

Figure 5. Health Care Settings – Patients[10]



[10] If immunocompromised, consult with MHO and attending physician.
[11] Based on review of Saskatchewan Disease Control Laboratory data in February 2014, approximately 93% of samples tested from individuals born prior to 1965 indicated immunity for measles, while approximately 83% of samples from persons born between 1965 and 1980 indicated immunity to measles. Factors to consider include age, history of exposure to measles, and availability of medical records.
[12] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter5 and http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7

Figure 6. Pregnant Women



[13] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter5 and http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7

Revisions

Date	Change
September 2018	Updated the dosage and formulation recommendations for immunoglobulin to align with the September 2018 National Advisory Committee on Immunization recommendations.

Please see the following pages for the Letter Template to a Measles Contact.

<DATE>

<MR./MS. NAME OF CONTACT REQUIRING EXCLUSION>
<ADDRESS>
<CITY SK POSTAL CODE>

Re: Temporary Exclusion from Work and Public for <INDIVIDUAL> until <DATE>

Dear <MR./MS. NAME OF CONTACT REQUIRING EXCLUSION>

As we have discussed, you have been exposed to measles, a highly contagious disease. Because this is a very contagious disease, and you have not been immunized previously, you are at increased risk of developing infection. Until it is determined that you have not been infected, all precautions need to be taken to prevent possible spread of infection to others. You are considered to be contagious from <DATE> to <DATE>.

Your assistance is very important to prevent spreading this disease to individuals who have not been immunized or who have not had the disease previously. Measles is contagious from 4 - 5 days before a person develops a rash until 4 days after the rash appears. This means that you are required to remain in your home (not to be out in public or at school/work) and should not have visitors to your home from <DATE> (5 days after 1st exposure) to <DATE> (21 days after last exposure). It is during this time that you may develop infection.

If you develop symptoms during this time, it is important to call ahead to your health care provider's office so arrangements can be made for you to be seen a way that reduces the chance of exposing other individuals to measles. Early symptoms include:

- high fever;
- cough;
- runny nose;
- red eyes.

A rash then develops after a day or 2 and usually starts on the face then spreads over the rest of the body.

If you do develop symptoms, we will be in touch with you to gather a list of individuals that you have been in contact with so we can offer immunization and education as necessary.

Thank you for your cooperation during this period. We appreciate your assistance in preventing the possible spread of infection. Please feel free to call <PHONE NUMBER> as needed.

Sincerely,

<NAME OF PUBLIC HEALTH DESIGNATE>
<TITLE>

cc: Medical Health Officer

Please see the following pages for the Letter Template to a School or Group Exposed to a Measles Case.

<DATE>

<NAME SCHOOL/SPORTS GROUP/ETC.>
<ADDRESS>
<CITY SK POSTAL CODE>

Re: Possible Exposure to Measles between <DATE> to <DATE>

Dear <NAME SCHOOL/SPORTS GROUP/ETC.>

We are investigating a person with red measles (Rubeola) who, while infectious, may have exposed others during <SCHOOL/SPORTS GROUP ACTIVITY/ETC.> Measles is a highly contagious disease spread through the air (by coughing, sneezing, talking). Public health is actively obtaining immunization records for individuals who have been exposed and may be contacting you to ask for your assistance in obtaining this information. Individuals who have had two doses of measles-containing vaccine (commonly provided as measles, mumps rubella [MMR] vaccine) or who have had a lab-confirmed infection in the past are considered immune and not at risk for infection.

Individuals who have not been immunized are at risk of developing infection and may be asked to stay out of <SCHOOL/SPORTS GROUP ACTIVITY/ETC.> until immunization has been provided.

Individuals who have been exposed may develop symptoms as early as 7 or as late as 21 days after the exposure. Early symptoms usually include:

- high fever;
- cough;
- runny nose;
- red eyes.

A rash then develops after a day or 2 and usually starts on the face then spreads over the rest of the body.

If you develop symptoms during this time, it is important to call ahead to your health care provider's office and inform them of your exposure so arrangements can be made for you to be assessed in a way that reduces the chance of exposing other individuals to measles.

Measles is contagious before early symptoms develop, which is 4 - 5 days before a person develops a rash, and remains contagious until 4 days after the rash appears. If you have symptoms and are waiting for laboratory confirmation, it is very important that you avoid contact with others who are not immune until the 5th day after the rash appears (you are no longer considered contagious after that time). If you require further medical attention, it is important call ahead to your health care provider as mentioned above.

We appreciate your assistance in preventing the possible spread of infection. Please feel free to call NUMBER as needed.

Sincerely,

<NAME OF PUBLIC HEALTH DESIGNATE>
<TITLE>

cc: Medical Health Officer

Public Health is investigating persons with measles who, while infectious, visited one or more public venues.

Measles is a highly contagious disease. Individuals who have had two doses of measles-containing vaccine (commonly provided as MMR or MMR-V) are considered immune and not at risk for infection. Individuals born before 1965 are likely to have been exposed to measles in childhood, and are considered to have a natural immunity to it.

Individuals born in 1965 or later and who have not been immunized are at risk of developing infection. Symptoms may develop as early as 7 or as late as 21 days after the exposure. Early symptoms usually include:

- high fever;
- cough;
- runny nose;
- red eyes.

A rash then develops after a day or 2 and usually starts on the face then spreads over the rest of the body.

If you develop symptoms compatible with measles in 7 to 21 days after being exposed, it is important to call ahead to your health care provider's office and inform them of your exposure so arrangements can be made for you to be assessed in a way that reduces the chance of exposing other individuals to measles.

Measles is contagious before symptoms develop, which is 4 to 5 days before a person develops a rash, and remains contagious until 4 days after the rash appears. If you have symptoms and are waiting for laboratory confirmation, it is very important that you avoid contact with others who are not immune until the 5th day after the rash appeared (you are no longer considered contagious after that time). If you require further medical attention, it is important to call ahead to your health care provider as mentioned above.

We appreciate your assistance in preventing the possible spread of infection. Please call your local public health office or the HealthLine at 811 as needed.

Please see the following pages for the Infection Prevention and Control Measures in Physicians' Offices.

Infection Prevention and Control Measures in Physicians' Offices

- For each patient encounter, screen the patient to determine whether the patient has any signs/symptoms of measles. Screen the patient:
  - at time of booking;
  - upon arrival in the waiting room; or
  - in exam room.

NOTE: Symptoms of measles include prodromal fever, conjunctivitis, coryza, cough and small spots with white or bluish white centers on an erythematous base on the buccal mucosa (Koplik spots). Three to five days after the start of the symptoms a red, blotchy (maculopapular) rash appears on the face and then progresses down the body.

- Book anyone with symptoms at the end of the day if clinical status allows; ensure other patients are not in the office.
- Use airborne precautions as measles virus remains suspended in the air; health care providers (HCP) entering the patient's room must wear a fit-tested N95 respirator unless the HCP has documented immunity to measles.
- Where possible immune staff should provide care to patients suspected to have measles.
- Post signage at the entrance (Attachment – Measles Alert Poster) instructing patients with signs and symptoms of measles or other respiratory symptoms to put on a surgical mask **before** entering the clinic.
- Provide surgical face masks for symptomatic patients as close to the entry of the clinical office as possible, with instructions on how to put on and take off mask. Consider having client call when in the parking lot (outside) and having immune staff go out to provide patient with a surgical mask. Instruct patient to wear the mask at all times while in the clinical office. Pediatric masks should be available on an individual patient basis if needed.
- Quickly triage the patient out of the common waiting areas and move the patient to an examining room. If possible, the patient should enter and exit through a separate entrance and go directly in and out of the examination room. Close door to examination room. The room should be a single room with a solid door (closed).
- Place a "DO NOT ENTER" sign for staff on the closed door.
- Keep the door closed to allow sufficient time (**two hours**) for the air to change in the room and be free of droplet nuclei before using the room for a non-immune patient.
- A bathroom used by a suspect case, to collect urine for measles virus, should also be off limits to non-immune patients for **two hours**. The bathroom door should be closed and have a "DO NOT ENTER" sign for staff/patients placed on the closed door. This is another reason to have patients seen at the end of the day.
- Routine cleaning for the room/equipment (once free of droplet nuclei) is sufficient.
- Ensure/encourage appropriate hand hygiene by staff and patient.

These recommendations align with Ontario's Infection Prevention and Control for Clinical Office Practice (June 2013) at:
http://www.publichealthontario.ca/en/eRepository/IPAC_Clinical_Office_Practice_2013.pdf

Please see the following pages for the Measles Alert Poster.

Measles Alert

Do you have a **FEVER** and **RASH**, with **COUGH** or **RUNNY NOSE** or **RED EYES**?

Have you been **EXPOSED TO SOMEONE** with suspected or confirmed measles?

If **YES**

PLEASE: Put on a mask.
Clean your hands with alcohol hand rub.
Report to the nurse or front desk immediately.
Measles has been confirmed in Saskatchewan.

Measles is very contagious.
Help prevent the spread of measles.

Adapted from Alberta Health Services

Government of Saskatchewan

Please see the following pages for the Infection Prevention and Control Measures for Patients Suspected or Known to be Infected with Measles.

Infection Prevention and Control Precautions for patients suspected or known to be infected with Measles (Rubeola)

Always follow Routine Practices including a Point of Care Risk Assessment

Triage

Display posters at patient/client entrances with instructions for anyone with measles symptoms to identify themselves immediately to staff

If patient presents with symptoms of measles[1]

- **Triage suspected patients as expeditiously as possible** into an airborne infection isolation room/AIIR (negative pressure room) to avoid exposure to contacts in waiting rooms.
  - If a negative pressure room is unavailable, the patient should be managed in a private room with the door closed.
- **Place appropriate signage** (Airborne Precautions) outside of the room in a noticeable location (if applicable)

Assessment

Where possible, **only immune[2] staff should provide care** to patients suspected or confirmed to have measles (Staff should check with local Employee Health and Wellness/Occupational Health and Safety nurse for their immune status)

History & signs and symptoms suggestive of measles

- A fitted **N-95 respirator** should be worn by all non-immune Healthcare Workers (HCWs) who enter the room.
- **Patient should be restricted to their room,** but instructed or assisted with respiratory and hand hygiene, if transport out of room is required
- **Patients should be provided with a surgical mask** to wear when they are outside of the exam room
- **Postpone elective procedures that generate droplets**

Following Discharge

- **DO NOT use the room occupied by a patient** with suspected or confirmed case of the measles for **2 hours** after they have been discharged
- **Leave the door closed and leave alert signage posted** until 2 hours have elapsed and a terminal clean has been performed

Communication

Inform:

- **Patient of the requirements for isolation precautions/visitor restrictions**
- **IMMEDIATE notification of all <u>suspect and confirmed</u> cases to your local Public Health Office (306-___-____) or the MHO on call (306-___-____).**

The Public Health Office will provide additional guidance for case management.

- **Your Infection Control Professional**
- **Your local Housekeeping department** after 2 hours have elapsed following discharge, to perform a terminal clean of the exam room as per regional policies and procedures.
- **If exposure of a Healthcare Worker (HCW) is suspected**, contact local Employee Health and Wellness/ Occupational Health and Safety office.

1. **Symptoms** include Fever 38.3° C or higher, cough, runny nose or red eyes, red blotchy rash appearing three to seven days after fever starts, beginning behind the ears and on the face and spreading down to the body and then to the arms and legs
2. **Immune** - Serological evidence of measles IgG antibodies; or Documentation of 2 doses of measles-containing vaccines for all HCWs.

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Saskatchewan Health: Within 72 hours.

Public Health Follow-up Timeline: Initiate within 24-48 hours.

Public Health Purpose for Notification of Meningococcal Disease (adapted from British Columbia Center for Disease Control [2017])

- To minimize mortality and serious morbidity from meningococcal disease;
- To rapidly identify close contacts of the case and to provide recommendations for appropriate preventive measures for close contacts so as to prevent further spread of infection and disease;
- To provide information about the disease, its transmission, and methods of prevention;
- To identify clusters or outbreaks of infection and to initiate appropriate prevention and control measures;
- To track epidemiology trends of meningococcal disease in Saskatchewan including risk factors and distribution;
- To monitor the effectiveness of prevention and control measures;
- To plan expansion or introduction of future immunization programs;
- To provide timely clinical care including diagnosis and treatment using current, evidence-based guidelines
- To make timely and evidence informed actions on outbreaks; and
- To inform the public and medical community about meningococcal disease.

Surveillance Case Definition[1] (Public Health Agency of Canada, May 2008)

Confirmed Case	Clinical evidence[1] of invasive disease with laboratory confirmation of infection: • isolation of *Neisseria meningitidis* from a normally sterile site (blood, cerebrospinal fluid (CSF), joint, pleural or pericardial fluid)

[1] Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

	OR • demonstration of *N. meningitidis* DNA by an appropriately validated nucleic acid test (NAT) [2] from a normally sterile site.
Probable Case	Clinical evidence[1] of invasive disease with purpura fulminans or petechiae, with no other apparent cause and with non-confirmatory laboratory evidence: • detection of *N. meningitidis* antigen in the CSF.
[1]Clinical illness associated with invasive meningococcal disease usually manifests itself as meningitis and/or septicaemia, although other manifestations may be observed (e.g., orbital cellulitis, septic arthritis). Invasive disease may progress rapidly to petechiae or purpura fulminans, shock and death. [2]Each jurisdiction will have a validation process for the NAT that they have in place.	

Both confirmed and probable cases of **invasive** meningococcal disease (IMD) are notifiable to the provincial and national level.

At this time, conjunctivitis and pneumonia cases due to *N. meningitidis* are not notifiable nor reported to the Ministry of Health or the Public Health Agency of Canada, however case definitions are as follows:

- A conjunctivitis case requires isolation of *N. meningitidis* from the eye or the conjunctival sac in association with purulent conjunctivitis.
- A pneumonia case is one with a Gram strain (if done) showing Gram-negative diplococci and a polymorphonuclear cell response from sputum or respiratory aspirate, isolation with heavy growth of *N. meningitides*, **and** clinical or radiological evidence of pneumonia.
- Patients with *N. meningitidis* conjunctivitis or pneumonia should be treated by the clinician with appropriate systemic antibiotics (Public Health Agency of Canada, 2005).

Epidemiology and Occurrence

Under development

Additional Background Information

Causative Agent

Neisseria meningitidis, the meningococcus, is a Gram-negative, aerobic diplococcus. *Neisseria* are divided into Serogroups including A, B, C, W-135, X and Y (Heymann, 2015).

Symptoms

- Sudden onset of fever, intense headache, nausea and often vomiting, stiff neck, and photophobia.
- Petechial rash with pink macules or, very rarely, vesicles (Heymann, 2015).
- Delirium and coma often appear.
- Occasional fulminating cases exhibit sudden prostration, ecchymoses, and shock.

Complications

10-20% of survivors suffer long-term sequelae:

- Neurological deficits
- Hearing loss
- Limb loss

The case fatality rate is 8-15% (Heymann, 2015)

Reservoir/Source

Humans are the only reservoir. Asymptomatic colonization in the upper respiratory tract occurs in up to 5-10% of people. Less than 1% of colonized individuals develop disease (Heymann, 2015).

Incubation Period

2 to 10 days, commonly 3 to 4 days (Heymann, 2015).

Period of Communicability

As long as 7 days before the onset of symptoms until meningococci are no longer present in discharges from the nose and mouth, usually within 24 hours of the beginning of appropriate antibiotic treatment. Up to 5-10% of people can be asymptomatic carriers; communicability is difficult to determine in carriers (Heymann, 2015)**.**

Mode of Transmission

- Person-to-person by direct contact with respiratory droplets from the nose and throat of an infected person. Can be carried for distances < 1 meter by droplets generated by coughing or sneezing (Public Health Agency of Canada, 2005).
- Fomite transmission is insignificant (Heymann, 2015).

- The likelihood/risk of person-to-person transmission of meningococcal disease is related to the type of contact and length of the contact with the confirmed case (Public Health Agency of Canada, 2005).

Specimen Collection and Transport

- Cultures of blood and CSF are indicated in all patients with suspected invasive disease.
- Cultures of petechial (purpuric lesions) scrapings, synovial fluid, pleural fluid and pericardial fluid are positive in some patients.
- In accordance with the Saskatchewan Disease Control Regulations, section 21.1, all clinical isolates **must** be forwarded to the Roy Romanow Provincial Laboratory (RRPL) for serotyping. Ideally this should be done when the initial gram stain or positive preliminary culture results are available if not ordered sooner by the Medical Health Officer (MHO). Further characterization may be done by National Microbiology Lab.
- **Note:** Since *N. meningitidis* can be part of the normal nasopharyngeal flora, isolation of this organism from the throat is not helpful in determining the cause of the disease.

Refer to the RRPL Compendium of Tests for details on specimen collection and transportation – available online at https://rrpl-testviewer.ehealthsask.ca/.

Risk Factors/Risk Groups

Susceptibility to the clinical disease is low and decreases with age. Persons deficient in certain complement components are especially prone to recurrent disease.

Increased risk of IMD is associated with the following:

- functional or anatomic asplenia;
- underlying immune deficiencies (properdin deficiency, deficiency of terminal complement components or factor D deficiency);
- candidates and recipients of solid organ transplant;
- recipients of hematopoietic stem cell transplant;
- infants, adolescents, and young adults;
- crowded housing/living conditions;
- low socioeconomic status;

- active or passive exposure to tobacco smoke and concurrent upper respiratory tract infections (U.S. Centers for Disease Control and Prevention, 2015);
- young people living in an institutional setting such as military recruits or enlisted personnel and university students in a dormitory setting or at residential camps;
- living in the African meningitis belt (area from Senegal to Ethiopia).

Public Health Investigation

I. Case

Refer to Attachment – Meningococcal Disease (invasive) Data Collection Worksheet to assist.

History

- Determine if case has been laboratory confirmed and if molecular serotyping has been completed.
- Onset of illness, presentation and treatment (with what and when) – to determine incubation period and period of communicability which helps to identify the possible source and contacts to be followed.
- Travel history may be of significance in contact tracing.
- Determine if case has underlying medical conditions or falls into a risk category.
- Try to determine acquisition exposures as well as transmission exposures (e.g. student residence, sporting events, childcare or occupational settings etc.).
- Liaison with school authorities when a case is a student.
- Review immunization history of the case.

Public Health Interventions

Assessment

- Assess for contacts - Aggressive contact tracing, identification, and appropriate management, is the foundation to the prevention of secondary cases. Refer to Table 2 - Contact Definition.
- Obtain names, addresses, and phone numbers of all possible contacts. This information may need to be obtained from someone close to the case.

Communication

- Letters can be sent to classrooms and other group settings where individual contact tracing is not required (i.e. involving school age and adults where there are no vulnerable contacts) to inform them of the exposure, symptom monitoring and when to seek medical attention (see Sample letter).

Education

- All cases should be provided disease information as well as information on prevention and control measures including period of communicability and avoiding contact with vulnerable individuals.

Exclusion

- Individuals with the disease are generally in hospital so are not attending activities. They are isolated until 24 hours after initiation of an appropriate antibiotic (e.g., ceftriaxone, etc.). Otherwise cases or contacts generally do not need to be excluded from any activities.

Immunization

- Case follow-up should be used as an opportunity to recommend immunizations they are eligible for as per the Saskatchewan Immunization Manual. The case should be assessed for underlying risk factors and should be offered vaccine as outlined in the Saskatchewan Immunization Manual, Appendix 7.1.[2]

Referrals

- When clients are hospitalized, communication with hospital staff and or infection control staff is important.
- Refer client to primary caregiver for referrals (physiotherapy, occupational therapy, Home Care) are available if necessary.

Treatment

The public health practitioner should direct any questions regarding the current treatment protocols to the physician or MHO. The following serves as a reference for the public health investigator:

- *Antibiotic treatment is required and should be started as soon as presumptive diagnosis is made. For patient management the client's physician should consult an infectious disease specialist.*
- *In addition to therapeutic antibiotics, the case should receive chemoprophlaxis before hospital discharge unless the infection was treated with an antibiotic that is effective in nasopharyngeal eradication of N. meningitidis (Public Health Agency of Canada, 2005).*

[2] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7

II. Contacts/Contact Investigation

Contact Definition

Table 2: Definition of Close Contacts (Public Health Agency of Canada, 2005)

- Household contacts of a case.
- Persons who share sleeping arrangements with the case (e.g. shared bedrooms or dorm rooms in residences).
- Persons with intimate contact with the case.
- Persons who have direct contamination of their nose or mouth with the oral/nasal secretions of a case (e.g., kissing on the mouth, shared cigarettes, shared drinking bottles) in the 7 days before onset of illness.
- Health care workers (HCWs) who have had intensive (e.g., intubating, resuscitating or closely examining the oropharynx), unprotected contact (without using droplet precautions) with infected patients in the 7 days before onset of illness and completion of the first 24 hours of treatment.[3]
- Children and staff in childcare and nursery school facilities during the 7 days before onset of illness.
- Airline passengers sitting immediately on either side of the case (but not across the aisle) when the total time spent aboard the aircraft was at least 8 hours during the 7 days before onset of illness.

Chemoprophylaxis is not recommended for close contacts of patients with evidence of *N. meningitidis* only in non-sterile sites such as an oropharyngeal swab, endotracheal secretions, or conjunctival swab. (US Centers for Disease Prevention and Control, 2018).

Prior to the introduction of the routine use of chemoprophylaxis for household contacts, they were 500 to 1,200 times at greater risk of IMD than the general population. There is also an increased risk in child care settings, although the risk is lower than in household settings. Risk is not increased in social contacts, therefore the individual relationship to the case must be considered as outlined in Table 2 for school, transportation, social, and workplace contacts.

[3] HCWs are rarely at risk even when caring for infected patients and chemoprophylaxis is rarely warranted except when they meet the definition of a close contact (Heymann, 2015).

Public Health Interventions

Assessment

- Assess for symptoms.

Communication

- Individual follow-up of contacts in in larger daycares, classrooms, schools, teams, workplaces, etc., is generally not recommended. These individuals should be informed by letter from public health, advising them to see their physician if they develop symptoms. These persons, if they become symptomatic, should not be assumed to have pertussis but should be assessed, tested and treated appropriately.

Chemoprophylaxis

The purpose of chemoprophylaxis is to eradicate nasopharyngeal colonization by *N. meningitidis* and thus prevent disease in contacts and further transmission to susceptible persons (Public Health Agency of Canada, 2005).

- Antimicrobial chemoprophylaxis should be administered *as soon as possible*, ideally less than 24 hours, after identification of the index patient but is still recommended for up to 10 days after the last contact with the index case while they were infectious (Public Health Agency of Canada, 2005; U.S. Centers for Disease Control and Prevention, 2011)[4].
- Chemoprophylaxis should be offered for close contacts (as defined in Table 2).
- It should also be considered for close contacts of a case that is strongly suspected to be IMD, if laboratory confirmation cannot be obtained within 24 hours.
- Chemoprophylaxis is not routinely recommended for HCWs including emergency personnel[5]. Only health care personnel who were managing an airway[6] or exposed to respiratory secretions of a patient with meningococcal disease (US Centers for Disease Prevention and Control, 2018).

[4] Chemoprophylaxis is unlikely to be of benefit if given > 10 days after the most recent exposure to an infectious case (Public Health Agency of Canada, 2005).
[5] HCWs are rarely at risk even when caring for infected patients and chemoprophylaxis is rarely warranted except when they meet the definition of a close contact (Heymann, 2015).
6 intubating, resuscitating or closely examining the oropharynx

- For residents of an institutional living or residential camp setting, only contacts that share a room with the case need prophylaxis. If there are other persons who meet the contact definition, they should also receive prophylaxis.
- Refer to Attachment – Meningococcal Chemoprophylaxis Guidelines for details.

Education

- Close contacts of confirmed cases should be educated about meningococcal disease and the signs and symptoms of meningococcal disease (meningitis and meningococcemia).
- They should be advised to seek immediate medical attention if they develop febrile illness or any other signs (see Symptoms).
- They should also be advised about the modes of transmission, period of communicability, and measures that they can take to reduce the risk of acquiring the disease.
- Reinforce proper hand washing and personal protective measures as per Respiratory and Direct Contact Introduction and General Considerations regarding diseases transmitted via respiratory and direct contact.
- Exposed household contacts and daycare contacts should be observed and advised to seek prompt medical attention if they develop a febrile illness.
- Meningococcal Disease (*Neisseria meningitidis*) information sheet can be provided.
- Advise individuals of the increased risk from overcrowding in living quarters and workplaces, such as schools, camps, and ships.

Exclusion

Due to the low secondary attack rate and the short duration of chemoprophylaxis, contacts do not need to be excluded from day care, school, or work.

Immunoprophylaxis

- Close contacts of individuals with meningococcal infections have an increased risk of developing IMD; this risk is greatest for household contacts. The increased risk of meningococcal disease for household contacts persists for up to one year after disease in the index case and beyond any protection from antibiotic chemoprophylaxis. In general, this prolonged risk is not seen among other contacts that do not have ongoing exposure (Public Health Agency of Canada, 2005).

When the serogroup is vaccine-preventable (i.e., serogroup A, B, C, W-135 or Y), the following individuals should be considered for immunoprophylaxis in addition to chemoprophylaxis:

- household contacts of a case;
- persons who share sleeping arrangements with the case;
- persons who have direct exposure of their nose or mouth with oral/nasal secretions of a case (e.g., kissing on the mouth, shared cigarettes, shared drinking bottles); and
- children and staff in child care and nursery school facilities.

The following individuals are close contacts who **do not** require immunoprophylaxis (they should only receive chemoprophylaxis) as they do not have ongoing exposure:

- HCWs who have managed the airway[7] of a meningococcal case.
- Airline passengers sitting immediately on either side of the case (but not across the aisle) when the total time spent aboard the aircraft was at least 8 hours.

Vaccination history should be reviewed for eligible close contacts (date and type of previous meningococcal vaccine). When indicated, immunization should be carried out as soon as possible. For those who were previously immunized, revaccination should be provided based on the following criteria:

- Individuals with underlying medical risk factors (as per Saskatchewan Immunization Manual, Appendix 7.1[8]) should be revaccinated if it has been **more than four weeks** since a previous meningococcal vaccine was received (Public Health Agency of Canada, 2015).
- Individuals who were immunized at less than 1 year of age should be revaccinated if it has been **more than 4 weeks** since a previous meningococcal vaccine was received (Public Health Agency of Canada, 2015).
- Individuals who were immunized after their first birthday and individuals without underlying medical risk factors should be revaccinated if they have not been vaccinated with a meningococcal vaccine **in the past year** (Public Health Agency of Canada, 2015).

[7] intubating, resuscitating or closely examining the oropharynx
[8] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7.

To the extent possible, Saskatchewan follows the recommendations in the 2015 Canadian Immunization Guide for post-exposure vaccination of close contacts for vaccine preventable meningococcal serogroups[9].

Special Considerations for Immunoprophylaxis

Serogroup B:
Recommendations for post-exposure use of meningococcal B vaccine are not included in the current version of the evergreen Canadian Immunization Guide (as of April 2015). Refer to Chapter 10 of the Saskatchewan Immunization Manual for the multicomponent meningococcal B vaccine (4CMenB) schedule and complete the series that they are eligible for based on their age.

Serogroup C:
Individuals 11 years of age and older who are contacts to serogroup C can receive either Men-C-C or Men-C-ACYW-135. Saskatchewan parameters for which vaccine to provide are outlined in Attachment – Immunoprophylaxis Guidelines for Serogroup C Contacts Who Are 11 Years of Age and Older.

Testing

- Testing of asymptomatic contacts is of no value and is not recommended.

III. Environment

Child Care Centre/Schools Control Measures

Ensure each parent receives the information sheet about Meningococcal Disease (*Neisseria meningitidis*).

[9] https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-13-meningococcal-vaccine.html

Management of the centre/school:

- Notify and educate staff and parents of contacts of the case to be alert for anyone with sudden onset of fever, intense headache, nausea and often vomiting, stiff neck and photophobia. Seek prompt evaluation by a physician for any ill child.
- The centre director must notify public health if any additional children become ill.
- All children and care providers should be evaluated as to whether they meet criteria for contact definition for meningococcal disease and be given chemoprophylaxis as appropriate.
- Notify parents of all childcare centre attendees of the occurrence of a case of meningococcal disease (see the appropriate Attachment – Sample Letter about Invasive Meningococcal Disease – Prophylaxis Recommended or Sample Letter about Invasive Meningococcal Disease – Prophylaxis NOT Recommended) and a Meningococcal Disease *(Neisseria meningitidis)* information sheet.
- Assess immunization status of children and staff and immunize as per Immunoprophylaxis section.

Special Considerations for Funeral Homes

Follow routine infection control practices when handling cadavers.

Traditionally, cadavers with meningococcal disease have been considered a possible source of infection. The risk is likely very low if the deceased person had been treated with an effective antibiotic for at least 24 hours before death.

In instances when the deceased had not been treated with an effective antibiotic before death, it is prudent for those who have occupational contact with a cadaver to follow routine infection control practices with additional droplet and contact precautions (Public Health Agency of Canada, 2005).

IV. Epidemic Measures

Outbreaks

An outbreak is defined as increased transmission of *N. meningitidis* in a population, manifested by an increase in cases of the same serogroup.

Outbreaks can be subdivided into organization-based or community-based outbreaks using the criteria shown in Table 3.

Table 3: Types of Outbreak

Organization-based	Increased transmission of *N. meningitidis* in an organization or institution with two or more cases of the same serogroup occurring within a 4-week interval. This includes restricted populations, such as schools, day cares, sports groups, or social groups, as well as nursing homes or long-term care facilities.
Community-based	Increased transmission of *N. meningitidis* in a community, with three or more confirmed cases of the same serogroup occurring within a three-month interval AND an age-specific incidence OR specific community population incidence of approximately 10/100,000, where there is an absence of an epidemiologic link between cases. This is not an absolute threshold and should be considered in the context of other factors.

Regardless of the type of outbreak, contact tracing, identification of close contacts, and provision of chemoprophylaxis to close contacts need to be conducted as described for sporadic cases.

When evidence suggests that an outbreak is occurring with increased transmission of *N. meningitidis* involving a vaccine-preventable serogroup in a delineated population, vaccination of persons at high risk should be considered. The specific epidemiology of the outbreak needs to be ascertained to define the group at risk. Decisions regarding the use of vaccine in communities with a higher than expected rate of disease should be made in consultation with the chief MHO.

When an outbreak occurs:

1. Communication strategy should be in place to provide timely information to the public. This would include:
   - why some people are being immunized and not others;
   - why some people are being given rifampin and not others;
   - not sharing of drinking equipment, cigarettes, etc. especially at sports and high school events;
   - low risk to people entering outbreak area.

2. A communication strategy aimed at the health care community should also be developed. This includes notification of local hospital emergency departments, labs, infection control departments, and physicians/nurse practitioners.
3. An outbreak advisory committee comprising ministry and local public health representatives, clinicians, and medical laboratory personnel should be established. Keep other jurisdictions informed about the outbreak and related control strategies.
4. A communication strategy is prepared before a decision is made to undertake an outbreak immunization program.

Prevention and Education

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Education

- Educate the public about the disease and the need for active immunization. Immunization information fact sheets can be used to guide discussion.
- Education should be provided regarding respiratory etiquette and measures to prevent transmission.

Immunization

- Immunize infants, children, and adults according to the recommended age-appropriate schedules. Refer to Saskatchewan Immunization Manual.[10]
- Provide the appropriate vaccine to travelers at risk (refer to local travel health consultant for details). The risk to travelers planning to have prolonged contact with the local population in areas experiencing endemic/epidemic meningococcal A or C diseases may be reduced by immunization.
- Consider vaccination/revaccination for individuals at risk in outbreak situations if one of the vaccine preventable serogroups has been confirmed.

[10] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Revisions

Date	Change
September 2018	• Updated to align with Panorama configuration; • Incorporated Meningococcal Disease Data Collection Worksheet; • Clarified the purpose for notification of cases to public health; • Incorporated an Epidemiology and Occurrence placeholder into the chapter; • Rearranged and updated the style into the new format of the Manual. • Implemented boxes to draw attention to treatment, chemo and Immunoprophylaxis information. • Removed reference to treatment of conjunctivitis and chemoprophylaxis for contacts to cases with conjunctivitis based on more recent references. • Updated chemoprophylaxis recommendations for HCWs based on more recent references. • References reaffirmed or updated as necessary.

References

Alberta Health and Wellness. (2018). *Public health notifiable disease management guidelines: Meningococcal disease, invasive (IMD)*. Retrieved August, 2018 from http://www.health.alberta.ca/professionals/notifiable-diseases-guide.html.

American Academy of Pediatrics. (2015). *Red Book: 2015 Report of the Committee on Infectious Diseases* (30th ed.). Elk Grove Village, IL: Author.

British Columbia Centre for Disease Control. (2017). *Meningococcal disease.* In *BCCDC Communicable disease control manual.* Retrieved August, 2018 from http://www.bccdc.ca/health-professionals/clinical-resources/communicable-disease-control-manual/communicable-disease-control

Health Canada. (2002). Prevention and control of occupational infections in health care: An infection control guideline. *Canada Communicable Disease Report (CCDR), 28S1:1-264.* Retrieved March, 2013 from http://www.collectionscanada.gc.ca/webarchives/20071124130346/http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Heymann, D. L. (Ed.). (2015). *Control of Communicable Diseases Manual* (20th ed.). Washington, DC: American Public Health Association.

Public Health Agency of Canada. (2005). Guidelines for the prevention and control of meningococcal disease. *Canada Communicable Disease Report (CCDR), 31S1:1-20*. Retrieved August, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/05vol31/31s1/index-eng.php.

Public Health Agency of Canada. (2006). Update: Guidelines for the prevention and control of meningococcal disease. *Canada Communicable Disease Report (CCDR), 32(22).* Retrieved March, 2013 from http://www.collectionscanada.gc.ca/webarchives/20061212105411/http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/06vol32/dr3222ec.html.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2*, November 2009. Retrieved August, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Mening-eng.php.

Public Health Agency of Canada. (2009). Update on the invasive meningococcal disease and meningococcal vaccine conjugate recommendations. *Canada Communicable Disease Report (CCDR),* V35*(ACS-3).* Retrieved August, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/acs-dcc-3/index-eng.php.

Public Health Agency of Canada. (2015). *Canadian immunization guide* (Evergreen ed.). Ottawa, Canada: Public Works and Government Services Canada. Retrieved August, 2018 http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php#toc.

U.S. Centers for Disease Control and Prevention. (2010). Updated recommendations for use of meningococcal conjugate vaccines: Advisory Committee on Immunization Practices. *Morbidity and Mortality Weekly Report (MMWR), 60(03);72-76,* January 28, 2011. Retrieved August, 2018 from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6003a3.htm.

U.S. Centers for Disease Control and Prevention. (2015). *Epidemiology and prevention of vaccine-preventable diseases.* (13th ed.). Atkinson, W., Hamborsky, J., Wolfe, S., (Eds.). Washington DC: Public Health Foundation. https://www.cdc.gov/vaccines/pubs/pinkbook/mening.html

U.S. Centers for Disease Control and Prevention. (2018). *Manual for the surveillance of vaccine-preventable diseases. Chapter 8: Meningococcal disease (2018).* (MacNeil, J., Patton, M.). Atlanta GA: Washington DC. https://www.cdc.gov/vaccines/pubs/surv-manual/chpt08-mening.html

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PANORAMA

Meningococcal Disease (invasive) Data Collection Worksheet

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

LHN ->SUBJECT SUMMARY-> RESPIRATORY & DIRECT CONTACT ENCOUNTER GROUP-> CREATE INVESTIGATION

Disease Summary Classification: CASE:	**Date**	**Classification: CONTACT:**	**Date**	**LAB TEST INFORMATION:**
☐ Confirmed	YYYY / MMM / DD	☐ *Contact*	*YYYY / MMM / DD*	*Date specimen collected:*
☐ Does Not Meet Case	YYYY / MMM / DD	☐ *Not a Contact*	*YYYY / MMM / DD*	*YYYY / MMM / DD*
☐ Person Under Investigation	YYYY / MMM / DD	☐ *Person Under Investigation*	*YYYY / MMM / DD*	☐ *Blood* ☐ *Other* ☐ *CSF* ☐ *Joint fluid* ☐ *Pericardial fluid*
☐ Probable	YYYY / MMM / DD			

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province (specify where)	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD		

REPORTING NOTIFICATION Name of Attending Physician or Nurse:	Location:
Provider's Phone number:	Date Received (Public Health): YYYY / MMM / DD

Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician
☐ Other_____

C) DISEASE EVENT HISTORY

LHN-> INVESTIGATION->DISEASE SUMMARY (UPDATE)->DISEASE EVENT HISTORY

Site / Presentation: ☐ Meningitis ☐ Sepsis ☐ Unknown

Meningococcal Disease (invasive) Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

D) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION-> SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Arthritis - septic		YYYY / MMM / DD	Neurologic - delerium		YYYY / MMM / DD
Bruising - ecchymoses		YYYY / MMM / DD	Pain - photophobia (sensitivity to light)		YYYY / MMM / DD
Cellulitis - orbital		YYYY / MMM / DD	Prostration		YYYY / MMM / DD
Coma		YYYY / MMM / DD	**Purpura fulminans (coagulation of small blood vessels)**		YYYY / MMM / DD
Fever		YYYY / MMM / DD	Rash - maculopapular		YYYY / MMM / DD
Headache		YYYY / MMM / DD	Rash - petechial		YYYY / MMM / DD
Meningitis		YYYY / MMM / DD	**Sepsis (e.g. bacteremia, septicemia, etc.)**		YYYY / MMM / DD
Nausea		YYYY / MMM / DD	**Shock**		YYYY / MMM / DD
Neck stiffness (nuchal rigidity)		YYYY / MMM / DD			YYYY / MMM / DD
Other s/s					

E) INCUBATION AND COMMUNICABILITY

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):
Earliest Possible Exposure Date: YYYY / MM / DD **Latest Possible Exposure Date**: YYYY / MM / DD

Exposure Calculation details:

Communicability for Case (period for transmission):
Earliest Possible Communicability Date: YYYY / MM / DD **Latest Possible Communicability Date**: YYYY / MM / DD

Communicability Calculation Details:

F) RISK FACTORS (RF followed by + impact the Immunization Forecaster)

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	Yes Start Date	N, NA, U	Add'l Info
Chronic Medical Condition - Cochlear Implant +			
Chronic Medical Condition Congenital or Acquired, or Functional Asplenia +			
Contact At risk population (international travellers or immigrants) (i.e. risk areas)			
Contact - IMD Case: serogroup A, Y, or W-135 +	YYYY / MM/DD		
Contact - IMD Case: serogroup B +	YYYY / MM/DD		
Contact - IMD Case: serogroup C +	YYYY / MM/DD		
Contact to a known case (Add'l Info)	YYYY / MM/DD		
Immunocompromised – Acquired Complement Deficiency +			
Immunocompromised – Congenital immunodeficiency +			
Immunocompromised - Related to disease or treatment (Add'l Info)			
Immunocompromised - Transplant Candidate or Recipient - Solid Organ/Tissue +			
Occupation - Health care worker - IOM Risk Factor	TE		
Occupation - Child care worker	TE		
Behaviour - Sharing personal items (cigarettes, water bottles, etc)	TE		
Setting - Crowded living conditions (>1 person per room excluding bathrooms)	TE		
Special Population – Attends childcare	TE		
Special Population - Attends school	TE		
Special Population - Lives in a communal setting	TE		

Meningococcal Disease (invasive) Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

DESCRIPTION	Yes Start Date	N, NA, U	Add'l Info
Special Population - Post secondary education institution	TE		
Travel: Outside of Canada (Add'l Info)	YYYY / MM/DD AE		
Travel Outside of Saskatchewan, but within Canada (Add'l Info)	YYYY / MM/DD AE		
Other risk factor (Add'l Info)			

G) COMPLICATIONS

LHN-> INVESTIGATION->COMPLICATIONS

Description	Yes Date of onset	Description	Yes Date of onset
Disseminated intravascular coagulation (DIC)	YYYY / MMM / DD	Gangrene	YYYY / MMM / DD
Other complications			

H) IMMUNIZATION HISTORY INTERPRETATION SUMMARY

LHN -> INVESTIGATION-> IMMUNIZATION HISTORY INTERPRETATION SUMMARY

Interpretation Date: YYYY / MM / DD **serotype: _____**

Interpretation of Disease Immunity: ☐ IOM - Fully immunized (for age) ☐ IOM - Partially immunized

☐ IOM – Unimmunized ☐ IOM - Unclear immunization history **Valid doses received**: _____ **Doses needed**: _____

Reason:

☐ Previous disease ☐ Previous responder/Previous history of immunity ☐ Date Of Birth

☐ IOM – Interpretation of history by investigator

I) TREATMENT

LHN-> INVESTIGATION-> MEDICATIONS->MEDICATIONS SUMMARY

Medication *(Panorama = Other Meds) :* _____

Prescribed by:_____ Started on: YYYY / MMM / DD

J) INTERVENTIONS

INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

Assessment: Investigator name
☐ Assessed for contacts YYYY / MM / DD

Immunization: Investigator name
☐ Eligible Immunization recommended YYYY / MM / DD
☐ Disease-specific immunization recommended YYYY / MM / DD
☐ Disease-specific immunization given YYYY / MM / DD

Communication:
☐ Other communication (see Investigator Notes) YYYY / MM / DD
Investigator name
☐ Letter (See Document Management) YYYY / MM / DD
Investigator name

Immunoprophylaxis
☐ Immunoprophylaxis (Contacts only)

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD
☐ Disease-Info/Prev-Cont/Assess'd for Contacts YYYY/ MM / DD

Isolation:
☐ Facility isolation Investigator name YYYY / MM / DD
☐ Home isolation Investigator name YYYY / MM / DD

Education/counselling:
☐ Prevention/Control measures YYYY / MM / DD
☐ Disease information provided YYYY / MM / DD
Investigator name

Testing:
☐ Lab testing recommended YYYY / MM / DD
Investigator name

Exclusion: Investigator name
☐ Daycare YYYY / MM / DD ☐ Preschool YYYY / MM / DD
☐ School YYYY / MM / DD ☐ Work YYYY / MM / DD

Referral:
☐ Consultation with MHO ☐ Primary Care Provider

Other Investigation Findings:
☐ Investigator notes ☐ Document Management

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

Meningococcal Disease (invasive) Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

K) OUTCOMES ***(optional except for severe influenza)*** LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering YYYY / MM / DD ☐ ICU/intensive medical care YYYY / MM / DD ☐ Hospitalization YYYY / MM / DD
☐ Recovered YYYY / MM / DD ☐ Intubation /ventilation YYYY / MM / DD ☐ Unknown YYYY / MM / DD
☐ Fatal YYYY / MM / DD ☐ Other _____YYYY / MM / DD

Cause of Death: (if Fatal was selected) _____

L) Acquisition Event LHN-> INVESTIGATION-> EXPOSURE SUMMARY-> ACQUISITION EVENT SUMMARY -> QUICK ENTRY

Acquisition Event ID:_____

Exposure Name: _____

Acquisition Start YYYY / MM / DD to **Acquisition End:** YYYY / MM / DD

Location Name: _____

Setting Type

☐ Travel ☐ Health care setting ☐ Public facilities ☐ Recreational facilities ☐ Most likely source

M) Transmission Events LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> QUICK ENTRY

Transmission Event ID	Exposure Name	Setting type (Consider the following settings for TE; if >1 select "multiple settings" in Panorama)	Date/Time	# of contacts
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities (daycare, school, etc)	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities (daycare, school, etc)	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities (daycare, school, etc)	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities (daycare, school, etc)	YYYY / MM / DD to YYYY / MM / DD	
	Meningococcal Contacts – Inv ID# _____	☐Multiple Settings	YYYY / MM / DD to YYYY / MM / DD	

N) TOTAL NUMBER OF CONTACTS

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> TE HYPERLINK -> UNKNOWN/ANONYMOUS CONTACTS

Anonymous contacts:_____ (total number of individuals [including groups that 1:1 follow-up is not required or is not feasible])

Initial Report completed by:		**Date initial report completed:** YYYY / MMM / DD

Meningococcal Disease - invasive
Attachment – Meningococcal Chemoprophylaxis Guidelines

Chemoprophylaxis* for Close Contacts of Individuals with Meningococcal Infection		
Drug* **	**Dosage****	**Comments**
Rifampin	**Adults:** ▪ 600 mg orally every 12 hours for 4 doses **Children ≥ 1 month of age (up to 60 kg):** ▪ 10 mg/kg (maximum 600 mg) orally every 12 hours for 4 doses **Infants < 1 month of age:** ▪ 5 mg/kg per dose orally every 12 hours for 4 doses	Should not be used in pregnancy - Ceftriaxone is a safer alternative. Urine and tears may be stained red. Advise against wearing of soft contact lenses as they can also be stained. Can reduce effectiveness of oral contraceptives. Advise use of alternative/ additional contraceptive measures. Refer to Rifampin Chemoprophylaxis Dosage Guide for *Neisseria meningitidis* for information on dosing.
Ceftriaxone	**Adults and adolescents ≥ 12 years:** ▪ 250 mg IM x 1 dose **Children < 12 years:** ▪ 125 mg IM x 1 dose	Recommended drug for pregnant women. Alternative for persons who cannot tolerate oral medication. Dilute in 1% lidocaine to reduce pain at injection site.
Ciprofloxacin	**Adults ≥ 18 years of age:** ▪ 500 mg PO x 1 dose	Contraindicated during pregnancy and lactation. Only approved for persons > 18 years of age. Not recommended for prepubertal children
*Chemoprophylaxis should be offered to all persons having close contact with an IMD case during the infectious period (the 7 days before onset of symptoms in the case to 24 hours after onset of effective treatment) regardless of their immunization status. Chemoprophylaxis is unlikely to be of benefit if given > 10 days after the most recent exposure to an infectious case. If antibiotics such as penicillin, which do not reliably eliminate nasopharyngeal carriage, have been used for treatment, the index case should also receive antibiotics that clear nasal carriage before discharge. **PO, orally; IM, intramuscularly. *** See Appendix F - Patient Information Sheets for medication fact sheets.		

(Source: Public Health Agency of Canada, 2005)

Rifampin Chemoprophylaxis Dosage Guide for *Neisseria meningitidis*

Dosage Guide based on the noted weight in kg below. **Calculate dose based on exact weight. Maximum dose 600 mg.**																
Weight in kg ***Dosage by age***	**5**	**6**	**7**	**8**	**9**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60** Max or adult dose
<1 mo of age *5 mg/kg/dose (25 mg/ml suspension)* 1 Dose PO q 12 h x 4 doses	1.0 ml	1.2 ml	1.4 ml	1.6 ml	1.8 ml	2.0 ml	3.0 ml	4.0 ml								
>1 mo of age *10 mg/kg/dose (max dose 600 mg)* *1 Dose PO q 12 h x 4 doses*	2.0 ml	2.4 ml	2.8 ml	3.2 ml	3.6 ml	4.0 ml	6.0 ml	8.0 ml	10.0 ml	12.0 ml	14.0 ml	16.0 ml	18.0 ml	20.0 ml	22.0 ml	24.0 ml

Recommendations

1. Use the appropriate weight-specific dose noted in the first column in the chart above for infants and children.
2. Rifampin Pediatric Suspension should be prepared by a pharmacist as follows:
   - **Add contents of 3 (300mg) caps or 6 (150 mg caps) of Rifampin to 36 mls of simple syrup to yield a 25 mg/ml suspension.**
   - **SHAKE WELL.**
3. Store prepared suspension and simple syrup at room temperature because of their tendency to crystallize if refrigerated.
4. Discard prepared suspension after treatment course is completed. Preparation expires after 28 days.
5. As much as possible, use only one preparation form per client (i.e., capsule(s) only, or suspension only).
6. Give client a Rifampin information sheet.

Note:

- Rifampin is contraindicated in pregnancy. Discuss Ceftriaxone dose with MHO.
- If necessary, discuss alternative treatments with MHO for non-pregnant adults.

Meningococcal Disease - invasive

Attachment – Immunoprophylaxis Guidelines for Serogroup C Contacts Who Are 11 Years of Age and Older

Individuals 11 years of age and older who are contacts to serogroup C can receive either Men-C-C or Men-C-ACYW-135. Saskatchewan parameters for which vaccine to provide are outlined as follows:

Contact Group	Vaccine	Recommendation
Individuals 11 years and older with underlying risk factors (as per SIM Appendix 7.1[1])	Men-C-ACYW-135	Provide to individuals who: • have not received a previous dose of Men-C-ACYW-135 as part of their routine immunization **OR** • are due for a Men-C-ACYW-135 booster dose as per high-risk immunization schedule.[1]
	Men-C-C	Provide to high-risk individuals who: • have had a dose of Men-C-ACYW-135 **more than 4 weeks ago** **BUT** • are not yet due for their routine Men-C-ACYW-135 booster.[1]
Grade 6 students (regardless of age)	Men-C-ACYW-135	Provide to individuals who: • have not received a dose of meningococcal C-containing vaccine **in the past year** **AND** • are eligible for Men-C-ACYW-135 as part of the routine school immunization program.
	Men-C-C	If Men-C-C is provided at the time of exposure, Men-C-ACYW-135 should be provided a minimum of 4 weeks after Men-C-C to complete the routine immunization Grade 6 program.

[1] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7

Meningococcal Disease - invasive
Attachment –Immunoprophylaxis Guidelines for Serogroup C Contacts Who Are 11 Years of Age and Older

Contact Group	Vaccine	Recommendation
Individuals born Jan 1, 2000 or later (up to age 22)[2]	Men-C-ACYW-135	Provide to individuals who: • have not received a dose of meningococcal C-containing vaccine **in the past year** **AND** • have not received a single dose of Men-C-ACYW-135 as part of the routine school immunization program.
	Men-C-C	Provide to individuals who: • have received one dose of Men-C-ACYW-135 **AND** • it has been **more than 1 year** since their last meningococcal C-containing vaccine.
Individuals 11 years and older with no risk factors and not eligible for the Grade 6 program	Men-C-C	Provide to individuals who have not received a dose of meningococcal C-containing vaccine **in the past year.**

[2] http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter5

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.
From Public Health to Ministry of Health: Within 2 weeks.

Public Health Follow-up Timeline: Initiate within 72 hrs.

Public Health Purpose for Notification of Mumps (Adapted from Massachusetts, 2017)

- To prevent mortality and serious morbidity from mumps through rapid contact tracing;
- To prevent transmission of mumps from imported cases;
- To track epidemiology trends of mumps in Saskatchewan including risk factors and distribution;
- To monitor the effectiveness of prevention and control measures including the immunization program;
- To inform decisions about future immunization programs
- To make timely and evidence informed actions on outbreaks; and
- To inform the public and medical community about mumps.

Information

Surveillance Case Definition[1] (Public Health Agency of Canada, 2008)

Confirmed Case	Clinical illness [a] and laboratory confirmation of infection in the absence of recent immunization [b] with mumps-containing vaccine: • isolation of mumps virus from an appropriate clinical specimen **OR** • detection of mumps virus ribonucleic acid (RNA) **OR** • seroconversion or a significant rise (e.g., fourfold or greater) in mumps immunoglobulin G (IgG) titre by any standard serologic assay between acute and convalescent sera

[1] Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

	OR • positive serologic test for mumps immunoglobulin M (IgM) antibody [c] in a person who is either epidemiologically linked to a laboratory-confirmed case or has recently travelled to an area of known mumps activity. **OR** Clinical illness in a person with an epidemiologic link to a laboratory-confirmed case.
Probable Case	Clinical illness [a] • in the absence of appropriate laboratory tests **OR** • in the absence of an epidemiologic link to a laboratory-confirmed case.

[a] Clinical illness is characterized by acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary gland, lasting > 2 days, and without other apparent cause.

[b] The most frequent reaction to measles-mumps-rubella (MMR) immunization is malaise and fever (with or without rash) occurring 7-12 days after immunization. Parotitis has occasionally occurred after immunization. However, this should be determined for each case, as these reactions and the time frame can vary (*Canadian Immunization Guide*, 7th edition).

A laboratory-confirmed case may not exhibit clinical illness, as up to 30% of cases are asymptomatic.

[c] IgM serology has the potential for false-positive findings. *If the clinical presentation is inconsistent with a diagnosis of mumps or in the absence of recent travel/exposure history, IgM results must be confirmed by the other listed confirmatory methods.

Further strain characterization is indicated for epidemiologic, public health and control purposes.

Although the case definition indicates that a positive serologic test for mumps IgM is a confirmed case, the challenge with relying on the IgM serology alone is that other etiologic agents (e.g., infection with parainfluenza virus, Epstein-Barr virus (EBV), or *Mycoplasma pneumoniae*) cross react and result in a false positive IgM for mumps. The positive predictive value of mumps IgM is low when the incidence of mumps is low in the community and most results will be false positives. If you have any questions regarding the interpretation of lab results, please call the to Roy Romanow Provincial Laboratory (RRPL) or the local Medical Health Officer (MHO).

To confirm diagnosis of mumps, the following must be taken into consideration:

- lab information;
- clinical presentation;
- case history.

Epidemiology and Occurrence

Canada

With the introduction of vaccine in 1969 in Canada, the number of reported mumps cases nationally decreased by more than 99% from an average of 34,000 cases per year in the early 1950s to fewer than 400 cases in the early 1990 and an annual average of 79 cases in the period 2000–2006. From 1996 to 2006, only five outbreaks primarily involving pre-school or school-aged children, adolescents, and young adults were reported.

Over time, the age distribution of mumps cases has changed. In Canada, the proportion of reported cases aged 20 years and older increased from 14% in 1988–1990 to 64% in 2003–2005 while the proportion of cases aged 1–9 decreased from 49% to 17% during the same period (Public Health Agency of Canada, 2009).

In Saskatchewan, between 2000-2016, a total of 32 cases of mumps were reported with zero cases reported in 6 of these years.

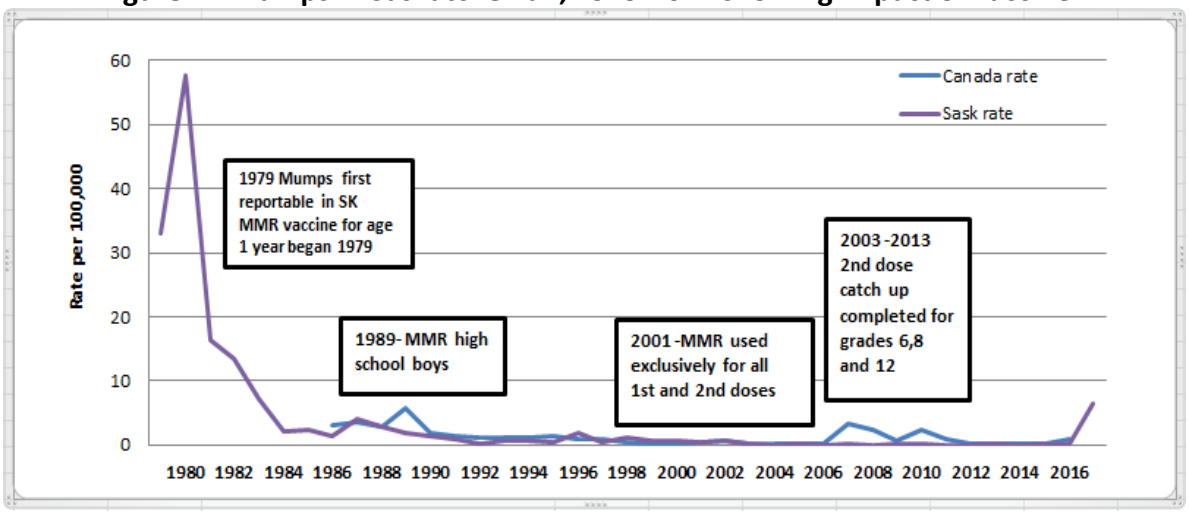
In 2017, 77 cases were largely related to three outbreaks: one involved a mine worksite; another involved a sports team which likely contracted the virus during interprovincial sports events. Mumps was introduced into a remote community from a neighbouring province.

Table 1. Evolution of the Mumps Immunization Program in Saskatchewan

1979	MMR vaccine for age 1 year
Fall 1991 to 1992	Mass MMR immunization for teen-aged boys in high schools and post-secondary institutions
2001	MMR used exclusively for all 1st and 2nd doses; MR discontinued by Berna
2003 - 2004	2 dose mumps catch-up in Grade 6
2007 - 2013	2-dose mumps catch-up for eligible Grade 12 students
2008 - 2013	2-dose mumps catch-up for eligible Grade 8 students
2011 - 2013	2nd dose provided to eligible Grade 6 students
May 2013	Adult born since Jan. 1, 1970 eligible for 2 MMR doses

Saskatchewan Immunization Manual (2018)

Figure 1. Mumps in Saskatchewan, 1979-2017 showing impact of vaccine



Additional Background Information

Causative Agent

Mumps virus, a member of the family *Paramyxoviridae*, genus *Rubulavirus.*

Symptoms

Prodromal symptoms are non-specific and include myalgia, headache, malaise and low-grade fever.

This acute viral illness is characterized by fever, swelling and tenderness of one or more salivary glands, usually the parotid and sometimes the sublingual or submaxillary glands. Children often experience respiratory symptoms. Up to 30% of infected cases can be asymptomatic.

- Orchitis can occur in as many as 20-30% of postpubertal males.
- Asceptic meningitis occurs in up to 10% of cases and rarely, encephalitis may occur as a complication (Heymann, 2015).
- Other rare complications may include arthritis, mastitis, glomerulonephritis, myocarditis, endocardial fibroelastosis, thrombocytopenia, cerebellar ataxia, transverse myelitis, ascending polyradiculitis, pancreatitis, oophoritis, hearing impairment etc. (American Academy of Pediatrics, 2018).
- During the first trimester of pregnancy, mumps is associated with an increased rate of spontaneous abortion (Heymann, 2015).

Reservoir/Source
Humans are the only known natural hosts.

Incubation Period
Range from 12-25 days (usually16-18 days) (American Academy of Pediatrics, 2018).

Period of Communicability
Can be isolated for up to 7 days before the onset of symptoms and for as long as 9 days after the onset of the illness. The period of maximum infectiousness is between 2 days before to 5 days after the onset of illness (Heymann, 2015)

Mode of Transmission
Droplet spread or direct contact with the respiratory secretions of an infected person; airborne transmission also occurs.

Specimen Collection and Transport
For the diagnosis of mumps the recommended specimens to be collected are:

- serum sample
  AND
  - a swab from around opening of Stenson's duct
    OR
  - a urine sample.

The buccal swab and urine sample will be tested by polymerase chain reaction (PCR). The respiratory pathogens currently in circulation can interfere with the serologic diagnosis (cross-reactions leading to false positive IgM).

- It is recommended that a buccal swab be obtained at the same time as the serological sample.
- Samples should be collected when the patient first presents with symptoms; these have the best chance of having a positive result by PCR if mumps infection is present. Among symptomatic persons who have received a dose of MMR, the virus may be cleared rapidly.

Public Health Investigation

I. Case

Control measures must be implemented immediately for all confirmed, probable or clinical cases. Awaiting lab confirmation must not delay the initiation of control measures. Refer to Attachment – Mumps Data Collection Worksheet to assist.

History

- Determine mumps immunization history including number of doses, date(s) administered, and type of vaccine.
- If the case has been fully immunized against mumps, further details of immunizations are required (lot numbers, where the vaccines were received, etc.).
- Determine if there is an opportunity for acquisition through:
  - contact with a confirmed or probable case of mumps.
  - history of travel (seven to 21 days before onset of rash), or contact (seven to 21 days before onset of rash) with a person who had recent travel.
- Health conditions that may render the individual more susceptible to infection or alter the period of communicability (e.g. immunocompromised).
- Identify contacts (refer to contact definition) by inquiring about opportunities for transmission events during the infectious period, which includes seven days prior to and five days after the parotitis appears:
  - household;
  - daycare/school;
  - workplaces;
  - health care facilities[2] (including physicians' offices and waiting rooms).

Public Health Interventions

Assessment

- Assess for contacts paying particular attention to susceptible contacts as per Table 3.

Communication

- Letters can be sent to classrooms and other group settings where individual contact tracing is not required (i.e. involving school age and adults where there are no vulnerable contacts) to inform them of the exposure, symptom monitoring and when to seek medical attention (see Sample letter).

[2] In acute care settings, Infection Control and Occupational/ Employee Health should also be involved.

Education

- All cases should be provided disease information as well as information on prevention and control measures including period of communicability and avoiding contact with susceptible individuals.

Exclusion and Isolation

Exclusion and isolation of cases should be implemented as outlined in Table 2.

Table 2. Exclusion Requirements for Cases

Who	Exclusion Requirements	Timeframe
Cases (including confirmed, clinical and suspect).[3]	Exclude from childcare, school, post-secondary institutions, and workplaces. Avoid contact with susceptible people.	For at least 5 days from parotitis onset. This should be extended to 9 days if the case remains symptomatic.
Health Care Workers (HCWs) who are cases (including confirmed, clinical and suspect).[3] Note – Advise case to immediately notify Occupational Health and/or Infection Control for the facility in which they work.	Cases should be excluded from work. Cases who work with vulnerable patients (i.e., immunocompromised).	For at least 5 days from parotitis onset. This should be extended to 9 days if the case remains symptomatic. For 9 days from parotitis onset.
Cases in the hospital or other health care facility.	The case should be on droplet precautions.	For at least 5 days from parotitis onset. This should be extended to 9 days if the case remains symptomatic.

Immunization

Ensure the client's entire immunization status is up-to-date once they have recovered.[4]

Treatment

- Supportive therapy as there is no specific treatment for mumps.
- Individuals with severe central nervous system involvement may require hospitalization.

[3] The exclusion of epidemiologically-linked contacts with symptoms can be discontinued before five days if laboratory results rule out a diagnosis of mumps.

[4] Life-long immunity is expected following natural infection with mumps.

II. Contacts/Contact Investigation

Table 3. Contact Definition (Public Health Agency of Canada, 2009)

Definition of Close Contact
Contacts of confirmed cases are defined as any of the following during the infectious period (approximately 7 days before to 5 days after symptom onset): • household contacts of a case; • persons who sleep in the same room as the case; • direct contact with the oral/nasal secretions of a case (e.g., face-to-face contact where droplet contact may occur, sharing cigarettes/drinking glasses/food/cosmetics (lip gloss), kissing on the mouth, children and staff in child care and nursery school facilities, etc.); • children and staff in child care and school facilities; • HCWs who have unprotected face-to-face interaction (within 1 metre) to an infectious mumps case in the facility.
Definition of Susceptible Contacts
• Those born in 1970 or later who have not received two doses of mumps-containing vaccine (at least four weeks apart) after their first birthday **AND** o who have not had laboratory confirmed mumps **OR** o who do not have documented immunity due to mumps illness. Serological screening to identify susceptible contacts is impractical and unnecessary, since there are no additional risks of immunizing those already immune.

In Canada, it is assumed that people who were born before 1970 are generally considered immune due to natural immunity.

<u>Public Health Interventions</u>

Assessment

Assess for signs and symptoms and immunization history.

Communication

- Identifiable contacts should, at a minimum, be provided with a letter that includes all details as outlined in education.

Education

- All contacts of confirmed cases should be educated about mumps including the signs and symptoms, period of communicability and measures to prevent transmission of respiratory viruses – handwashing, not sharing water bottles, etc.
- The risk of exposure should also be communicated to all students and parents and other contacts.

- Individuals should be advised to visit one's health-care provider should any symptoms develop.

Exclusion and Immunization

- Exclusion of susceptible contacts that meet the criteria in Table 3 is outlined in Table 4.
- If the contact develops symptoms compatible with mumps, exclusion criteria for cases should be applied.

Table 4. Exclusion and Immunization Requirements for Contacts

Non-HCW Contacts who are:	Required Immunizations	Exclusion Requirements	Timeframe
Immune.	None.	None.	None.
Susceptible (in school, childcare or workplace setting).	As per Saskatchewan Immunization Manual.[5]	None.	None.

The following additional requirements apply to ***Health Care Workers who are Contacts***

- Advise the health-care worker to contact Occupational Health and/or Infection Control for the facility in which they work.
- Public Health will notify Occupational Health and/or Infection Control that contacts to mumps have been identified in their facility. Personal details of the contacts will not be disclosed.
- Provide information on mumps disease and its symptoms.
- Assess immunization status.

Table 5. Exclusion and Immunization Requirements for Contacts who are Health Care Workers

History of Immunization	Required Immunizations	Exclusion Requirements
Documented 2 doses of mumps-containing vaccine.	None.	None.
Documented 1 dose of mumps-containing vaccine.	Provide second dose of mumps-containing vaccine.	Return to work immediately.

[5] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

History of Immunization	Required Immunizations	Exclusion Requirements
Undocumented immunization history.	1. Draw blood for mumps IgG serology. 2. Provide a dose of mumps-containing vaccine (after serology taken).	While waiting for serology results, exclude case from work for period of communicability, which starts on day 10 after exposure where exposure is day 1: a. If IgG positive, then consider immune and can return to work; consider a second dose of MMR for adequate measles and rubella protection. b. If IgG negative, then consider susceptible, provide a second dose of mumps-containing vaccine 28 days after the first and exclude from work on day 10 after first exposure until day 26 after last exposure.

Testing

Attempt to confirm diagnosis in any contacts that develop symptoms consistent with mumps.[6]

Prophylaxis/Immunization

Although immunization with live virus mumps-containing vaccine has not been demonstrated to be effective in preventing infection after exposure, the following still applies:

- Immunization of susceptible contacts with mumps-containing vaccine, recognizing that immunization after exposure may not prevent disease if the individual is already infected. See Table 4. Exclusion and Immunization Requirements for Contacts. Serological screening to identify susceptible contacts is impractical and unnecessary, since there is no risk to those already immune.

[6] This recommendation is applicable when sporadic cases are occurring. Recommendations for testing during an outbreak should be discussed with the MHO.

III. Environment

Child Care Centre/Schools Control Measures

Strict enforcement of infection control measures. Refer to the Saskatchewan Ministry of Health Infection Control Manual for Child Care Facilities.[7]

Health Facilities Control Measures

Strict enforcement of infection control measures. Refer to your Regional Infection Control Manual.

Cases should be on isolation and in a private room for at least 5 days from parotitis onset. This should be extended to 9 days if the case remains symptomatic. Refer to Table 2 (Exclusion Requirements for Cases) and Table 5 (Exclusion and Immunization Requirements for Contacts who are Health Care Workers).

IV. Epidemic Measures

The resources required for contact tracing and the management of contacts may put significant demands on public health and laboratory capacity.

- Logistics for providing immunization to susceptible contacts, including prioritization of vaccine supply, should be carefully considered.
- Serological screening to identify susceptible individuals is impractical and unnecessary, since there is no risk to those already immune.

When determining means to control outbreaks, exclusion of susceptible students from affected schools, thought to be at risk of transmission, should be considered. Excluded students can be readmitted following immunization. Immunization is not known to prevent mumps in those already exposed, but will protect against future exposures if the individual has had time to mount an immune response. Those who continue to be unimmunized due to medical, religious, or other reasons should be excluded until at least 26 days after the onset of parotitis in the last person with mumps in the affected school.

In the event of an outbreak, promote awareness in the community affected by the outbreak and among healthcare personnel:

- share information about the settings within which transmission is occurring;
- transmission patterns among fully vaccinated populations;

[7] http://www.saskatchewan.ca/live/births-deaths-marriages-and-divorces/starting-a-family/early-learning-and-child-care/child-care

- remind healthcare personnel to not rule out mumps on the assumption that individuals have evidence of mumps immunity because outbreaks have occurred in highly vaccinated populations in high transmission settings, including school settings (e.g., elementary school, middle school, high school, and college students) (Centers for Disease Prevention and Control, 2018).

Prevention Measures

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization
Immunize infants, children, and adults according to the recommended schedule. Refer to the Saskatchewan Immunization Manual.[8]

Education
- Education should be provided regarding respiratory etiquette and measures to prevent transmission of mumps.
- Educate the public about the disease and the need for active immunization with a mumps-containing vaccine. Immunization information fact sheets can be used to guide discussion.

[8] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Revisions

Date	Change
September 2018	• Updated to align with Panorama configuration • Clarified the purpose for notification of cases to public health • Incorporated an Epidemiology and Occurrence section with Canadian information and included Saskatchewan Immunization program history from Sask Immunization Manual to provide context. • Updated period of communicability to remove outer limit of 14 days following parotitis. • Rearranged and updated the style into the new format of the Manual. • Added information into Epidemic section regarding transmission among fully vaccinated individuals. • References reaffirmed or updated as necessary.

References

American Academy of Pediatrics. (2018). *Red book: 2018-2021 Report of the Committee on Infectious Diseases* (31st ed.). Elk Grove Village, IL: Author.

Centers for Disease Control and Prevention. (2008). *Epidemiology and prevention of vaccine-preventable diseases* (10th ed.). Atkinson, W., Hamborsky, J., McIntyre, L., Wolfe, S. (Eds.). Washington, DC: Public Health Foundation.

Centers for Disease Control and Prevention (2018). *Manual for the surveillance of vaccine-preventable diseases – Chapter 9. Mumps.* Centers for Disease Control and Prevention, Atlanta, GA. Retrieved September, 2018 from https://www.cdc.gov/vaccines/pubs/surv-manual/chpt09-mumps.html

Heymann, D. L. (Ed.). (2015). *Control of communicable diseases manual* (20th ed.). Washington, DC: American Public Health Association.

Mandell, G. L., Bennett, J. E., & Dolin, R. (Eds.). (2000). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (5th ed.). Philadelphia, PA: Churchill Livingstone.

Public Health Agency of Canada. (2002). Infection control guidelines: Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR*), *28S1,* March 2002. Retrieved October, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Public Health Agency of Canada. (2018). *Canadian immunization guide* (Evergreen ed.). Ottawa, Canada: Public Works and Government Services Canada. Retrieved August, 2018 http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php#toc.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2*, November 2009. Retrieved September, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Mumps_Oreill-eng.php.

Public Health Agency of Canada. (2009). Guidelines for the prevention and control of mumps outbreaks in Canada. *Canada Communicable Disease Report (CCDR), 35S4*, December 2009. Retrieved September, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/10pdf/36s1-eng.pdf.

Government of Saskatchewan

Mumps Data Collection Worksheet

PANORAMA

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

LHN ->SUBJECT SUMMARY-> RESPIRATORY & DIRECT CONTACT ENCOUNTER GROUP-> CREATE INVESTIGATION

Disease Summary Classification: CASE	**Date**	***Classification: CONTACT***	***Date***	***LAB TEST INFORMATION:***
☐ Confirmed	YYYY / MM / DD	☐ *Contact*	*YYYY / MM / DD*	*Date specimen collected:*
☐ Does Not Meet Case	YYYY / MM / DD	☐ *Not a Contact*	*YYYY / MM / DD*	*YYYY / MM / DD*
☐ Person Under Investigation	YYYY / MM / DD	☐ *Person Under Investigation*	*YYYY / MM / DD*	*Specimen type:*
☐ Probable	YYYY / MM / DD			☐ *Blood* ☐ *Urine* ☐ *Stool*

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province (specify where)	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD		

REPORTING NOTIFICATION Name of Attending Physician or Nurse**:**	Location:
Physician/Nurse Phone number:	Date Received (Public Health): YYYY / MM / DD
Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician ☐ Other_____	

Mumps Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

C) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Abortion - spontaneous (miscarriage)		YYYY / MM / DD	Lab - platelet count low		YYYY / MM / DD
Coryza or rhinitis		YYYY / MM / DD	Lethargy (fatigue, drowsiness, weakness, etc)		YYYY / MM / DD
Cough		YYYY / MM / DD	Meningitis - aseptic		YYYY / MM / DD
Encephalitis		YYYY / MM / DD	Orchitis (inflamed testicle)		YYYY / MM / DD
Hearing loss		YYYY / MM / DD	**Pain - salivary glands**		YYYY / MM / DD
Infection - upper respiratory tract		YYYY / MM / DD	**Parotid gland - inflammation (parotitis)**		YYYY / MM / DD
Other S/S					

D) INCUBATION AND COMMUNICABILITY

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):
Earliest Possible Exposure Date: YYYY / MM / DD **Latest Possible Exposure Date**: YYYY / MM / DD

Exposure Calculation details:

Communicability for Case (period for transmission):
Earliest Possible Communicability Date: YYYY / MM / DD **Latest Possible Communicability Date**: YYYY / MM / DD

Communicability Calculation Details:

E) RISK FACTORS

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	Start date Yes	N, NA, U	Add'l Info
Contact - At risk population (international travellers or immigrants)	YYYY / MM/DD		
Contact to a known case (Add'l Info)	YYYY / MM/DD		
Immunocompromised - Related to underlying disease or treatment			
Occupation - Health Care Worker - IOM Risk Factor	TE		
Risk Behaviour - Sharing personal items (cigarettes, water bottles)	TE		
Special Population - Attends childcare	TE		
Special Population - Attends school	TE		
Special Population - Lives in a communal setting	TE		
Special Population - Post secondary education institution	TE		
Special Population - Pregnancy			
Travel - Outside of Canada (Add'l Info)	YYYY / MM/DD AE		
Travel - Outside of Saskatchewan, but within Canada (Add'l Info)	YYYY / MM/DD AE		

F) IMMUNIZATION HISTORY INTERPRETATION SUMMARY

LHN -> INVESTIGATION-> IMMUNIZATION HISTORY INTERPRETATION SUMMARY

Interpretation Date: YYYY / MM / DD

Interpretation of Disease Immunity: ☐ Disease Case - Fully immunized (for age) ☐ Disease Case - Partially immunized

☐ Disease Case – Unimmunized ☐ Disease Case - Unclear immunization history **Valid doses received**: _____ **Doses needed**: _____

Reason:

☐ Previous disease ☐ Previous responder/Previous history of immunity ☐ Date Of Birth

☐ Interpretation of history by investigator

Mumps Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

G) INTERVENTION

LHN -> INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

Assessment:
☐ Assessed for contacts YYYY / MM / DD
Investigator name

Exclusion: Investigator name
☐ Work YYYY / MM / DD ☐ Preschool YYYY / MM / DD
☐ School YYYY / MM / DD ☐ Daycare YYYY / MM / DD

Other Investigation Findings:
☐ Investigator Notes YYYY / MM / DD
☐ See document management YYYY / MM / DD

Immunization: Investigator name
☐ Eligible Immunization recommended YYYY / MM / DD
☐ Disease-specific immunization recommended YYYY / MM / DD
☐ Disease-specific immunization given YYYY / MM / DD

Communication:
☐ Other communication (see Investigator Notes) YYYY / MM / DD
Investigator name
☐ Letter (See Document Management) YYYY / MM / DD
Investigator name

Isolation:
☐ Facility isolation YYYY / MM / DD Investigator name
☐ Home isolation YYYY / MM / DD Investigator name

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD
☐ Disease-Info/Prev-Cont/Assess'd for Contacts YYYY/ MM / DD

Quarantine:
☐ Quarantine YYYY / MM / DD
Investigator name

Education/counselling: Investigator name
☐ Prevention/Control measures YYYY / MM / DD
☐ Disease information provided YYYY / MM / DD

Testing:
☐ Lab testing recommended YYYY / MM / DD
Investigator name

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
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YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

H) OUTCOMES *(optional except for severe influenza,*

LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering YYYY / MM / DD ☐ ICU/intensive medical care YYYY / MM / DD ☐ Hospitalization YYYY / MM / DD
☐ Recovered YYYY / MM / DD ☐ Intubation /ventilation YYYY / MM / DD ☐ Unknown YYYY / MM / DD
☐ Fatal YYYY / MM / DD ☐ Other _____ YYYY / MM / DD

Cause of Death: (if Fatal was selected) _____

Mumps Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

I) Acquisition Event LHN-> INVESTIGATION-> EXPOSURE SUMMARY-> ACQUISITION EVENT SUMMARY -> QUICK ENTRY

Acquisition Event ID:_____

Exposure Name: _____

Acquisition Start YYYY / MM / DD to **Acquisition End:** YYYY / MM / DD

Location Name: _____

Setting Type

☐ Travel ☐ Health care setting ☐ Public facilities ☐ Recreational facilities ☐ Most likely source

J) Transmission Events LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> QUICK ENTRY

Transmission Event ID	Exposure Name	Setting type (Consider the following settings for TE; if >1 select "multiple settings" in Panorama)	Date/Time	# of contacts
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure ☐Public facilities	YYYY / MM / DD to YYYY / MM / DD	
	Mumps Contacts – Inv ID# _____	☐Multiple Settings	YYYY / MM / DD to YYYY / MM / DD	

K) TOTAL NUMBER OF CONTACTS

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> TE HYPERLINK -> UNKNOWN/ANONYMOUS CONTACTS

Anonymous contacts:_____ (total number of individuals [including groups that 1:1 follow-up is not required or is not feasible])

Initial Report completed by:		**Date initial report completed:** YYYY / MM / DD

Respiratory and Direct Contact

Neonatal Group B *Streptococcus*

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.
From Public Health to Ministry of Health: Within 2 weeks.

Public Health Follow-up Timeline: Within 72 hours.

Information

Case Definition (Public Health Agency of Canada, May 2008)

Confirmed Case	Clinical illness[1] in an infant less than 1 month of age with laboratory confirmation of infection: • isolation of group B *Streptococcus* (*Streptococcus agalactiae*) from a normally sterile site (such as blood or cerebrospinal fluid) **OR** • demonstration of group B *Streptococcus* DNA in a normally sterile site.
Probable Case	Clinical illness[1] in an infant less than 1 month of age with laboratory confirmation of infection: • detection of group B *Streptococcus* antigen in a normally sterile site.

[1]There are two forms of clinical illness; early onset disease (1-7 days), characterized by sepsis, respiratory distress, apnea, shock, pneumonia, and meningitis; and late onset (7 days to 1 month), characterized by sepsis and meningitis.

Even though the case definition is for infants < 1 month, follow-up of infants between 1 to 3 months may be considered.

Causative Agent
Streptococcus agalactiae, group B *Streptococcus* (GBS).

Symptoms
There are 2 distinct forms:

- Early-onset disease – lethargy, poor feeding, jaundice, fever, grunting respirations and other signs of respiratory distress, pallor and hypotension. Respiratory distress is usually present at or within a few hours after birth. Diagnosed as sepsis, pneumonia and less frequently meningitis, osteomyelitis or septic arthritis. It is acquired in utero or during delivery; low-birth weight, premature infants are more susceptible.

- Late-onset disease – lethargy, poor feeding, irritability and fever. Diagnosed as sepsis and meningitis and, less frequently, bone and joint infections.

Incubation Period

- Early-onset – 1 to 7 days.
- Late-onset – 7 days to 1 month.

Reservoir/Source

Humans. Heymann (2008) says about 10-30% of pregnant women harbour group B streptococci in the genital tract, and about 1-2% of their offspring may develop symptomatic infection.

Mode of Transmission

- Early-onset is acquired in utero or during delivery.
- Late-onset is acquired through person-to-person contact and occurs in full-term infants.
- Nosocomial transmission may occur if appropriate infection prevention and control measures are not taken.

Risk Factors/Risk Group

The American Academy of Pediatrics (2009) indicates that the risk for GBS is increased in the following:

- maternal age younger than 20 years;
- previous baby with GBS disease;
- urinary tract infection due to GBS during the pregnancy;
- GBS carriage late in pregnancy;
- maternal temperature of 38 degrees Celsius or higher during labour;
- rupture of membranes 18 hours or more before delivery;
- preterm infants born at less than 37 weeks gestation.

Period of Communicability

The administration of intravenous antibiotics (generally penicillin) to women colonized with group B streptococci at the onset and throughout labour interrupts transmission to newborn infants, decreasing infection and mortality. (This is consistent with Society of Obstetricians and Gynaecologists of Canada Guidelines, Jan 2007.)

Specimen Collection and Transport

- Take a vaginal and rectal swab for culture at 35-37 weeks gestation. Cultures collected earlier do not accurately predict whether a woman will have GBS at delivery.
- For diagnosis in a neonate, culture of sterile fluid (blood or CSF) is required.

Methods of Control/Role of Investigator

Prevention and Education

There are limited effective primary prevention strategies for the early onset form of this disease. Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities. Prevention of the late onset form of this disease is best accommodated via handwashing.

Studies that looked at screening versus risk-based approach found that risk of early-onset disease was significantly lower among the infants of screened women compared to those in the risk-based approach. As such, pregnant women are to be tested late in pregnancy (35-37 weeks) to determine whether or not they are positive for GBS, so they can be treated during labour.

Intrapartum therapy of women with positive screenings and certain other risk factors has been found to be the most effective in preventing neonatal GBS disease (Dobson & Money, 2004).

Immunization

Immunization strategies have been researched for many years, but currently, there is no vaccine for group B *Streptococcus*.

Education

- Prenatal education of high risk mothers about screening and intrapartum treatment.
- Physicians should be aware of the need for testing of pregnant women and appropriate treatment of the women who screen positive.

Management

I. Case

History

See Risk Factors/Risk Groups above.

Immunization

Not applicable.

Treatment/Supportive Therapy

- Treatment choices are governed by the most recent guidelines. The public health practitioner should direct any questions regarding the current treatment protocols to the physician or Medical Health Officer. See Appendix H – Sources for Clinical Treatment Guidelines.
- See Attachment – Recommendations for Prevention and Management of Neonatal Group B *Streptococcus*.

Exclusion

Not applicable.

Referrals

15-30% of survivors of group B streptococcal meningitis have permanent neurologic sequelae (hearing/vision loss or learning disabilities). Referral by physician to appropriate disciplines.

II. Contacts/Contact Investigation

Contact Definition

No contact tracing is required**.**

Testing

Test only if symptomatic.

Prophylaxis/Immunization

Not applicable.

Exclusion
Not applicable.

III. Environment

Child Care Centres/Institutional Control Measures
Neonatal nurseries – hand hygiene is the best way to prevent the spread to other infants (American Academy of Pediatrics, 2009).

Epidemic Measures

- Contact precautions and cohorting of ill and colonized infants is recommended during an outbreak.
- Epidemiologic evaluation of late-onset cases in a special care nursery may be required to determine a common source and prevent spread to others.

References

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

Dobson, S. & Money, D. (2004). The prevention of early-onset neonatal group B streptococcal disease. *Journal of Obstetric and Gynecology Canada, 26(9)*, 826-32, September 2004. Retrieved August, 2011 from http://www.sogc.org/guidelines/public/149E-CPG-September2004.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2*, November 2009. Retrieved August, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Strep_B-eng.php.

Neonatal Group B *Streptococcus*
Attachment – Recommendations for Prevention and Management of Neonatal Group B *Streptococcus*

The following are recommendations for pregnant women (Society of Obstetricians and Gynaecologists of Canada [SOGC], 2004):

1. Offer all women screening for group B *streptococcus* (GBS) disease at 35 to 37 weeks' gestation with culture done from one swab first to the vagina then to the rectal area.
2. Treat the following women intrapartum at time of labour or rupture of membranes with IV antibiotics:
    - all women positive by GBS culture screening done at 35 to 37 weeks;
    - any women with an infant previously infected with GBS;
    - any women with documented GBS bacteriuria (regardless of level of colony-forming units per mL) in this pregnancy.
3. Treat women at less than 37 weeks' gestation with IV antibiotics unless there has been a negative GBS vaginal/rectal swab culture within 5 weeks.
4. Treat women with intrapartum fever with IV antibiotics (i.e., chorioamnionitis must be treated, but broader spectrum antibiotics would be advised).
5. If a woman is GBS-positive by culture screening or by history of bacteriuria, with prelabour rupture of membranes at term, treat with GBS antibiotic prophylaxis and initiate induction of labour with IV oxytocin.
6. If GBS culture result is unknown and the woman has ruptured membranes at term for greater than 18 hours, treat with GBS antibiotic prophylaxis.

Neonatal Management (SOGC, 2004)

1. Infants delivered by women who have received intrapartum antibiotics at least 4 hours before delivery, do not need a septic workup. These infants should be observed in hospital for the first 24 hours for signs of infection, but do not need additional therapy or investigations.
2. Infants who appear well despite their mothers being GBS colonized and not receiving adequate antibiotics (< 4 hours) should be observed for 48 hours and evaluated or treated if signs of sepsis develop.
3. Infants of mothers with chorioamnionitis should undergo a diagnostic evaluation for sepsis and be treated with antibiotics. (Sepsis workup includes a complete blood-cell count and differential, blood culture, and chest radiograph, including a lumbar puncture if feasible.)

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Ministry of Health: Within 2 weeks.

Public Health Follow-up Timeline: Immediate.

Public Health Purpose for Notification of Pertussis (adapted from British Columbia Center for Disease Control [2017])

- To minimize mortality and serious morbidity from pertussis in young children through contact tracing;
- To track epidemiology trends of pertussis in Saskatchewan including risk factors and distribution;
- To identify locations where increased transmission of pertussis may be occurring in order to inform other interventions;
- To monitor the effectiveness of prevention and control measures;
- To plan expansion or introduction of future immunization programs;
- To provide timely clinical care including diagnosis and treatment using current, evidence-based guidelines;
- To make timely and evidence informed actions on outbreaks; and
- To inform the public and medical community about pertussis.

Surveillance Case Definition[1] (Public Health Agency of Canada, May 2008)

Confirmed Case	Laboratory confirmation of infection: • isolation of *Bordetella pertussis* (e.g. from a culture) from an appropriate clinical specimen **OR** • detection of *B. pertussis* DNA (e.g NAAT or PCR) from an appropriate clinical specimen **AND** one or more of the following: o cough lasting 2 weeks or longer o paroxysmal cough of any duration o cough with inspiratory "whoop" o cough ending in vomiting or gagging, or associated with apnea. **OR**

[1] Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

	Epidemiologic link to a laboratory-confirmed case **AND** one or more of the following for which there is no other known cause: o paroxysmal cough of any duration o cough with inspiratory "whoop" o cough ending in vomiting or gagging, or associated with apnea.
Probable Case	Cough lasting 2 weeks or longer in the absence of appropriate laboratory tests and not epidemiologically linked to a laboratory-confirmed case **AND** one or more of the following, with no other known cause: • paroxysmal cough of any duration • cough with inspiratory "whoop" • cough ending in vomiting or gagging, or associated with apnea.
Suspect Case	One or more of the following, with no other known cause: • paroxysmal cough of any duration • cough with inspiratory "whoop" • cough ending in vomiting or gagging, or associated with apnea.
Public health follow-up of probable and suspect cases should be considered based on the epidemiology of pertussis in the community and the involvement of vulnerable populations.	

Epidemiology and Occurrence

Pertussis is a cyclical disease which peaks at 4 to 5 year intervals (see Figure 1). Infants are the most vulnerable and are often infected by older siblings, parents or caregivers. Figure 2 shows the rates of pertussis in infants relative to children 1-19 years of age.

- An adolescent pertussis vaccine (Tdap) was introduced to students in Grade 8 in 2003. This widened the gap in the rate of illness in these age groups; the gap was narrowed following the implementation of a Tdap program for all adults in 2010, especially parents and caregivers of infants, in an effort to reduce the risk to these vulnerable infants.
- In October 2017, it was recommended that all pregnant women be offered Tdap in the third trimester irrespective of prior Tdap receipt.
- The waning of immunity conferred by pertussis vaccine in infancy was reflected in an increase of incidence in 2015 to 2017, mainly among the 10-14 year old cohort.

Figure 1: Rates of Pertussis disease showing its cyclical nature, 1990 - 2017

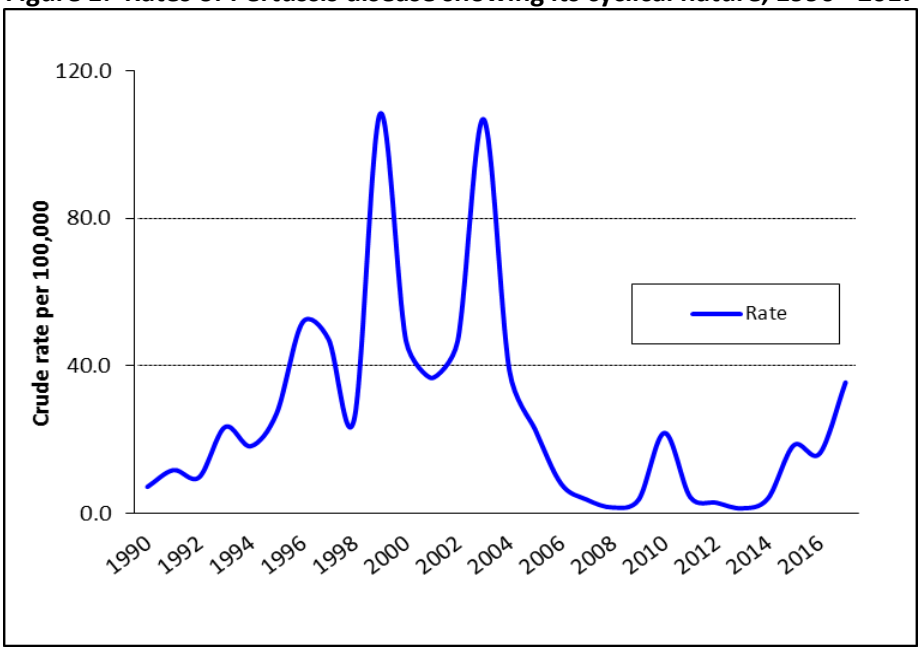
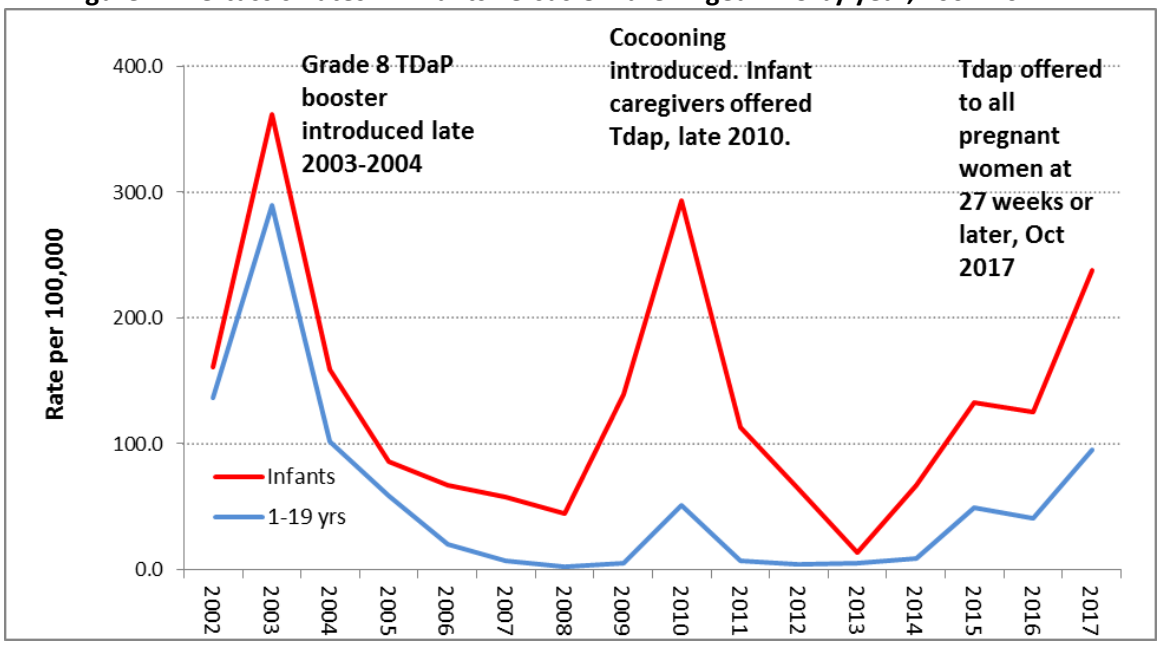


Figure 2: Pertussis Rates in Infants versus Children Aged 1-19 by year, 2002-2017



Additional Background Information

Causative Agent

Bordetella pertussis.

Symptoms

Catarrhal Stage: starts with mild respiratory symptoms of cough, rhinorrhea and possible fever.
Paroxysmal Stage: paroxysms of cough characterized by inspiratory whoop and vomiting after cough.
Convalescent Stage: gradual recovery with cough lasting 1-2 months or longer.

Infants less than 6 months can have an atypical presentation with short catarrhal stage, gagging, gasping or apnea as prominent early manifestations, absence of whoop and prolonged convalescence.

Complications among infants include pneumonia, seizures, encephalopathy and death. Complications in adolescents and adults include syncope, sleep disturbance, incontinence, rib fracture and pneumonia.

Reservoir/Source

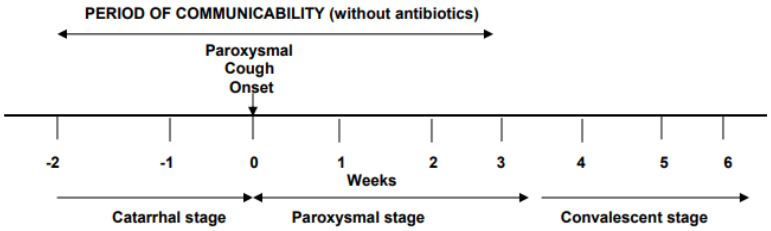
Humans.

Incubation Period

6-20 days (average 9-10 days).

Period of Communicability

- Highly communicable in the early catarrhal stage and the beginning of the paroxysmal stage (first 2 weeks).
- Communicability decreases after the catarrhal and paroxysmal stages and becomes negligible 3 weeks after onset of symptoms.
- Case is no longer contagious after completing 5 days of treatment.



Mode of Transmission
Person-to-person by direct contact with discharges from respiratory secretions via aerosolized droplet.

Specimen Collection and Transport
Nasopharyngeal swab in Regan Lowe transport medium. See the Saskatchewan Disease Control Laboratory Compendium for further details at https://rrpl-testviewer.ehealthsask.ca/

Public Health Investigation

I. Case

Refer to Attachment – Pertussis Data Collection Worksheet to assist.

History

- Key elements to inquire about include:
  - Immunization history of case.
  - Onset of illness and treatment (with what and when) – to determine incubation period and period of communicability which helps to identify the possible source and contacts to be followed.
  - Travel history may be of significance in contact tracing.
  - Underlying medical conditions and severity of illness (e.g. if hospitalization was required).
  - Current health status of household contacts (are contacts symptomatic?).
  - Identify contacts (refer to Table 2 – Definitions of Contacts) paying particular attention to vulnerable contacts (infants and women in the third trimester).
  - Occupational considerations exist for health care settings – see Special Considerations for Cases and Contacts in the Health Care Setting

Public Health Interventions

Assessment

- Assess for contacts paying particular attention to vulnerable contacts as per Table 2.

Communication

- Letters can be sent to classrooms and other group settings where individual contact tracing is not required (i.e. involving school age and adults where there are no vulnerable contacts) to inform them of the exposure, symptom monitoring and when to seek medical attention (see Sample letter).

Education

- All cases should be provided disease information as well as information on prevention and control measures including period of communicability and avoiding contact with vulnerable individuals.

Exclusion

- There is limited evidence supporting the use of exclusion; by the time a person is diagnosed with pertussis, they have likely exposed most of their contacts. Therefore **exclusion is no longer recommended in most situations**; however the consensus was to use exclusion if there are vulnerable individuals involved (see Table 2 – Definitions of Contacts).
    1. **Cases** should be excluded from school or daycare/preschool **where there are vulnerable persons, for 5 days** after they start the medication, or 21 days from onset of cough if untreated. If there are no vulnerable persons in the school or day care, the case can return to school or daycare/preschool as soon as he/she feels well enough to do so.
    2. **Adult cases** who have **close contact with vulnerable persons at work** should be excluded from work **for 5 days** after they start the medications, or 21 days from onset of cough if untreated. If there are no vulnerable persons in the workplace, the case can return to work as soon as he/she feels well enough to do so.
- When exclusion is recommended, it should continue for 5 days after they start the appropriate medication, or 21 days from onset of cough if untreated or until test results come back negative for pertussis.
- Exclusion is **not recommended in most other situations** as there is limited evidence to support it since a person who has been diagnosed with pertussis may have likely exposed most of their contacts. Please refer to Special Considerations for Cases and Contacts in the Health Care Setting below for additional recommendations.

Immunization

- Case follow-up should be used as an opportunity to recommend immunizations they are eligible for as per the Saskatchewan Immunization Manual. Infants and children who have recovered from pertussis should complete their pertussis immunization series, as natural infection does not confer life-long immunity (American Academy of Pediatrics, 2015).

Treatment

- Treatment recommendations have been summarized in Attachment – Pertussis Treatment and Chemoprophylaxis Guidelines.

Who Should be Treated

Treatment is recommended for all individuals that are laboratory confirmed, clinically diagnosed and epidemiologically linked to another case, or probable cases (clinically diagnosed) during an outbreak.

1. **All cases** – laboratory confirmed **OR** clinically diagnosed and epidemiologically linked to another case **OR** clinically diagnosed during an outbreak.
2. **All symptomatic household contacts** – the assumption is that these symptomatic people will also have pertussis. *Sometimes symptomatic household contacts may be reluctant to take antibiotics without a confirmed diagnosis. If there are no vulnerable persons in the household, it is acceptable to wait for results of testing.*
3. All other community contacts who are symptomatic should **not** be assumed to have pertussis unless clinical symptoms are very predictive, but should be assessed, tested and treated appropriately.

II. Contacts/Contact Investigation

Table 2. Definitions of Contacts	
Close Contact	• Individuals that have shared respiratory secretions (e.g., kissing) or shared the same confined air space for more than an hour, or have had face-to-face exposure for more than 5 minutes.
Vulnerable Contact	• **Children less than 1 year of age**, because they have a higher rate of mortality from pertussis infection. • **Pregnant women in the third trimester**, because if infectious at the time of birth they may pass the infection to their newborn.
Household Contact	• Household contact is living in the same household as the case including family[2] day care setting.
Occupational Contact	• Contact of Health Care Workers (HCW's) oral or nasal mucosa with infected secretions from the pertussis case. **OR** • Sharing the same confined air space (within 2 metres) for more than an hour with the pertussis case, without implementing droplet precautions. **OR** • Having had face-to-face exposure for more than 5 minutes with a pertussis case without implementing droplet precautions.

Public Health Interventions

Assessment

- Assess for symptoms.
- Assess for vulnerable individuals in their household. Recommend chemoprophylaxis as appropriate.

Communication

- Individual follow-up of contacts in in larger daycares, classrooms, schools, teams, workplaces, etc., is generally not recommended. These individuals should be informed by letter from public health, advising them to see their physician if they develop symptoms. These persons, if they become symptomatic, should not be assumed to have pertussis but should be assessed, tested and treated appropriately.

[2] Family day care refers to day cares that are run out of an individual's home to a limited number of children (*The Child Care Act, 2003*).

Education

- All contacts should be provided disease information on symptom monitoring, prevention and control measures including avoiding contact with vulnerable individuals.

Exclusion

- **Symptomatic family daycare contacts** should be excluded from **daycare where there are vulnerable persons**, until they have completed 5 days of appropriate antibiotic or until test results come back negative for pertussis. In other words, if there are no vulnerable persons in the family day care, the symptomatic day care contact can return to day care as soon as he or she feels well enough to do so.
- **Symptomatic contacts** (non-household, non family-daycare) who have been assessed and tested but are not being treated until the test results are back, do not need to be excluded. They should be asked to **avoid close contact with vulnerable persons** until their diagnosis is established.

Immunization

- Immunization status of exposed individuals should be reviewed. Priority should be given to infants, children, and pregnant women in their third trimester.
- Accelerated immunization with the first dose at 6 weeks of age and the second and third doses using minimum intervals may be indicated in case of an outbreak in a defined community. See *Saskatchewan Immunization Manual*[3] and discuss with Medical Health Officer.
- Immunizations should be completed for those whose schedules are incomplete.

Testing

- Non-immediate household and non-family day care contacts who are symptomatic should be assessed, tested and treated as appropriate.

[3] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Chemoprophylaxis

Chemoprophylaxis efficacy is related to early implementation and is **unlikely to be of benefit after 21 days** has elapsed since the first contact with a case. **Prophylaxis is generally not recommended for contacts in larger daycares, classrooms, schools, teams, workplaces, etc.** Contacts will be informed, usually by letter from public health, and advised to see their physician/nurse practitioner if they develop symptoms. The letter will inform these contacts that if they become symptomatic they should be assessed, tested and treated appropriately.

- See Attachment – Pertussis Treatment and Chemoprophylaxis Guidelines.
- Chemoprophylaxis should be offered to the following contacts:
  1. **All symptomatic immediate household contacts** – persons in a family day care setting are considered immediate household contacts. The assumption is that these symptomatic people will also have pertussis.
  2. **Symptomatic vulnerable persons** who have had "close contact" with a case should be started on antibiotics until their diagnosis is established.
  3. **Asymptomatic immediate household contacts**, including family-daycare attendees, where there is a vulnerable person in the household. The vulnerable person being ill does not eliminate the need for chemoprophylaxis of household contacts.
  4. Outside of the immediate household or family day care, offer prophylaxis only **to asymptomatic vulnerable persons** who have had "close contact" with a **case**.
  5. **Non immediate-household and non family-daycare contacts who are symptomatic** should **not** be assumed to have pertussis unless clinical symptoms are very predictive, but should be assessed, tested and treated appropriately.
- Chemoprophylaxis efficacy is related to early implementation and is unlikely to be of benefit after 21 days has elapsed since the first contact with a case.
- Chemoprophylaxis for all people in larger daycares, classrooms, schools, teams, workplaces, etc., is generally not recommended. These individuals should be informed by letter from public health, advising them to see their physician if they develop symptoms. These persons, if they become symptomatic, should not be assumed to have pertussis but should be assessed, tested and treated appropriately.

Special Consideration for Cases and Contacts in the Health Care Setting
(Ontario Hospital Association, 2015)

Collaboration with Occupational Health/Employee Health is important in appropriate management of health care workers (HCWs). HCWs who do not provide direct patient care, such as housekeeping staff, may be managed as in the community setting. HCWs who do not provide direct patient care, such as housekeeping staff, may be managed as in the community setting. Community contacts who are health care workers should be managed as outlined below.

Prevention is always the primary goal and HCWs should protect themselves and their patients by being vaccinated as per the *Saskatchewan Immunization Manual*[4] – Chapter 7: Immunization of Special Populations, Section 3.2 Health Care Workers. Status of vaccination with Tdap (tetanus, diphtheria, and acellular pertussis vaccine) should be evaluated for all HCW contacts.

The most effective control of transmission of pertussis in hospital settings includes isolation of the suspected or known case and use of droplet precautions. In addition, the following outlines appropriate management:

Management of Health Care Workers

1. HCWs who are considered **vulnerable contacts**[5] should be offered chemoprophylaxis.
2. HCWs who are **confirmed cases** of pertussis:
   - Should be referred for appropriate antibiotic treatment.
   - Should be excluded from work until after 5 days of treatment or for 21 days from onset of cough if untreated.

[4] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.
[5] HCW vulnerable or high risk contacts include:
- pregnant women in their third trimester,
- household contact of infants under 12 months of age or a woman who is in her third trimester of pregnancy; OR
- who may expose these vulnerable patient populations (e.g. hospitalized infants or pregnant women).

3. HCWs who are **symptomatic contacts** to pertussis case:
   - Should be referred for clinical management, which should include laboratory investigation (nasopharyngeal swab) and appropriate antibiotic treatment.
   - Should be excluded from work until after 5 days of treatment **or** for 21 days from onset of cough if untreated, **or** until swab comes back negative for pertussis. A surgical mask is not sufficient for protection of patients and other staff.
4. HCWs who are **asymptomatic contacts** to pertussis case:
   - Should be given chemoprophylaxis with an appropriate antibiotic if they are **vulnerable or high risk** work or live with a vulnerable contact(s) (American Academy of Pediatrics, 2015).
   - Should be advised of early symptoms of pertussis and be put under surveillance by their employee health nurse.
   - Report development of symptoms to Occupational Health and Safety/Employee Health Department for an individual assessment.
   - Those with no history of an adult dose of Tdap vaccine should be given vaccine.
   - Exclusion of asymptomatic contacts is not indicated.

III. Environment

Child Care Centre/Schools Control Measures

Strict enforcement of infection control measures. Refer to the *Infection Control Manual for Child Care Facilities*.[6] Notification of parents of children in either of these settings where a case has occurred is important. This can be accomplished via a letter sent through the school or daycare.

Chemoprophylaxis for all people in larger daycares, classrooms, schools, teams, workplaces, etc., is generally not recommended. They should be informed by letter from public health, and advised to see their physician if they develop symptoms. Review immunization histories of childcare attendees.

Health Facilities Control Measures

Strict enforcement of infection control measures. Refer to the Health Authority Infection Control Manual. Refer to Special Considerations for Cases and Contacts in the Health Care Setting for additional information.

[6] http://publications.gov.sk.ca/documents/13/105320-infection-control-manual-child-care-centres.pdf

IV. Epidemic Measures

- Enhanced surveillance including details about immunization history of case and household contacts.
- Accelerated immunization with the first dose at 6 weeks of age and the second and third doses at 4 week intervals may be indicated at a community level.
- Immunizations should be completed for those whose schedule is incomplete.
- Additional measures may be instituted by the medical health officer to help contain the outbreak.
- As of October 2017, an enhanced outbreak measure is to provide pregnant women at 27 weeks gestation or later, irrespective of prior Tdap receipt, an additional dose of Tdap to offer protection to their newborn until they are eligible to be vaccinated.

Prevention Measures

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization

Immunize infants, children, pregnant women and adults according to the recommendations in the *Saskatchewan Immunization Manual*.

Education

- Education should be provided regarding respiratory etiquette and measures to prevent transmission of pertussis by practising good hand hygiene and not sharing drinking glasses or utensils.
- Educate the public about the disease and the need for active immunization. Immunization information fact sheets can be used to guide discussion.

Revisions

Date	Change
September 2018	• Updated to align with Panorama configuration. • Updated Epidemiology and Occurrence section with 2017 data. • Incorporated incubation and communicability graphic. • Updated Special Considerations for Cases and Contacts in the Health Care Setting based on Ontario Hospital Association 2017 updates. • Updated purpose for notification based on BCCDC objectives of surveillance (2017).
September 2017	• Clarified the purpose for notification of cases to public health. • Incorporated an Epidemiology and Occurrence section to the chapter indicating timeframes of when changes were made to pertussis immunization program. • Incorporated reference regarding when public health management should be considered for probable and suspect cases. • Incorporated reference to outbreak measure of enhanced immunization of pregnant women in 3rd trimester. • Incorporated clarification on the use of chemoprophylaxis for health care workers. • Rearranged and updated the style into the new format of the Manual. • References reaffirmed or updated as necessary.

References

American Academy of Pediatrics. (2015). *Red book: 2015 Report of the Committee on Infectious Diseases* (30th ed.). Elk Grove Village, IL: Author.

British Columbia Centre for Disease Control (2017). Objectives of surveillance. BCCDC.

Government of Saskatchewan. (2003). *The Child Care Act*. Regina, SK: Queens Printer Saskatchewan.

Ontario Hospital Association. (2017). *Pertussis surveillance protocol for Ontario hospitals.* Retrieved August, 2018 from https://www.oha.com/Documents/Pertussis%20Protocol%20October%202017%20(last%20reviewed%20and%20revised%20on%20October%202017).pdf.

Public Health Agency of Canada. (2002). Infection control guidelines: Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR), 28S1,* March 2002. Retrieved May, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Public Health Agency of Canada. (2003). National consensus conference on pertussis. *Canada Communicable Disease Report (CCDR), 29S3*, April 2003.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR*), *35S2*, November 2009. Retrieved September, 2017 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Pertus_Coquel-eng.php.

Government of Saskatchewan

PANORAMA

Pertussis Data Collection Worksheet

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

LHN-> SUBJECT SUMMARY-> RESPIRATORY & DIRECT CONTACT ENCOUNTER GROUP->CREATE INVESTIGATION

Disease Summary Classification: CASE	**Date**	***Classification: CONTACT***	***Date***	***LAB TEST INFORMATION:***
☐ Confirmed	YYYY / MM / DD	☐ *Contact*	*YYYY / MM / DD*	*Date specimen collected:*
☐ Does Not Meet Case	YYYY / MM / DD	☐ *Not a Contact*	*YYYY / MM / DD*	*YYYY / MM / DD*
☐ Person Under Investigation	YYYY / MM / DD	☐ *Person Under Investigation*	*YYYY / MM / DD*	*Specimen type:*
☐ Probable	YYYY / MM / DD			☐ *Nasopharyngeal*
☐ Suspect	YYYY / MM / DD			☐ *Throat*

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province (specify where)	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD		

REPORTING NOTIFICATION Name of Attending Physician or Nurse:	Location:
Physician/Nurse Phone number:	Date Received (Public Health): YYYY / MM / DD

Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician ☐ Other_____

Pertussis Data Collection Worksheet

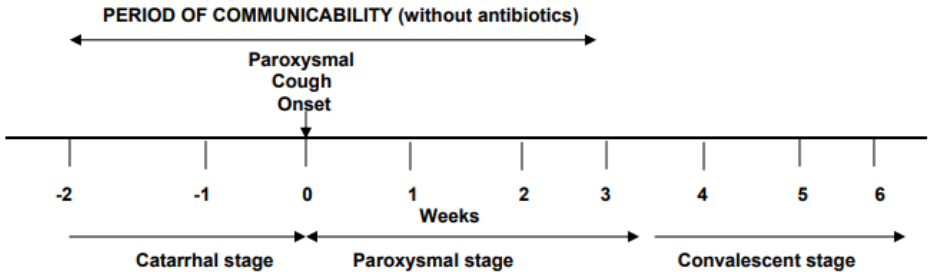
Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

C) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes - Date of onset	Description	No	Yes - Date of onset
Apnea		YYYY / MM / DD	**Cough – paroxysmal**		YYYY / MM / DD
Coryza or rhinitis		YYYY / MM / DD	**Cough – with whoop**		YYYY / MM / DD
Cough		YYYY / MM / DD	**Cough > 2 weeks**		YYYY / MM / DD
Cough – with apnea		YYYY / MM / DD	**Gagging - infant**		YYYY / MM / DD
Cough – with vomiting		YYYY / MM / DD	**Gasping - infant**		YYYY / MM / DD



D) INCUBATION AND COMMUNICABILITY

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):
Earliest Possible Exposure Date: YYYY / MM / DD **Latest Possible Exposure Date:** YYYY / MM / DD

Exposure Calculation details:

Communicability for Case (period for transmission):
Earliest Possible Communicability Date: YYYY / MM / DD **Latest Possible Communicability Date:** YYYY / MM / DD

Communicability Calculation Details:

E) RISK FACTORS (RF followed by + impact the Immunization Forecaster)

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	Yes	N –No NA – not asked U - unknown	DESCRIPTION	Yes	N –No NA – not asked U - unknown
Special Population - Pregnancy	YYYY / MM / DD		**Setting** - Crowded living conditions (>1 person per room excluding bathrooms)		
Contact - Persons with similar symptoms	YYYY / MM / DD		**Special Population** - Lives in a communal setting		
Contact to a known case (Add'l Info)	YYYY / MM / DD		**Travel** - Outside of Canada (Add'l Info)	AE/TE YYYY / MM / DD	
Immunocompromised - Related to underlying disease or treatment			**Travel** - Outside of Saskatchewan, but within Canada (Add'l Info)	AE/TE YYYY / MM / DD	
Maternal Tdap not received between 27 weeks and 2 weeks prior to delivery *(For infant cases <1 year)*	YYYY / MM / DD				

Pertussis Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

F) IMMUNIZATION HISTORY INTERPRETATION SUMMARY

LHN -> INVESTIGATION-> IMMUNIZATION HISTORY INTERPRETATION SUMMARY

Interpretation Date: YYYY / MM / DD

Interpretation of Disease Immunity: ☐ IOM - Fully immunized (for age) ☐ IOM - Partially immunized

☐ IOM – Unimmunized ☐ IOM - Unclear immunization history **Valid doses received**: _____ **Doses needed**: _____

Reason: ☐ IOM - Interpretation of history by investigator

G) TREATMENT

LHN -> INVESTIGATION-> MEDICATIONS->MEDICATIONS SUMMARY

Medication *(Panorama = Other Meds)* : _____

Prescribed by:_____ Started on: YYYY / MM / DD

H) INTERVENTION

LHN -> INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

Assessment:
☐ Assessed for contacts YYYY / MM / DD
(especially pregnant or < 1 year of age)
Investigator name

Other Investigation Findings:
☐ Investigator Notes ☐ See Document Management

Immunization:
☐ Eligible immunizations recommended YYYY / MM / DD
☐ Disease-specific immunization recommended YYYY / MM / DD
☐ Disease-specific immunization given YYYY / MM / DD
Investigator name

Communication:
☐ Other communication (see Investigator Notes) YYYY / MM / DD
Investigator name
☐ Letter (See Document Management) YYYY / MM / DD
Investigator name

Referral:
☐ Other (specify)_____ YYYY / MM / DD
Investigator name

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD
☐ Disease-Info/Prev-Cont/Assess'd for Contacts YYYY/ MM / DD

Testing:
☐ Laboratory testing recommended YYYY / MM / DD
Investigator name

Education/counseling: Investigator name
☐ Prevention/Control measures YYYY / MM / DD
☐ Disease information provided YYYY / MM / DD

Treatment:
☐ Treatment not recommended YYYY / MM / DD
Investigator name

Exclusion: Investigator name
☐ Daycare YYYY / MM / DD ☐ Preschool YYYY / MM / DD
☐ School YYYY / MM / DD ☐ Work YYYY / MM / DD

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	
YYYY/MM/DD			YYYY/MM/DD	

Pertussis Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

I) OUTCOMES *(optional except for severe influenza,* LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering	YYYY / MM / DD	☐ ICU/intensive medical care	YYYY / MM / DD	☐ Hospitalization	YYYY / MM / DD
☐ Recovered	YYYY / MM / DD	☐ Intubation /ventilation	YYYY / MM / DD	☐ Unknown	YYYY / MM / DD
☐ Fatal	YYYY / MM / DD	☐ Other _____	YYYY / MM / DD		

Cause of Death: (if Fatal was selected) _____

J) Transmission Events LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> QUICK ENTRY

Transmission Event ID	Exposure Name	Setting type	Date/Time	# of contacts
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure		
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure		
		☐Congregate/Communal living ☐Health Care setting ☐Type of community contact ☐ Household Exposure		
	Pertussis Contacts – Inv ID# _____	☐Multiple Settings	YYYY / MM / DD to YYYY / MM / DD	

K) TOTAL NUMBER OF CONTACTS

LHN -> INVESTIGATION-> EXPOSURE SUMMARY -> TRANSMISSION EVENT SUMMARY -> TE HYPERLINK -> UNKNOWN/ANONYMOUS CONTACTS

Anonymous contacts:_____ (total number of individuals [including groups that do not require 1:1 follow-up])

Initial Report completed by:		**Date initial report completed:** YYYY / MMM / DD

Drug[1]	Dosage	Comments
Azithromycin	**Infants <6 months:** 10 mg/kg/day orally for 5 days. **Children (>= 6 months to 50 kg):** 10 mg/kg/day (to a maximum of 500 mg)orally on the first day followed by 5mg/kg/day (to a maximum of 250 mg) once a day for the next 4 days (5 days total). **Adults (50 kg and over):** 500 mg orally on the first day followed by 250 mg daily for the next 4 days (5 days total).	Preferred antibiotic for infants under 1 month of age. Azithromycin is likely safe in pregnancy. No teratogenicity in humans or animals (Rx Files, 2013).
Clarithromycin	**Children (up to 33 kg):** 15 mg/kg/day provided in a divided dose bid for 7 days **(not to exceed maximum of adult dose**). **Adults (33 kg and over):** 250-500 mg po bid for 7 days	Clarithromycin should not be used in **pregnancy** except where no alternative therapy is appropriate (eCPS, 2015)
Erythromycin	**Children (up to 25 kg):** **Erythromycin estolate:** 40 mg/kg/day (to maximum of 1 g per day) provided in a divided dose tid for 7 days. The estolate is a liquid preparation, only used for children or people with difficulty swallowing. **Adults :** **Erythromycin 250 mg qid** for 7 days (to maximum of 1 g per day). Some experts recommend 2 g daily in divided doses, for example: a) The Anti-infective Guidelines for Community Acquired Infections: 2001, recommends 1-2 g po daily in divided doses. b) b) The Sanford Guide to Antimicrobial Therapy, 2002, recommends 500 mg qid po.	When prescribing erythromycin prophylactically for neonates one should consider that there have been reports of infantile hypertrophic pyloric stenosis (IHPS) associated with its use as pertussis prophylaxis for newborns. The risk of IHPS after treatment with azithromycin and clarithromycin is unknown. **Erythromycin estolate is contraindicated in individuals with existing liver disease or dysfunction, and in pregnancy (CPS, 2010).**

Prescribers of macrolide antibiotics for infants <2 months of age on should monitor for signs and symptoms of pyloric stenosis.

For those who are allergic to macrolides, the following may be used although its efficacy is not proven:

1. Children: trimethoprim 8mg/kg/day-sulfamethoxazole 40mg/kg/day for 10 days.
2. Adults: 2 tabs bid or 1 double strength (DS) tab bid.

[1] Refer to the product monograph and/or the current version of the CPS before prescribing medications.

References

Jensen, B., Regier, L. D., (Ed.) (2013). *Rx files, Drug Comparison Charts* (9th ed.). Saskatoon, SK: Saskatoon Health Region.

Canadian Pharmacists Association. (2015). *Online Compendium of pharmaceuticals and specialties (eCPS): The Canadian drug reference for health professionals*. Ottawa, Canada: Author.

Heymann, D. L., (Ed.). (2015). *Control of Communicable Diseases Manual* (20th ed.). Washington, DC: American Public Health Association.

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.
From Public Health to Ministry of Health: Within 2 weeks.

Public Health Follow-up Timeline: Initiate within 72 hrs.

Public Health Purpose for Notification of Pneumococcal Disease - invasive (adapted from British Columbia Center for Disease Control [2017])

- To track epidemiology trends of invasive pneumococcal disease (IPD) in Saskatchewan including characteristics, risk factors and distribution;
- To monitor the effectiveness of prevention and control measures;
- To plan expansion or introduction of future immunization programs;
- To make timely and evidence informed actions on outbreaks; and
- To inform the public and medical community about IPD.

Surveillance Case Definition[1] (Public Health Agency of Canada, May 2008)

Confirmed Case	Clinical evidence of invasive disease[1] with laboratory confirmation of infection: • isolation of *Streptococcus pneumoniae* from a normally sterile site (excluding the middle ear and pleural cavity) **OR** • demonstration of *S. pneumoniae* DNA from a normally sterile site (excluding the middle ear and pleural cavity)
Probable Case	Clinical evidence of invasive disease[1] with no other apparent cause and with nonconfirmatory laboratory evidence: • demonstration of *S. pneumoniae* antigen from a normally sterile site (excluding the middle ear and pleural cavity)
[1] Clinical illness associated with invasive disease manifests itself mainly as pneumonia with bacteremia, bacteremia without a known site of infection, and meningitis. Pneumonia without bacteremia is not notifiable.	

[1] Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

Epidemiology and Occurrence

Under Development

Additional Background Information

Causative Agent

Streptococcus pneumoniae is a gram-positive coccus that replicates in chains. It has a capsule made up of polysaccharides, which lead to the differentiation of over 90 sero-types.

Reservoir/Source

Humans - can be colonized in the upper respiratory tract but not develop infection or disease in the host.

- When the bacterium migrates in the respiratory tract and is not cleared effectively because of cillia impairment or mechanical obstruction, it can replicate and cause disease.
- When bacteremia occurs it can be spread to a variety of sites where replication leads to disease outcomes.

Pathophysiology

Invasive pneumococcal disease (IPD) can present as meningitis, endocarditis, septic arthritis, and peritonitis.

- Meningitis
  - *Streptococcus pneumoniae* is the most common etiological agent of bacterial meningitis in adults. It may arise from direct extension of infection from the middle ear, sinuses, or from bacterial seeding to the choroid plexus in the brain following bacteremia.
  - Local extension to the meninges via the sinuses or dura mater defects or the pleura via the lungs can also lead to invasive disease development.
- Peritonitis in adults, endocarditis, pericarditis and septic arthritis can occur spontaneously or secondarily to a prosthesis or underlying rheumatoid illness.
- Osteomyelitis in adults tends to involve the vertebrae.
- Unusual pneumococcal infections may suggest underlying immunodeficiencies of some cause.

Streptococcus pneumoniae can colonize the upper respiratory tract and adhere to the cells lining the nasopharanx. Impairment of ciliary action plays an important role in the development of infection in the respiratory tract.

The organism causes disease through its ability to escape phagocytosis because of its capsular structure. It is therefore able to replicate in tissues and fluids and create an intense inflammatory response causing the various familiar clinical pictures to appear. The organism does not produce any clinically significant toxins.

Symptoms

Common symptoms of IPD (e.g., infections of the meninges, joints, etc.) are:

- fever;
- malaise;
- associated symptoms of severe systemic infection - symptoms vary depending on the site of infection (see Pathophysiology section above).

In non-invasive disease, direct spread in the respiratory tract can lead to the development of disease entities such as otitis media, sinusitis, and pneumonia.

Incubation Period

The incubation period is dependent on a number of factors including site of infection, bacterial load and underlying conditions that support the development of infection. In invasive disease the clinical picture usually starts developing within a few hours of infection ocurring and is a reflection of the intense inflamatory response to the organism.

- Meningitis – unknown; probably short, 1-4 days.
- Pneumonia – not well determined; may be as short as 1-3 days.

Period of Communicability

- Unknown.
- May be as long as the bacterium is present in the respiratory tract.
- May be prolonged especially in immunocompromised hosts.
- Probably less than 24-48 hours after effective antimicrobial therapy has begun.

Mode of Transmission

- Contact with respiratory secretions or direct oral contact.
- Person to person via droplet spread is thought to be the most prevalent form of transmission but infrequently leads to illness.

Risk Groups/Risk Factors (Fauci, et al., 2007)
Settings with increased risk of exposure:

- daycare centres;
- military training camps;
- prisons;
- homeless shelters;
- air pollution;
- over-crowded living conditions;
- poor socioeconomic status.

Host factors:

- respiratory infection, inflammation (viral respiratory illness such as influenza);
- chronic obstructive pulmonary disease (COPD);
- immunosuppression due to illness or therapy;
- asplenia;
- age (infancy or elderly);
- alcoholism;
- allergies;
- cigarette smoking;
- malnutrition;
- chronic disease (including HIV, liver/kidney disease, diabetes, etc.);
- fatigue, stress and/or exposure to cold.

Specimen Collection and Transport
Specimen type is dependent on the relevant clinical disease. Material can be obtained from the infectious focus, blood or CSF. Blood cultures should be done in all cases of suspected invasive disease. Recovery of pneumococci from an upper respiratory tract culture is not indicative of the etiologic diagnosis of pneumoccocal disease in the respiratory tract.

Where appropriate, material obtained can be gram stained and subsequently cultured using standard microbiological techniques. All isolates from a normally sterile site should be tested for antibiotic sensitivity as results from this will assist in case management and antibiotic therapy.

Isolates of *S. pneumoniae* from IPD cases should be referred to Roy Romanow Provincial Laboratory (RRPL) for serotyping.

Public Health Investigation

I. Case

History

Refer to Attachment – Pneumococcal Disease (invasive) Data Collection Worksheet to assist.

Key elements to inquire about include:

- Presentation of illness.
- Medical history including underlying medical conditions that may predispose the individual to invasive disease (see risk factors/risk groups).
- Settings with increased risk of exposure (see risk factors/risk groups).
- Immunization history of case.

Public Health Interventions

Education

- All cases should be provided disease information as well as information on prevention and control measures including period of communicability and avoiding contact with vulnerable individuals.

Immunization

- Immunization to be offered if incomplete.
- If case meets eligibility criteria, immunizations should be started as per Saskatchewan Immunization Manual[2].

Isolation

- Clients are no longer communicable once on effective antibiotic therapy for 24-48 hours.
- Clients may return to work or school/daycare settings when they have clinically recovered and are able to resume normal activities.

Referrals

Specialist care and long-term follow up may be indicated in certain circumstances.

Treatment/Supportive Therapy

Treatment for clinical management is under the direction of the primary care provider. The public health practitioner should direct any questions regarding the current treatment protocols to the physician or Medical Health Officer (MHO).

II. Contacts/Contact Investigation

No contact tracing is required.

[2]https://www.ehealthsask.ca/services/Manuals/Pages/SIM.aspx

III. Environment

Child Care Centres/Institutional Control Measures

- Standard precautions for hospitalized patients (refer to local infection control manual). No specific measures.

IV. Epidemic Measures

- No specific measures.
- Immunization may be indicated for use in outbreaks.
- Outbreaks should be reported immediately to Saskatchewan Ministry of Health.

Prevention Measures

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization

- Routine immunization of all children with the Pneu-C (conjugate pneumococcal vaccine) as per Saskatchewan Immunization Manual.[3]
- The reader is referred to both the Saskatchewan Immunization Manual,[1] the latest version of the Canadian Immunization Guide and the latest guidelines/memos indicating provincial policies for further information.

Prophylactic Antibiotic Therapy

- Individuals with certain risk conditions may be placed on long-term prophylactic antibiotic therapy by their physician.

[3] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Revisions

Date	Change
September 2018	• Clarified the purpose for notification of cases to public health. • Incorporated an Epidemiology and Occurrence section as a placeholder. • Rearranged and updated the style into the new format of the Manual.

References

American Academy of Pediatrics. (2015). *Red book: 2015 Report of the Committee on Infectious Diseases* (30th ed.). Elk Grove Village, IL: Author.

Fauci, A. S., Braunwald, E., Kasper, D., Hause, S. L., Longo, D. L., Jameson, J. L., et al. (2007). *Harrison's principles of internal medicine* (17th ed.). Whitby, ON: The McGraw-Hill Companies.

Heymann, D. L. (Ed.). (2015). *Control of communicable diseases manual* (20th ed.). Washington, DC: American Public Health Association.

Mandell, G. L., Bennett, J. E., & Dolin, R. (Eds.). (2000). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (5th ed.). Philadelphia, PA: Churchill Livingstone.

Public Health Agency of Canada. (2006). *Canadian immunization guide* (7th ed.). Ottawa, Canada: Public Works and Government Services Canada.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR*), *35S2,* November 2009. Retrieved August, 2018 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Pneumoco-eng.php.

Pneumococcal Disease (invasive) Data Collection Worksheet

Panorama QA complete: ☐ **Yes** ☐ **No**
Initials:

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: ☐ Work ☐ Personal
Phone #: ☐ Primary Home: ☐ Mobile contact: ☐ Workplace:		
Place of Employment/School:	Gender: ☐ Male ☐ Female ☐ Other ☐ Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	**Address Type:** ☐ No fixed ☐ Postal Address ☐ Primary Home ☐ Temporary ☐ Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

SUBJECT SUMMARY-> RESPIRATORY & DIRECT CONTACT ENCOUNTER GROUP-> CREATE INVESTIGATION

Disease Summary Classification: CASE	**Date**			**LAB TEST INFORMATION:**
☐ Confirmed	YYYY / MM / DD	☐ Person Under Investigation	YYYY / MM / DD	Date specimen collected: YYYY / MM / DD
☐ Does Not Meet Case	YYYY / MM / DD	☐ Probable	YYYY / MM / DD	Specimen type: ☐ Blood ☐ CSF ☐ Other

Disposition:

FOLLOW UP:

☐ In progress	YYYY / MM / DD	☐ Complete	YYYY / MM / DD
☐ Incomplete - Declined	YYYY / MM / DD	☐ Not required	YYYY / MM / DD
☐ Incomplete – Lost contact	YYYY / MM / DD	☐ Referred – Out of province (specify where)	YYYY / MM / DD
☐ Incomplete – Unable to locate	YYYY / MM / DD		

REPORTING NOTIFICATION Name of Attending Physician or Nurse:	Location:
Physician/Nurse Phone number:	Date Received (Public Health): YYYY / MM / DD

Type of Reporting Source: ☐ Health Care Facility ☐ Lab Report ☐ Nurse Practitioner ☐ Physician ☐ Other_____

Pneumococcal Disease (invasive) Data Collection Worksheet

Please complete **all** sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

C) DISEASE EVENT HISTORY

INVESTIGATION->DISEASE SUMMARY (UPDATE)->DISEASE EVENT HISTORY

Site / Presentation: ☐ Sepsis ☐ Meningitis ☐ Pneumonia with bacteremia ☐ Other

D) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Arthritis - septic		YYYY / MM / DD	**Malaise**		YYYY / MMM / DD
Cardiac - endocarditis		YYYY / MM / DD	**Meningitis**		YYYY / MMM / DD
Cardiac - pericarditis		YYYY / MM / DD	**Peritonitis**		YYYY / MMM / DD
Fever		YYYY / MM / DD	**Pneumonia**		YYYY / MMM / DD
Osteomyelitis			**Sepsis (e.g. bactremia, septicemia, etc.)**		

E) RISK FACTORS (RF followed by + impact the Immunization Forecaster)

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	Yes Start date	N, NA, U	Add'l Info
Chronic Medical Condition - Other (Add'l Info))			
Contact to a known case (Add'l Info)	YYYY / MM/DD		
Environmental - Second hand smoke			
Immunocompromised – Acquired Complement Deficiency +			
I**mmunocompromised** – Congenital immunodeficiency +			
Special Population - Attends childcare			
Special Population – Homeless +			
Special Population - Lives in a communal setting			
Substance Use - Tobacco			

F) IMMUNIZATION HISTORY INTERPRETATION SUMMARY

LHN -> INVESTIGATION-> IMMUNIZATION HISTORY INTERPRETATION SUMMARY

Interpretation Date: YYYY / MM / DD

Interpretation of Disease Immunity: ☐ IOM - Fully immunized (for age) ☐ IOM - Partially immunized

☐ IOM – Unimmunized ☐ IOM - Unclear immunization history **Valid doses received**: _____ **Doses needed**: _____

Reason:

☐ IOM – Interpretation of history by investigator

G) TREATMENT

LHN -> INVESTIGATION-> MEDICATIONS-> MEDICATIONS SUMMARY

Medication *(Panorama = Other Meds) :* _____

Prescribed by:_____ Started on: YYYY / MM / DD

Pneumococcal Disease (invasive) Data Collection Worksheet

Please complete **all** sections**.**

Panorama Client ID: _____
Panorama Investigation ID: _____

H) INTERVENTION

LHN -> INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:

General: Investigator name
☐ Disease-Info/Prev-Control YYYY/ MM / DD

Education/counselling: Investigator name
☐ Prevention/Control measures YYYY / MM / DD
☐ Disease information provided YYYY / MM / DD

Immunization:
☐ Eligible Immunization recommended YYYY / MM / DD
☐ Disease-specific immunization recommended YYYY / MM / DD
☐ Disease-specific immunization given YYYY / MM / DD
Investigator name

Other Investigation Findings:
☐ Investigator Notes ☐ See Document Management

Isolation:
☐ Facility isolation YYYY / MM / DD Investigator name
☐ Home isolation YYYY / MM / DD Investigator name

Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

I) OUTCOMES *(optional except for severe influenza,*

LHN-> INVESTIGATION-> OUTCOMES

☐ Not yet recovered/recovering YYYY / MM / DD ☐ ICU/intensive medical care YYYY / MM / DD ☐ Hospitalization YYYY / MM / DD
☐ Recovered YYYY / MM / DD ☐ Intubation /ventilation YYYY / MM / DD ☐ Unknown YYYY / MM / DD
☐ Fatal YYYY / MM / DD ☐ Other _____ YYYY / MM / DD

Cause of Death: (if Fatal was selected) _____

Initial Report completed by:		Date initial report completed: YYYY / MM / DD

Respiratory and Direct Contact

Rubella

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours (or immediate if an outbreak is suspected).

From Public Health to Ministry of Health: Within 72 hours (or immediate if an outbreak is suspected).

Public Health Follow-up Timeline: Initiate within 24-48 hrs.

Information

Case Definition (Public Health Agency of Canada, May 2008)

Confirmed Case	Laboratory confirmation of infection in the absence of recent immunization[1] with rubella containing vaccine: • isolation of rubella virus from an appropriate clinical specimen **OR** • detection of rubella virus RNA **OR** • seroconversion or a significant (e.g., fourfold or greater) rise in rubella IgG titre by any standard serologic assay between acute and convalescent sera **OR** • positive serologic test for rubella IgM antibody using a recommended assay* in a person with an epidemiologic link to a laboratory-confirmed case or who has recently travelled to an area of known rubella activity. **OR** Clinical illness[2] in a person with an epidemiologic link to a laboratory-confirmed case.
Probable Case	Clinical illness[2] • in the absence of appropriate laboratory tests **OR** • in the absence of an epidemiologic link to a laboratory-confirmed case **OR** • in a person who has recently travelled to an area of known rubella activity.

[1] The most frequent reaction to measles-mumps-rubella (MMR) immunization is malaise and fever (with or without rash) occurring 7-12 days after immunization. However, this should be determined for each case, as these reactions and time frames can vary (*Canadian Immunization Guide*, 2006).

[2] Clinical illness is characterized by fever and rash, and at least one of the following:

- arthralgia/arthritis
- lymphadenopathy
- conjunctivitis

*IgM serology has the potential for false-positive findings. If the clinical presentation is inconsistent with a diagnosis of rubella or in the absence of recent travel/exposure history, IgM results must be confirmed by the other listed confirmatory methods. Rubella avidity serology is recommended for IgM positive results in pregnant women. Most acute rubella cases develop IgM after 5 days post rash onset. Therefore, a suspected rubella case in which serum collected < 5 days after rash onset initially tests IgM negative should have a second serum collected > 5 days after onset for retesting for IgM. Further strain characterization is indicated for epidemiologic, public health and control purposes.

Causative Agent
Rubella virus, an RNA virus of the genus *Rubivirus*.

Symptoms
Adults may experience a 1 to 5 day prodrome of mild fever, malaise, headache, and conjunctiva. Characteristic postauricular and suboccipital lymphadenopathy is followed by a diffuse maculopapular rash 5 to 10 days later. Children usually have few or no symptoms.

Complications (American Academy of Pediatrics, 2009)

- Encephalitis.
- Thrombocytopenia.
- Maternal rubella during pregnancy can result in miscarriage, fetal death or a variety of congenital anomalies. Refer to Congenital Rubella Syndrome/Infection in the Respiratory and Direct Contact section of the manual.

Incubation Period
Usually 16-18 days, but ranges from 14-23 days, (American Academy of Pediatrics, 2009).

Reservoir/Source
Humans.

Mode of Transmission
Spread by direct or droplet contact with nasopharyngeal secretions of an infected individual. In congenital rubella syndrome, the virus is transmitted to the fetus during pregnancy in 25% of cases of women who were exposed to rubella during their first trimester of pregnancy.

Period of Communicability
Approximately 1 week before to 4-5 days after onset of the rash.

Specimen Collection and Transport
To facilitate rapid testing, laboratory requisitions should be clearly marked "suspect case of rubella" when sending specimens for rubella testing.

To confirm the diagnosis the following specimens should be submitted to Saskatchewan Disease Control Laboratory (SDCL):

- Submit 5 mL serum samples for rubella IgM and IgG (acute and convalescent).
  - IgM response begins with onset of rash and will persist for 1 to 2 months. Only a small proportion of cases will have IgM present in serum samples collected on the day the rash appears. The proportion with IgM rises rapidly until the great majority of cases have IgM by day 5 post-onset of rash.
  - IgG response begins about 1 week after the onset of symptoms and will persist for a lifetime.
  - Convalescent sera should be drawn 10 to 20 days after the initial serology to assess the rise in IgG titre (seroconversion). This interval may be shorter if maternal rubella is being investigated.
  - Rubella specific IgM serology is the standard test for routine diagnosis of rubella but demonstration of a significant increase in the rubella specific IgG titre is a reliable alternative serologic method for diagnosis.
- Nasopharyngeal secretions, for isolation of rubella virus. Collect nasopharyngeal swab or a throat swab, and place in virus transport medium, within 4 days after the onset of symptoms. Refer to the SDCL Compendium of Tests at http://sdcl-testviewer.ehealthsask.ca/ for specimen collection instructions.
- Refrigerate specimens immediately and ship on ice to SDCL. Specimen must be received within 24 hr of collection.

Methods of Control/Role of Investigator

Prevention and Education

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization

- Immunize infants, children and adults according to the recommended schedule. Refer to Saskatchewan Immunization Manual.[1]
- Because of the implication of congenital rubella syndrome, special attention to immune status should be paid to women in their preconception, prenatal and postnatal period. If necessary, immunizations should be offered in accordance with the Saskatchewan Immunization Manual.[1]
- Postpartum women who are non-immune should be given rubella-containing vaccine before discharge from hospital. Refer to Saskatchewan Immunization Manual[1] for details.

Education

- Education should be provided regarding respiratory etiquette and measures to prevent transmission of rubella.
- Educate the public about the disease and the need for active immunization with a rubella-containing vaccine. Immunization information fact sheets can be used to guide discussion.

Management

The primary goal of rubella control is to prevent defects in the infants of women who acquire the disease while pregnant. Educate all individuals who are considered contacts. Provide information about rubella to all individuals who may have been exposed to the virus, especially women who may be pregnant or of reproductive age.

[1] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Information about the signs and symptoms of the disease and the importance of isolation from other possible contacts, including health care workers, daycares and schools and especially other pregnant women is essential.

I. Case

History

- Determine case status and immunization history including a review of the number and dates of rubella-containing vaccine.
- Determine the source of infection. Discuss social events, visitors from out of province, travel out of province and any contact with others who have been ill or with infants who may have congenital rubella syndrome.
- Discuss in detail the dates, names and places where the individual may have been in contact with others during the period of communicability and record contact details on the Attachment – Contact Follow-up Form in the Respiratory and Direct Contact Introduction and General Considerations section of the manual.

Immunization

Investigate immunization history, record date and place.

Treatment/Supportive Therapy

None. Supportive care in the home if symptoms of fever and headache indicate encephalitis, the case should seek medical attention.

Exclusion

Exclude cases from school, daycare, and work for 7 days following the onset of rash (Health Canada 1999, American Academy of Pediatrics 2009).

Referrals

In case of infection with wild rubella virus early in pregnancy, referral to family physician for appropriate counselling should be provided.

II. Contacts/Contact Investigation

Contact Definition/Categorization

- Anyone who is likely to have been exposed to the nose or throat secretions of a person with rubella during their infectious period.

- Investigate all household and close contacts, with special emphasis on exposure to pregnant women, and determine susceptibility. See Definition of Susceptible Contacts. The following settings should be considered:
  - work, school, childcare centres;
  - social events;
  - medical or clinical facilities may be considered as well.
- Individuals are considered immune if they:
  - were born in Canada prior to 1970;
  - were born in Canada in 1970 or later and have documented evidence of immunization with live rubella-containing vaccine after their first birthday;
  - were born outside Canada and have documented evidence of immunization with live rubella-containing vaccine after their first birthday,
  - have laboratory-documented evidence of rubella or laboratory evidence of immunity.

Definition of Susceptible Contacts
• Infants less than one year of age. • Immunocompromised individuals. • Persons born in Canada in 1970 or later and people born outside of Canada who do not have: ▪ documented evidence of vaccination with one dose of live rubella-containing vaccine received after their first birthday **OR** ▪ laboratory evidence of immunity **OR** ▪ a history of laboratory-confirmed rubella.

Prophylaxis/Testing/Immunization

- All pregnant women who have been exposed to the virus should have a blood test for rubella antibody if not already documented. Immune globulin may be suggested for those who are non-immune in consultation with the infectious disease specialist and gynaecologist. The value of this approach has not been established.

- Immunize all susceptible contacts with the exception of pregnant or immunosuppressed individuals. All individuals who have been exposed to the virus and who have no medical contraindications to the rubella vaccine should be given rubella-containing vaccine immediately.[2] Post pubertal females should be advised not to get pregnant for 1 month after receiving rubella-containing vaccine.
- Follow up all contacts within one week to confirm that they have been immunized and/or that they have or have not developed symptoms.

Exclusion

Exclude all suspected cases from school, daycare or work. If possible do not send them home on public transportation or on the school bus.

III. Environment

Child Care Centres/Institutional Control Measures

- Investigate immune status of health care/daycare workers and immunize all who are non-immune, except in the case of pregnancy or immunosuppression.
- Health care workers who are susceptible must not work with patients suspected or confirmed to have rubella. These workers can become infected and may also become a source for transmission (Health Canada, 2002).
- Inform parents of children in daycare centres of the need for susceptible children 12 months of age or older to be immunized immediately.
- Cases in a hospital or institution should be managed under strict contact and droplet isolation precautions.

Epidemic Measures

- Ensure prompt reporting of all confirmed and suspected cases. The medical community and general public should be made aware of rubella epidemics in order to identify and protect any pregnant women who may be susceptible.
- Active surveillance for infants with congenital rubella syndrome (CRS) should be carried out until 9 months after the last reported case of rubella.

[2] Although live-virus rubella vaccine given after exposure has not been demonstrated to prevent illness, vaccine theoretically could prevent illness if administered within 3 days of exposure. If this exposure does not result in illness, immunization will provide protection in the future (American Academy of Pediatrics, p. 582, 2009).

- There is a special concern when rubella cases are identified in unimmunized or underimmunized communities and additional control measures may be implemented.

References

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

Health Canada. (1999). Infection control guidelines: Routine practices and additional precautions for preventing the transmission of infection in health care. *Canada Communicable Disease Report (CCDR), 25S4*, July 1999. Retrieved August, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Health Canada. (2002). Infection control guidelines: Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR*), *28S1*, March 2002. Retrieved August, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2*, November 2009. Retrieved August, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Rube-eng.php.

Respiratory and Direct Contact

Congenital Rubella Syndrome/Infection (CRS/CRI)

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.
From Public Health to Ministry of Health: Within 72 hours.

Public Health Follow-up Timeline: Initiate within 72 hrs.

Information

Case Definition (Public Health Agency of Canada May 2008**)**

Table 1. National Case Definition for Congenital Rubella Syndrome (CRS)	
Confirmed Case	*Live birth*: two clinically compatible manifestations (any combination from Table 3, Columns A and B) with laboratory confirmation of infection: • isolation of rubella virus from an appropriate clinical specimen **OR** • detection of rubella virus RNA **OR** • positive serologic test for IgM antibody in the absence of recent immunization with rubella-containing vaccine **OR** • rubella IgG persisting for longer than would be expected (approximately six months after birth) from passive transfer of maternal antibody, or in the absence of recent immunization. *Still birth*: two clinically compatible manifestations with isolation of rubella virus from an appropriate clinical specimen.
Probable Case	In the absence of appropriate laboratory tests, a case that has at least: • any two clinically compatible manifestations listed in Table 3, Column A **OR** • one manifestation listed in Table 3, Column A, plus one listed in Table 3, Column B.
Not a Case	• rubella antibody titre absent in the infant **OR** • rubella antibody titre absent in the mother **OR** • rubella antibody titre declining in the infant consistent with the normal decline after birth of passively transferred maternal antibody.

Case Definition (Public Health Agency of Canada, May 2008**)**

Table 2. National Case Definition for Congenital Rubella Infection (CRI)	
Confirmed Case	Laboratory confirmation of infection but with no clinically compatible manifestations: • isolation of rubella virus from an appropriate clinical specimen **OR** • detection of rubella virus RNA **OR** • positive serologic test for rubella IgM antibody in the absence of recent immunization with rubella-containing vaccine **OR** • rubella IgG persisting for longer than would be expected (approximately six months after birth) from passive transfer of maternal antibody, or in the absence of recent immunization.

Table 3. Congenital Rubella Syndrome: Clinically Compatible Manifestations (Public Health Agency of Canada, May 2008)	
Column A	**Column B**
1. Cataracts or congenital glaucoma (either one or both count as one). 2. Congenital heart defect. 3. Sensorineural hearing loss. 4. Pigmentary retinopathy.	1. Purpura. 2. Hepatosplenomegaly. 3. Microcephaly. 4. Micro ophthalmia. 5. Mental retardation. 6. Meningoencephalitis. 7. Radiolucent bone disease. 8. Developmental or late onset conditions such as diabetes and progressive panencephalitis and any other conditions possibly caused by rubella virus.

Causative Agent
Rubella virus, an RNA virus of the genus *Rubivirus*.

Symptoms
In addition to the manifestations identified in Table 3, the following may also be seen (American Academy of Pediatrics, 2009):

- growth retardation;
- interstitial pneumonitis;
- thrombocytopenia;
- dermal erythropoesis ("blueberry muffin" lesions).

Moderate to severe cases of CRS are usually recognizable at birth. Mild cases that involve slight cardiac involvement or deafness may not be detected for months or even years. A frequent late manifestation of CRS is insulin-dependent diabetes mellitus (Heymann, 2008).

Fetal infections during the 1st trimester are at the greatest risk of intrauterine death, spontaneous abortion and congenital malformations of major organ systems. Infection in the first 20 weeks of gestation is most often associated with CRS and birth defects. Infections after the first 20 weeks of gestation are most often associated with CRI (Alberta Health & Wellness, 2005).

Incubation Period
Not applicable.

Reservoir/Source
Humans.

Mode of Transmission

- From an infected mother to her developing fetus.
- The occurrence of congenital defects is up to 85% if infection associated with maternal rash occurs during the first 12 weeks of gestation, 54% during 13-16 weeks, and 25% during the end of the second trimester (American Academy of Pediatrics, 2009).

Period of Communicability
Infants with CRS/CRI can shed virus in their pharyngeal secretions and urine for up to a year or more.

Specimen Collection and Transport
Laboratory confirmation of CRS/CRI is done by:

- detection of IgM in cord blood or serum of the infant
  OR
- detection of persistent rubella IgG in the infant (beyond approximately 6 months at which time maternally acquired antibodies usually wane)
  OR
- detection of rubella virus in samples (e.g., respiratory specimens collected during the first few months of life) (Alberta Health & Wellness, 2005).

Contact Saskatchewan Disease Control Laboratory (SDCL) Virology Section for additional information about specimen collection.

Methods of Control/Role of Investigator

Prevention and Education
Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization

- Immunize infants, children and adults according to the recommended schedule. Refer to Saskatchewan Immunization Manual.[1]
- Special attention must be paid to the immune status of women in their preconception, prenatal and postnatal period. If necessary, immunizations should be offered in accordance with the Saskatchewan Immunization Manual.[1]
- Postpartum women who are non-immune should be given rubella-containing vaccine before discharge from the hospital. Refer to the Saskatchewan Immunization Manual.[1]

[1] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Education

- Educate the public about the disease and the need for active immunization with a rubella-containing vaccine. Immunization information fact sheets can be used to guide discussion.

Management

I. Case

History

Confirm the diagnosis.

Treatment/Supportive Therapy

There is no specific treatment for CRS.

Exclusion

- The infant should be isolated after birth. Routine practices, as well as droplet and contact precautions should be strictly enforced.
- Health care workers who are susceptible must not work with patients suspected or confirmed to have rubella. These workers can become infected and subsequently become a source for transmission (Health Canada, 2002).
- Once discharged from hospital, only persons that are immune to rubella should have contact with and care for the infected newborn.
- Children with CRS/CRI should be presumed infectious at least through to age one year, unless nasopharyngeal and urine cultures are negative for virus after three months of age. The Medical Health Officer (MHO) should determine a schedule of nasopharyngeal swabs and urine cultures for the first year of life in consultation with the physician and SDCL.
- Viral isolation is not always successful and repeated attempts at viral isolation testing may be necessary – the pediatrician may consult with MHO who is to consult with SDCL for guidance in this regard.

Referrals

- The family physician may make referrals to specialists for infants with CRS/CRI, as appropriate (ophthalmologists, audiologists, heart specialists, etc.).
- The infant should continue to be monitored for clinical manifestations by their physician.

II. Contacts/Contact Investigation

Susceptible (non-immune) persons should avoid contact with the infant until they are immunized. This is particularly relevant for non-immune pregnant women and children less than 12 months of age.

III. Environment

Child Care Centres/Institutional Control Measures

- Contact and droplet isolation precautions should be implemented in hospitals to infants with CRS/CRI who are under 12 months, unless urine and pharyngeal virus cultures are negative for rubella virus after 3 months of age.
- Investigate immune status of health care/daycare workers and immunize all who are non-immune, except in the case of pregnancy or immunosuppression.

References

Alberta Health and Wellness. (2005). *Public health notifiable disease management guidelines*: *Congenital rubella.* Retrieved August, 2011 from http://www.health.alberta.ca/professionals/notifiable-diseases-guide.html.

American Academy of Pediatrics. (2009). *Red book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: Author.

Health Canada. (1999). Infection control guidelines: Routine practices and additional precautions for preventing the transmission of infection in health care. *Canada Communicable Disease Report (CCDR), 25S4*, July 1999. Retrieved August, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Health Canada. (2002). Infection control guidelines: Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR), 28S1*, March 2002. Retrieved August, 2011 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR), 35S2*, November 2009. Retrieved August, 2011 from www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/CRS_SRC-eng.php.

Respiratory and Direct Contact

Severe Acute Respiratory Infection (SARI)

Notification Timeline

From Lab/Practitioner to Public Health: Immediate.
From Public Health to Ministry of Health: Upon notification from lab or physician.

Public Health Follow-up Timeline: Within 24-48 hours.

Information

Case Definition (adapted from Public Health Agency of Canada, 2013)
To confirm the diagnosis of a case of SARI, the case must meet criteria in each of the categories listed below for hospitalized cases **(A)** or for cases who are deceased **(B)**:

1. Respiratory symptoms.
2. Severity.
3. Unknown diagnosis.
4. Epidemiological exposure, as detailed in the specific case definitions below.

SARI Case (A)
A person admitted to hospital with the following:

1. **Respiratory symptoms, i.e.:**
   - Fever[1] of over 38 degrees Celsius **AND** new onset of (or exacerbation of chronic) cough or breathing difficulty.

AND

2. **Evidence of severe illness progression, i.e.:**
   - Either radiographic evidence of infiltrates consistent with pneumonia, or a diagnosis of acute respiratory distress syndrome (ARDS) or severe influenza-like illness (ILI),[2] which may also include complications such as encephalitis, myocarditis or other severe and life threatening complications.

AND

3. **Either admission to the ICU/other area of the hospital where critically ill patients are cared for OR mechanical ventilation**.

AND

[1] As per the ILI definition, fever may not be prominent in patients under 5 years or 65 years and older as well as in immunosuppressed individuals. Failure to take temperature should not rule out a history of self-reported fever. Clinical judgment should always prevail with regard to these groups.
[2] **Severe ILI:** In addition to the symptoms of ILI noted below, severe ILI may also include complications such as encephalitis, myocarditis or other severe and life threatening complications.

4. **No alternate diagnosis within the first 72 hours[3] of hospitalization, i.e.:**
   - Results of preliminary clinical and/or laboratory investigations, within the first 72 hours of hospitalization, cannot ascertain a diagnosis that reasonably explains the illness.

AND

5. **One or more of the following exposures/conditions, i.e.:**
   - Residence, recent travel (within ≤ 14 days of illness onset) to a country where human cases of novel influenza virus or other emerging/re-emerging pathogens have been detected or are known to be circulating in animals[4].
   - Close contact[5] with an ill person who has been to an affected area/site within the 14 days prior to onset of symptoms.
   - Exposure to settings in which there had been mass die offs or illness in domestic poultry or swine in the previous six weeks.
   - Occupational exposure involving **direct** health care, laboratory or animal exposure, i.e.:
     - **Health care exposure** involving health care workers who work in an environment where patients with SARI are being cared for, particularly patients requiring intensive care.

     OR
     - **Laboratory exposure** in a person who works directly with Laboratory biological specimens.

     OR
     - **Animal exposure** in a person employed as one of the following:
       - Poultry/swine farm worker;
       - Poultry/swine processing plant worker;
       - Poultry/swine culler (catching, bagging, transporting or disposing of dead birds/swine);

[3] It is suggested that laboratory investigation, including laboratory testing for influenza and other respiratory pathogens should be started as soon as possible upon presentation (i.e., do not wait 72 hours to initiate testing) and it requires immediate infection control and public health action. Refer to Attachment – Severe Acute Respiratory Illness (SARI) Screening Tool and discuss with the Medical Health Officer and Infection Control.

[4] Refer to the World Health Organization Human Animal Interface for the most recent information http://www.who.int/influenza/human_animal_interface/en/)

[5] Close contact is defined as: Anyone who provided care for the patient, including a health care worker or family member, or who had other similarly close physical contact; Anyone who stayed at the same place (e.g. lived with, visited) as a probable or confirmed case while the case was ill.

- Worker in live animal market;
- Dealer or trader of pet birds, pigs or other potentially affected animals;
- Chef working with live or recently killed domestic poultry, swine or other potentially affected animals;
- Veterinarian worker;
- Public health inspector/regulator.

OR

SARI Case (B)

A deceased person with the following:

1. **A history of respiratory symptoms, i.e.:**
   - History of unexplained acute respiratory illness (including fever and new onset of (or exacerbation of chronic) cough or breathing difficulty) resulting in death.

AND

2. **Autopsy performed with findings consistent with SARI, i.e.:**
   - Autopsy findings consistent with the pathology of ARDS without an identifiable cause.

AND

3. **No alternate diagnosis that reasonably explains the illness.**

AND

4. **One or more of exposures/conditions, as listed in (A).**

SARI Case Exclusion Criteria

A person should not be reported as a case of SARI if an alternate diagnosis can reasonably explain their illness.

Health Care Facility Surveillance for SARI

It is recommended that regions/jurisdictions use the Attachment – Severe Acute Respiratory Illness (SARI) Screening Tool in their acute and integrated health care facilities to ensure the early recognition of potential SARI cases and the prompt notification of Infection Control and Medical Health Officers (MHOs). This will ensure that sporadic cases of SARI are reported and assessed using this case definition.

Causative Agent
Varies; includes several emerging respiratory pathogens including but not limited to influenza A (H5N1), other novel influenza virus, SARS-CoV (coronavirus), etc.

Symptoms
- Fever (> 38 degrees Celsius).
- New onset of (or exacerbation of chronic) cough or breathing difficulty.
- Radiographic evidence of infiltrates consistent with pneumonia or acute respiratory distress syndrome (ARDS) or Severe ILI.

Incubation Period
Varies depending on the organism; for example:
- SARS-CoV is 3 to10 days.
- Avian influenza ranges from 2-8 days and as long as 17 days.

Reservoir/Source
Varies depending on the organism; for example:
- SARS-CoV is unknown.
- Avian influenza – primarily birds, but can affect humans and pigs as well.

Mode of Transmission
- Direct contact with respiratory secretions or body fluids of a confirmed, suspect of probable case or direct contact with suspected animals implicated in transmission.
- Airborne via aerosol-generating medical procedures.[6]
- SARS-CoV – person to person by close contact. Primarily through droplets and fomites.
- Avian influenza – refer to Vector-Borne and Zoonotic Diseases Avian Influenza section of the manual. (The virus is transmitted through close contact with dead or sick birds. There is limited human-to-human transmission occurring at this time.)
- MERS-CoV – contact with camels or their milk or urine; person to person by close contact.

[6] **Aerosol Generating Medical Procedure**: A medical or surgical procedure that involves manipulation or stimulation of a patient's airway in a manner that may stimulate coughing and/or promote the generation of aerosols.

Period of Communicability

- Varies depending on the specific organism suspected or identified.
- Not completely understood for SARS-CoV – initial studies suggest that transmission does not occur before onset of clinical symptoms and maximum period of communicability is less than 21 days.
- Difficult to determine when there is no evidence of direct human-to-human transmission (avian influenza).

Specimen Collection and Transport

Appropriate testing for routine respiratory pathogens should be reinforced.

The following are suggested laboratory diagnostic tests that should be considered in the **initial** laboratory work-up of patients presenting with symptoms of SARI. Relevant medical history, as well as clinical signs and symptoms will dictate appropriate ongoing testing for each patient, (The Public Health Agency of Canada, 2013).

Specimens should be sent on a STAT basis. Refer to the Saskatchewan Disease Control Laboratory (SDCL) Compendium of Tests[7], Time or Temperature Sensitive, STAT and Outbreak Samples Policy for details on submitting STAT samples. The MHO may be able to assist in expediting testing.

The **initial** specimens must be clearly marked **"SARI Screen".**

- Blood culture.
- Sputum for C&S.
- Nasopharyngeal swab in viral transport for:
  - influenza PCR;
  - respiratory virus culture;
  - direct antigen testing.
- CBC and differential.
- Liver function tests.
- Stool for viral studies (only if the patient has diarrhea).
- Arrange for other testing as recommended by MHO and/or Infectious Disease (ID) Specialist.

[7] http://sdcl-testviewer.ehealthsask.ca/

Methods of Control/Role of Investigator

Infection control procedures are paramount. Contact, droplet and airborne precautions must be implemented as necessary for patients in health care facilities and should be done in consultation with Infection Control and MHO. Refer to Infection Prevention and Control Measures and Initial Management of Persons who May Be Infected with a Novel Respiratory Virus.

Prevention and Education
Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education and provides information on high-risk groups and activities.

Refer to Vector-Borne and Zoonotic Diseases Avian Influenza section of the manual for additional prevention measures if poultry is involved as a host or source of infection.

SARI alerts should trigger MHOs to inform clinicians about the SARI screening tool and reinforce the "Think, Tell and Test" message.

- THINK about the possibility of an emerging respiratory infection, e.g., novel respiratory virus and how the spread can be prevented (implementation of appropriate infection control measures).
- TELL the local MHO and local infection control and consult with ID Specialist.
- TEST for pathogens only after appropriate consultation with the MHO and ID Specialist and based on clinical and epidemiologic symptoms.

Refer to Specimen Collection and Transport above, Attachment – Severe Acute Respiratory Illness (SARI) Screening Tool or Laboratory Testing for Persons Who May Be Infected with a Novel Respiratory Virus.

- Educate cases and contacts on the appropriate infection control measures that must be taken to reduce the spread.
- Provide education and instructions for staff who have cared for the case before appropriate precautions were implemented (i.e., had unprotected close contact with the case). This should include specific advice on how to self-monitor for fever and symptoms of respiratory illness for 14 days.

Management

I. Case

Contact, droplet and airborne precautions must be implemented as necessary for all clients being investigated for SARI.

History

- Complete the Attachment – Severe Acute Respiratory Illness (SARI) Screening Tool and Attachment – Emerging Respiratory Pathogens and Severe Acute Respiratory Infection (SARI) Case Report.
- If person-to-person spread is typical for the suspected organism, identify those who may have been exposed to this case and follow-up as per Contact Investigation below.
- If the case was severely ill with the respiratory illness during air travel (i.e., on return to Canada), then the MHO should contact Health Canada's Centre for Emergency Preparedness and Response (CEPR), to request passenger contact information (e.g., airplane manifest). Follow-up of passengers may be considered if the case meets the SARI case definition and there is an identified concern of SARI globally and travel exposure occurred during the incubation period (within 14 days prior to the onset of illness), or the case is found to have another illness with significant public health implications.

Immunization

- Review immunization history specifically for Pneu-P-23 (pneumococcal 23 polysaccharide vaccine) and Influenza. If high-risk, offer as appropriate.

Treatment/Supportive Therapy

- Consult with ID Specialist.

Exclusion

- The period of exclusion will be based on the specific organism.
- While laboratory results are pending, appropriate infection control measures should be implemented including exclusion where appropriate.

Referrals

- All SARI cases should be managed in consultation with the ID specialist and MHO.
- If no organism is identified, consultation with colleagues to determine further action is recommended.

II. Contacts/Contact Investigation

Close Contact means having cared for, lived with, or had face-to-face (within 1 metre) contact with, or has had direct contact with respiratory secretions and/or body fluids of a person with SARI (Public Health Agency of Canada, 2003).

- Household contacts, intimate contacts and health care providers should be the initial priority.
- Follow-up of the other close contacts should occur if the contacts can be reached within 14 days of their last contact with an infectious case.[8]

The extent of investigation for remote contacts is dependent on the extent of illness in the close contacts and specific organism and will be directed by the MHO.
See Attachment – Sample Severe Acute Respiratory Infection Contact Management Form.

Testing

- Consult with MHO for recommendations.

Prophylaxis/Immunization

- Review immunization history for contacts. The opportunity should be taken to catch up on immunizations for which the contact meets the eligibility criteria.

[8] This recommendation takes into account the need to prioritize limited public health resources. It is acknowledged that some cases may be symptomatic and missed if no attempt is made to reach potentially ill contacts identified beyond the 14-day time frame. Therefore this should be considered a reasonable approach to contact management and should not preclude any jurisdiction from undertaking a more complete contact investigation.

Education

- Public health should ensure that contacts receive education/instructions regarding infection control measures, self-monitoring, and who to contact if they become ill with respiratory symptoms. This should include informing the contact that if they develop symptoms (i.e., fever, cough or difficulty breathing), they should do the following:
  - Phone their personal physician so that decisions regarding the need for a clinical assessment can be individualized.
  - Health care providers should be asked to check in with their respective occupational health departments prior to returning to work.
  - Hospital/home isolation[9] may be recommended until symptoms have resolved/returned to baseline.

Exclusion

- If the close contact is **symptomatic** (i.e., has fever, cough or difficulty breathing), manage as a case.
- No exclusion recommended if the close contact is **asymptomatic** (i.e., is afebrile and has no respiratory symptoms that are different from their baseline status):
  - Self-monitor for fever and new respiratory symptoms for 14 days following last contact with the case.

III. Environment

Child Care Centres/Institutional Control Measures

- Facilities should promptly initiate contact, droplet and airborne precautions (in addition to Routine/Standard Precautions) and consult their local infection control policies. Infection Control and the MHO should be consulted on all SARI cases.
- Patients with suspected SARI should be moved to a designated isolation room ASAP (or negative pressure room if available).

[9] The symptomatic contact should be isolated in their home unless hospitalization is clinically indicated. These individuals would be instructed to stay home from work/school/other activities, wash their hands frequently and avoid direct face to face contact with others for the duration of their illness. The extent of the isolation requirements should be based on the severity of illness in the case, the composition of the household (e.g., presence of immunocompromised individuals) and any available evidence regarding communicability and ease of transmission.

Refer to provincial and national guidelines and discuss with the local MHO or Infection Control Practitioner for Infection Control guidance. Initial precautions may be more conservative and include airborne as well as contact and droplet precautions.

Epidemic Measures

If SARI cases are identified in a health care facility, it is important to heighten surveillance to assist in early identification and implementation of control measures and further outbreak control measures as required.

PHAC may be in a position to provide direction. Saskatchewan Ministry of Health will participate in communication messages and provide direction. Specific measures include:

- Use media to clearly inform the general public about the disease, risk of transmission/infection, signs and symptoms, and how to avoid contact with cases.
- Provide HealthLine with updated information to address concerns from the public.
- Ensure that health care workers are well informed of infection control measures and have appropriate facilities for triage.
- Promote the location of the triage facilities to the public.

References

Public Health Agency of Canada. (2003). *Public health management of cases and clusters of severe respiratory illness (SRI) in the SARS post-outbreak period: Interim guidelines, version 1.* Retrieved October, 2011 from http://www.phac-aspc.gc.ca/sars-sras/pdf/phm-of-cases-and-clusters-sars-pop_e.pdf.

Public Health Agency of Canada. (2013). *Severe acute respiratory illness (SARI) Case Definition.*

Public Health Agency of Canada. (2013). *Protocol for Microbiological Investigations of Severe Acute Respiratory Infections (SARI).* Retrieved January, 2015 from http://www.phac-aspc.gc.ca/eri-ire/proto-sari-iras-eng.php .

Severe Acute Respiratory Illness (SARI)
Attachment – Severe Acute Respiratory Illness (SARI) Screening Tool

Please see the following pages for the Severe Acute Respiratory Illness (SARI) Screening Tool.

SEVERE ACUTE RESPIRATORY ILLNESS (SARI)* SCREENING TOOL

PHYSICIANS to complete

For all persons with severe acute respiratory illness* presenting to the Emergency Department or admitted to Hospital.

*SARI may be caused by respiratory pathogens of known or unknown origin including novel respiratory viruses (Avian Influenza H7N9, H5N1, Novel Coronaviruses, etc.)

Addressograph/Patient Name:

Date/Time	**Place surgical mask on all patients presenting with *severe acute* respiratory symptoms** (unless the patient's clinical condition will be compromised by wearing the mask). **Ensure that it remains in place during any transportation of the patient for medical investigations/examinations, including Chest X-ray**

COMPLETE THE FOLLOWING SCREENING QUESTIONS - Indicating Yes or No for each of the criteria

PATIENT presents with SARI-defining features:

Yes	**No**	**Fever** (over >38˚ C), **and**
Yes	**No**	**Cough** or breathing difficulty, **and**
Yes	**No**	**Radiographic evidence** of infiltrates consistent with pneumonia or Respiratory Distress Syndrome

NOTE: If answered "NO" to any of the above, there is no need to proceed with this screening tool.

IN THE **14 DAYS** BEFORE THE ONSET OF SYMPTOMS, WERE ANY OF THE FOLLOWING PRESENT:

Yes	**No**	1.a) **Close contact** with a suspect or probable case of SARI *[Close contact means having cared for, lived with, or had face to face (within 2 meters) contact with, or having had direct contact with respiratory secretions and/or body fluids of a person with SARI]*
Yes	**No**	1.b) **Travel** to a country where there is a Public Health Agency of Canada public health notice of respiratory illness in effect: http://www.phac-aspc.gc.ca/phn-asp/index-eng.php
Yes	**No**	1.c) **Recent exposure/close contact** to a potential source of a SARI which may include reports of illness or die offs in domestic poultry flocks or illness in other animal vectors such as camels or swine.
Yes	**No**	2. **Current illness is inconsistent with other known cause.**

If you answered "NO" to questions 1 (a, b & c) and 2 The patient has *not* had any exposures of concern, and *does* have another explanation for their symptoms	→	**Initiate Contact & Droplet Precautions (in addition to Routine Practices)**
If you answered "YES" to questions 1 (a, b or c) or 2	→	• **Initiate Contact and Droplet Precautions; Airborne precautions for aerosol-generating procedures (AGMP's); admit patient to a single room.** • **Consult with infection control.**

1. **THINK infection control** • **Everyone** entering the room should observe hand hygiene, contact and droplet precautions (surgical mask, gowns, gloves, eye protection)**. Airborne Precautions for aerosol-generating procedures**.	**Done**	**Not Done**
2. **TELL** your Medical Health Officer **(**Regional contact ##**)** or if after hours, the MHO on call. ### The MHO will call Saskatchewan Disease Control Lab (SDCL) to expedite STAT testing.	**Done**	**Not Done**
3. **TELL** Infection Control (Monday to Friday) – insert Regional contact ##	**Done**	**Not Done**
4. **CONSULT** an Infectious Disease Specialist – insert Regional contact ##	**Done**	**Not Done**
5. **TEST -** Collect specimens and clearly mark specimens **"URGENT: for *SARI Screen*"** **Collect the specimens when clinically indicated**	**Done**	**Not Done**

- Nasopharyngeal and oropharyngeal swab in viral transport media
- CXR
- CBC and differential
- Endotracheal secretions, Broncoalveolar lavage (BAL)
- Serum for *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* serology.
- If patient has diarrhea, send stool for viral studies.
- Arrange other testing as recommended by MHO and/or ID specialist (document on this form).
- Local lab to contact SDCL and confirm details related to delivery/arrival for the STAT specimens.
- Liver function tests
- Blood culture
- Sputum C & S

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.
From Public Health to Ministry of Health: Immediate for known outbreaks. Individual cases are not reportable to the Ministry.

Public Health Follow-up Timeline: Less than 48 hours for prenatal and neonatal cases and contacts.

Information

Table 1: Case Definition (Public Health Agency of Canada, 2008)

Confirmed case	Clinical evidence of illness[1] and laboratory confirmation of infection: • isolation or direct antigen detection of varicella-zoster virus (VZV) from an appropriate clinical specimen **OR** • detection of VZV DNA **OR** • seroconversion or a significant rise (e.g., fourfold or greater) by any standard serologic assay in varicella-zoster IgG titre between acute and convalescent sera **OR** • positive serologic test for varicella-zoster IgM antibody **OR** • clinical evidence of illness[1] in a person with an epidemiologic link to a laboratory-confirmed case of chickenpox or VZV infection.
Probable Case	Clinical evidence of illness[1] in the absence of laboratory confirmation or epidemiologic link to a laboratory confirmed case.
[1]Clinical illness is characterized by a rash with rapid evolution of macules to papules, vesicles, and crusts; all stages are simultaneously present; lesions are superficial and may appear in crops.	

*Refer to Specimen Collection and Transport for details on appropriate clinical specimens.

Causative Agent
Human herpesvirus3 (alpha); member of VZV (Heymann, 2015).

Symptoms
Varicella may or may not begin with a prodromal period. The prodromal period, when present, is characterized by fever, malaise and upper respiratory tract infection followed by the characteristic lesions. The lesions appear in successive crops over the first 2-5 days of the rash and tend to develop on the trunk and face, with progression to the extremities. They progress rapidly from macules to papules, vesicles and crusts, all stages are simultaneously present; lesions are superficial, distribution is centrifugal. Ulcerated lesions may also be present on mucous membranes including the oropharynx, upper respiratory tract, conjunctiva and rectal and vaginal mucosa. In adults, these symptoms may be more severe (Mandell, Bennett & Dolin, 2000).

Complications
Varicella is generally considered a mild infection; however, 5-10% of otherwise healthy children may develop complications that may be fatal. Complications may include pneumonia, secondary bacterial infections, soft tissue infections, bacteraemia, septicemia, septic arthritis, necrotizing fasciitis, toxic shock-like syndrome, thrombocytopenia, cerebellar ataxia, encephalitis and hepatitis (American Academy of Pediatrics, 2015; Heymann, 2015).

Primary varicella is a more severe disease in adults, with a case fatality rate 10 to 30 times higher than in children. Moreover, in both adults and children, the majority who die of varicella have no identifiable risk factor for severe disease (Health Canada, 1999).

Neonates who develop varicella at 5-10 days are at increased risk for severe generalized varicella. The case-fatality rate for neonates whose mother developed varicella five days before delivery to within two days following delivery and who did not receive Varicella- Zoster Immune Globulin (VarIg) or antiviral therapy can reach 30% (Heymann, 2015).

Incubation Period
Usually 14-16 days but it can be as early as 10 days or as late as 21 days (Heymann, 2015).

Reservoir/Source
Humans.

Mode of Transmission
- Direct or indirect contact of oral or nasal mucous membranes with respiratory secretions or vesicular fluid.
- Inhalation of airborne virus.
- Indirect transmission may occur through contact with respiratory secretions or discharge from lesions on freshly soiled linens or towels.
- Transmission of vaccine virus is rare (Public Health Agency of Canada, 2006).
- Transmission can occur from direct contact with fluids from localized shingles lesions but is rare if the lesions are covered. Disseminated zoster can be transmitted by airborne route. (Household transmission rates have been noted to be approximately 15% [Stankus, Dlugopolski & Packer, 2000]).
- In utero infection through transplacental passage during maternal infection.

Risk Groups/Risk Factors
- Neonates born to non-immune mothers.
- Newborns of mothers who develop varicella between five days prior to delivery and 48 hours after the delivery.
- Infants.
- Adolescents (American Academy of Pediatrics, 2015).
- Individuals with chronic cutaneous/pulmonary disorder (American Academy of Pediatrics, 2015).
- Pregnant women who have never had varicella vaccine, varicella disease or shingles.
- Immunocompromised individuals.
- Cancer patients, especially lymphoid tissue, with or without steroid therapy.

Period of Communicability
- From one to two days before onset of rash and continuing until all lesions are crusted, approximately five days (Heymann, 2015; American Academy of Pediatrics, 2015).
- In immuno-competent individuals most virus replication has stopped by 72 hours after onset of the rash. The time may be longer in immunocompromised individuals (Mandell et al., 2000).

Specimen Collection and Transport

- Swabs from the base of a freshly de-roofed lesion for culture and direct fluorescent antibody (DFA) or polymerase chain reaction (PCR).
- Cerebrospinal fluid (CSF) for culture or PCR.
- Blood for serology.

Methods of Control/Role of Investigator

Prevention and Education

Refer to the Respiratory and Direct Contact Introduction and General Considerations section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities.

Immunization

Immunize infants, children, and adults according to the recommended schedules in the Saskatchewan Immunization Manual.[1]

Education

- Education should be provided regarding respiratory etiquette, hand hygiene and other measures to prevent transmission.
- Educate the public about the disease and the need for active immunization. Immunization information fact sheets can be used to guide discussion.

Management

I. Case

History

- Assess risk factors and exposure history. The source of infection could be a case of varicella or herpes zoster (rarely unless disseminated).
- Identify contacts (refer to contact definition).

Immunization

Assess immunization history.

[1] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

Education

- Practicing good hand hygiene.
- Not sharing personal items such as drinking glasses, eating utensils, or towels.
- Respiratory etiquette.
- Cases should avoid contact with high risk individuals who have not yet been exposed.

Treatment/Supportive Therapy

- Supportive therapy as indicated.
- Treatment with antivirals has a limited window of opportunity to affect the outcome of varicella-zoster infection. Acyclovir therapy initiated within 24 hours after onset of the rash is effective in accelerating skin lesion healing and can be used for generally healthy population (at increased risk of moderate to severe varicella) as soon as possible after rash onset (Public Health Agency of Canada, 2006).

Exclusion

- Cases should not be cared for by susceptible persons.
- Children with chickenpox may remain in school/daycare as long as they are feeling well enough to take part in normal activities (Canadian Pediatric Society, 2016).
  - Exclusion for five days after the appearance of the rash should still be considered when the child has severe illness or is going into a new setting where the classmates have not already been exposed.
- In health care facilities, the appropriate infection control measures should be implemented because of the risk of serious varicella in susceptible immunocompromised individuals. Refer to Health Facility Control Measures.
- Air travel is not recommended until lesions are crusted.
- Swimming in public pools is not recommended until lesions have healed and crusts are no longer present (Alberta Health and Wellness, 2008).

Referrals

Not applicable.

II. Contacts/Contact Investigation

Identify susceptible contacts with significant exposure (see Contact Definition).

Table 2: Contact Definition

Contact	Anyone who shared the same airspace with a case during the infectious period (48 hours before to five days after onset of rash).
Significant Exposure [2] (Public Health Agency of Canada, 2016 and 2013)	Varicella • Continuous household contact (living in the same dwelling) with a person with varicella. • Close contact with an infectious person, such as close indoor contact (e.g., in the same room) or face-to-face contact[3]. • Being in the same hospital room for >1 hour, or >15 minutes of face-to-face contact, with a patient with varicella. • Touching the lesions of a person with active varicella. Zoster • Touching a zoster rash, exposed lesion or vesicle fluid or articles freshly soiled by discharges from vesicles; • Contact with an individual who has disseminated zoster; • Contact with articles freshly soiled by mucous membrane secretions of a person with disseminated zoster; or • Exposure to an immunocompromised person with localized zoster anywhere on the body because their viral shedding may be greater.

[2] Verbal history of infection is not acceptable following a significant exposure to varicella in individuals at **high risk for varicella complications** and cannot be accepted as evidence of immunity

[3] Experts differ in their opinion about the duration of contact; some suggest five minutes and others up to one hour, but do agree that it does not include transitory contact (Centers for Disease Control and Prevention, 2016)

Susceptible Contacts	• Newborns of mothers who develop varicella between five days prior to delivery and 48 hours (two days) after delivery. • Hematopoietic stem cell transplant (HSCT) recipients regardless of pre-transplant varicella immune status or history of varicella disease or vaccination. • Immunocompromised individuals. • Hospitalized patients, especially premature infants. ➢ Preterm infants >/= 28 weeks gestation whose mother lacks a reliable history of chickenpox or serologic immunity (American Academy of Pediatrics, 2009). ➢ Preterm infants < 28 weeks gestation or birth weight of 1,000 g or less, regardless of the maternal history of chickenpox or serostatus (American Academy of Pediatrics, 2009). • Pregnant women who do not have documentation of immunity to varicella (routine prenatal screening includes varicella immunity). • Healthy individuals who (Public Health Agency of Canada, 2015): ➢ Do not report having a health care provider diagnosed or self-diagnosed history of varicella or zoster prior to implementation of a one dose varicella program[4] ➢ Do not have documented evidence of immunization with two doses of varicella containing vaccine, or ➢ Do not have previous laboratory evidence of immunity[5] to varicella.

[4] One-dose varicella program was implemented in Saskatchewan on January 1, 2005
[5] Laboratory testing should be conducted only once in a lifetime. If a person has been found to be seropositive, it is not necessary to test again.

Education

- Close contacts of confirmed cases should be educated about varicella and its signs and symptoms.
- They should also be advised that varicella is communicable to others long before the rash appears.
- Adult contacts (including pregnant women), and any individual with immunocompromising conditions, should be advised to see a physician if early signs and symptoms appear.
- Household contacts of confirmed and probable cases should avoid contact with susceptible/high risk groups/individuals during the incubation period.

History

- Assess risk factors.
- History of vaccination.
- History of varicella disease and/or shingles.

Preventive Measures

Immunize individuals as per the Saskatchewan Immunization Manual[6].

Prophylaxis Immunization

Although varicella vaccine has been shown to be effective in preventing or reducing the severity of the disease if given to susceptible individuals within 72 hours and no longer than five days after exposure, Saskatchewan Ministry of Health, at this time, does not routinely provide publicly funded immunization for contacts of chickenpox. The exception is children who fall into the target group who have not yet been immunized, and who do not have contraindications to immunization.

Immune Globulin Prophylaxis

Susceptible individuals at higher risk for severe disease (see list below), should be evaluated immediately for administration of VarIg. The National Advisory Committee for Immunization (NACI) (2016) recommends:

- For optimum benefit, VarIg should be administered as soon as possible (ideally within 96 hours) following first exposure.

[6] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx

- In instances of prolonged exposures, where the exact timing of transmission may be unknown, it may be used within 96 hours of the most recent exposure.
- If more than 96 hours but less than 10 days have elapsed since the last exposure, the susceptible high-risk individuals' clinician may determine that VarIg would be useful to attenuate (rather than prevent) disease. The benefit of administering VarIg after 96 hours is uncertain.

Dosage: 125 units/10 kg of body weight, to a maximum of 625 units IM. Refer to Appendix D – Publicly Funded Medications for Chemoprophylaxis/Treatment for information on how to access VarIg from Canadian Blood Services.

NACI recommends VarIg for the following susceptible **high-risk groups** after exposure to VZV (Public Health Agency of Canada, 2016):

1. Susceptible pregnant women.
2. Newborn infants of mothers who have varicella that began during the five days before to 48 hours after delivery.
3. Selected neonates in neonatal or pediatric intensive care units for the management of significant varicella exposure in consultation with the infectious diseases/infection control specialist.
4. Susceptible immunocompromised individuals, including (including those with HIV with CD4 cell count < 200 × 106/L or CD4 percentage < 15%) and HSCT recipients regardless of pre-transplant varicella immune status or history of varicella disease or vaccination.

Testing

Adolescents and adults who have a negative or uncertain past history of varicella and no documentation of vaccination should have serologic tests to establish susceptibility, since as many as 70 to 95% of such individuals have immunity to varicella. However, delays in obtaining test results should not delay appropriate post-exposure varicella management (Public Health Agency of Canada, 2006).

Chemoprophylaxis

Clinicians may want to consult with specialists to determine if and when acyclovir should be used for specific contacts in circumstances where the timeframe for VarIg has elapsed.

Acyclovir is generally not recommended for immunocompetent contacts.

Treatment

Antiviral drugs such as acyclovir appear useful in preventing or modifying varicella in exposed individuals if given within a week of exposure.

Exclusion

Susceptible caregivers, including healthcare workers (HCWs) exposed to chickenpox should be excluded from contact with high-risk patients from 8-21 days after exposure. Extend to 28 days if VarIg was given as it may prolong the incubation period if it is unable to fully protect against infection in the susceptible person who received it (Health Canada, 2002).

III. Environment

Prevent the spread of infection by using a household cleaner to wash any articles soiled with fluid from chickenpox blisters. Keep the infected person away from others who have not had chickenpox.

Health Facilities Control Measures

- HCWs should have proof of immunity or previous immunization assessed upon employment. Refer to the Saskatchewan Immunization Manual[7] – Chapter 7: Immunization of Special Populations, Section 3.2 Health Care Workers and other relevant Saskatchewan Ministry of Health policies/memos.
- A suspected or confirmed case of varicella occurring within a facility must be reported immediately to the local public health office and to infection control.
- Strict enforcement of infection control practices (routine practices as well as contact and airborne precautions) should be taken for a minimum of five days and until all lesions are crusted (Health Canada, 2002 and Health Canada, 1999).
- Immunocompromised cases should be isolated with contact and airborne precautions for the duration of their illness which can be up to a week (American Academy of Pediatrics, 2015).
- Provide varicella vaccine or VarIg to susceptible contacts as described in contact management.

[7] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

- Susceptible contacts who are HCWs should be excluded from working with high-risk susceptible patients during the potential period of communicability (from eight days, after first exposure to 21 days from last exposure to an infectious client) or to day 28 for those who received immune globulin as it may prolong the incubation period (Public Health Agency of Canada, 2006).
- Health care facilities may, after consultation with the Medical Health Officer (MHO), provide HCWs immunization and other follow up. HCWs must be instructed to call public health if they develop any signs or symptoms suggestive of varicella.
- HCWs who are symptomatic should be excluded from work until all lesions are dry and crusted and no new lesions are forming.
- Occupational Health (OH) should not exclude HCWs with a localized, postimmunization varicella-like rash that can be covered with an occlusive dressing.
- OH should exclude HCWs with a postimmunization varicella-like rash if the rash cannot be covered and if the HCWs are involved in the care of high-risk patients, (e.g., immunocompromised and newborn patients) for the duration of the rash.
- OH should inform Infection Control as soon as possible of a suspected or confirmed case.

Epidemic Measures

- Follow as per case and contact management.
- The use of varicella vaccine may be considered in the management of outbreaks in consultation with Saskatchewan Ministry of Health.

Revisions

Date	Change
March 2016	Updated recommendations on use of VarIg based on NACI Statement 2015.
March 2017	Updated definition of susceptible individuals based on NACI Statement (2015) and included contact to zoster under significant exposure definition as per PHAC (2015). References reaffirmed or updated as necessary.

References

Alberta Health and Wellness. (2013). *Public health notifiable disease management guidelines: Varicella (chickenpox)*. Retrieved March, 2014 from http://www.health.alberta.ca/professionals/notifiable-diseases-guide.html.

American Academy of Pediatrics. (2012). *Red book: 2012 Report of the Committee on Infectious Diseases* (29th ed.). Elk Grove Village, IL: Author.

Canadian Pediatric Society (2016). School and daycare exclusion policies for chickenpox: A rational approach. Retrieved April, 2017 from http://www.cps.ca/documents/position/exclusion-policies-for-chickenpox

Centers for Disease Control and Prevention. (2016). Strategies for the Control and Investigation of Varicella Outbreaks 2008. *National Center for Immunization and Respiratory Diseases.* Retrieved April 2017 from https://www.cdc.gov/chickenpox/outbreaks/manual.html

Centers for Disease Control and Prevention. Prevention of varicella: Recommendations of the advisory committee on immunization practices. *Morbidity and Mortality Weekly Report (MMWR), 56RR-4*, June 2007.

Feigin, R. & Cherry, J. (Eds.). (1998). *Textbook of pediatric infectious diseases*, *Vol. 2,* (4th ed.). Australia: Elsevier.

Health Canada. (1998). Infection control guidelines: Hand washing, cleaning, disinfection and sterilization in health care. *Canada Communicable Disease Report (CCDR), 24S8,* December 1998. Retrieved March, 2014 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/98pdf/cdr24s8e.pdf.

Health Canada. (1999). Infection control guidelines: Routine practices and additional precautions for preventing the transmission of infection in health care. *Canada Communicable Disease Report (CCDR), 25S4,* July 1999. Retrieved March, 2014 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s4e.pdf.

Health Canada. (1999). Proceedings of the national varicella consensus conference, May 1999. *Canada Communicable Disease Report (CCDR), 25S5*, August 1999. Retrieved March, 2014 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/99pdf/cdr25s5e.pdf.

Health Canada. (2002). Infection control guidelines: Prevention and control of occupational infections in health care. *Canada Communicable Disease Report (CCDR), 28S1*, March 2002. Retrieved March, 2014 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02pdf/28s1e.pdf.

Heymann, D. L. (Ed.). (2008). *Control of communicable diseases manual* (19th ed.). Washington, DC: American Public Health Association.

Mandell, G. L., Bennett, J. E., & Dolin, R. (Eds.). (2000). *Mandell, Douglas, and Bennett's principles and practice of infectious diseases* (5th ed.). Philadelphia, PA: Churchill Livingstone.

Public Health Agency of Canada. (2016). Varicella (Chickenpox) vaccine. *Canadian immunization guide* (7th ed.). Ottawa, Canada: Public Works and Government Services Canada.

Public Health Agency of Canada. (2013). Passive immunizing agents. *Canadian immunization guide* (7th ed.). Ottawa, Canada: Public Works and Government Services Canada.

Public Health Agency of Canada. (2006). VariZIG™ as the varicella zoster immune globulin for the prevention of varicella in at-risk patients. *Canada Communicable Disease Report (CCDR), 32 ACS-8*, October 2006. Retrieved March, 2014 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/06vol32/acs-08/index-eng.php.

Public Health Agency of Canada. (2008). Case definitions for communicable diseases under national surveillance. *Canada Communicable Disease Report (CCDR*), *35S2*, November 2009. Retrieved March, 2014 from http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/Varicel-eng.php.

Public Health Agency of Canada. (2015). Updated recommendations for the use of varicella zoster immune globulin (VarIg) for the prevention of varicella in at risk patients. *An Advisory Committee Statement National Advisory Committee on Immunization.*

Public Health Agency of Canada. (2015). Varicella proof of immunity – 2015 Update. *An Advisory Committee Statement National Advisory Committee on Immunization.* Retrieved from https://www.canada.ca/en/public-health/services/publications/healthy-living/varicella-proof-immunity-2015-update.html

Stankus, S. J., Dlugopolski, M., & Packer, D. (2000). Management of herpes zoster (shingles) and postherpetic neuralgia. *American Family Physicians.* Retrieved March, 2014 from http://www.aafp.org/afp/20000415/2437.html.