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Contents

1.0 Introduction ................................................................................................................................. 1
2.0 Goals and Objectives .................................................................................................................. 1
3.0 Roles and Responsibilities ......................................................................................................... 2
  3.1 World Health Organization ....................................................................................................... 2
  3.2 Federal Government ................................................................................................................. 2
  3.3 Provincial Government ............................................................................................................ 2
  3.4 Public Health in the Nova Scotia Health Authority (NSHA) .................................................. 3
4.0 Key Components of Respiratory Response Plan ....................................................................... 4
  4.1 Risk Assessment ....................................................................................................................... 4
  4.2 Case Definitions and other Clinical Information .................................................................... 5
  4.3 Surveillance and Reporting ..................................................................................................... 5
  4.4 Public Health Management of Respiratory Pathogens ............................................................ 6
  4.5 Outbreak Management ......................................................................................................... 6
  4.6 Immunization .......................................................................................................................... 7
5.0 Conclusion ................................................................................................................................. 9
6.0 Appendices .................................................................................................................................. 9

Appendix A: Clinical Information for Seasonal Influenza and ILI ............................................. 10
Appendix B: Clinical Information for Emerging Respiratory Pathogens .................................. 13
  Severe Acute Respiratory Infection ......................................................................................... 14
  Coronavirus (e.g. MERS-CoV, SARS) .................................................................................... 15
  Avian Influenza [e.g. A(H7N9), A(H5N1), A(H5N6)] ............................................................ 16
  Variant Influenza Viruses of swine origin [e.g. A(H3N2)v] ..................................................... 19
Appendix C: Public Health Management of Respiratory Pathogens ............................................ 20
  Case Management ..................................................................................................................... 20
  Contact Management ............................................................................................................... 22
  Infection Prevention and Control Measures for Healthcare Settings ..................................... 24
  Travel and Border Related Issues ............................................................................................. 25
Appendix D: Reporting .................................................................................................................... 26
  Influenza-like-illness ................................................................................................................. 26
  Laboratory confirmed influenza ............................................................................................... 28
  Hospitalizations and deaths ....................................................................................................... 28
  Emerging respiratory pathogens and SARI ............................................................................... 29
  Canadian Network Public Health Intelligence ......................................................................... 30
  Influenza immunization coverage ............................................................................................ 30
Appendix E: Laboratory Procedures and Reporting ...................................................................... 31
  Laboratory Procedures for Influenza ......................................................................................... 31
  Laboratory Procedures for Emerging Respiratory Pathogens and SARI (e.g. MERS-CoV, H7N9) .......................................................... 34
Appendix F: Q&A- Seasonal Influenza Vaccine Information ....................................................... 39
Appendix G: References .................................................................................................................. 40
1.0 Introduction

According to the World Health Organization (WHO), infectious diseases are emerging more quickly than ever, with the discovery of nearly 40 new diseases that were unknown a generation ago. As we learned in 2003, the sudden emergence of an infectious respiratory disease can spread rapidly around the world. Severe acute respiratory syndrome (SARS) was a reminder for the public health community that events starting abroad can swiftly appear in Canada. Following the emergence of Avian Influenza A (H7N9) in China and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) on the Arabian Peninsula, the WHO and the Public Health Agency of Canada (PHAC) have recommended increased vigilance for the surveillance of severe acute respiratory illness (SARI). The threat of imported diseases has increased, owing to several factors, including increased opportunities for disease emergence due to the effects of globalization, international spread through human migration and international travel and health vulnerabilities related to the aging population.

The Respiratory Response Plan for Public Health is intended to provide guidance to public health professionals to prepare for and respond to known and emerging respiratory pathogens including influenza-like-illness (ILI), seasonal influenza, SARI, and any respiratory pathogen with the potential to cause outbreaks and epidemics. Additionally, this guidance document applies to emerging respiratory pathogen investigations where human to human transmission and the risk to Nova Scotians is not clear. The body of the document will provide context for how national, provincial, and local public health infrastructures can work together to prepare for and respond to respiratory pathogens.

The appendices are included to ensure that public health practitioners can easily access technical guidance for their approach/response. It will be reviewed and revised annually or as necessary based on evolving epidemiology. It does not replace the Nova Scotia Health System All Hazards Plan.

2.0 Goals and Objectives

• To detect, monitor, and contain or minimize the spread of known and emerging respiratory pathogens which may present as ILI or SARI, including seasonal influenza and any respiratory pathogen with the potential to cause outbreaks and epidemics in a timely manner.
• To detect unusually severe morbidity and mortality related to respiratory pathogens and monitor associated impact (e.g. ICU admissions).
• To identify groups at high risk of developing complications related to respiratory pathogens.
• To implement public health measures to minimize morbidity, mortality and social disruption.
• To monitor the trend of ILI in the community to determine waning, re-emergence and activity levels of disease.
• To ensure public health practitioners have the knowledge, skills, and tools needed to adequately respond to known and emerging respiratory pathogens causing severe illness (e.g. H7N9, MERS-CoV, etc.).
• To support the evaluation of public health interventions effectiveness (including surveillance activities).
3.0 Roles and Responsibilities

Roles and responsibilities may vary depending on local, provincial, or national involvement. While the Nova Scotia Respiratory Response Plan focuses specifically on communicable disease prevention and control related to respiratory illness and action taken by the Office of the Chief Medical Officer of Health (OCMOH) at the Department of Health and Wellness (DHW) and Public Health in the Nova Scotia Health Authority (NSHA), it is acknowledged that other partners also have important roles and responsibilities in the response to a respiratory event. These partners include the IWK, non-health sector, private sector, municipalities, and international organizations. Similarly, members of the public bear responsibility for keeping themselves informed and for adhering to measures which reduce the spread of illness.

3.1 World Health Organization

Provide global guidance to PHAC regarding known and emerging respiratory pathogens which may present as ILI or SARI, including seasonal influenza and any respiratory pathogen with the potential to cause outbreaks and epidemics in a timely manner.

3.2 Federal Government

Public Health Agency of Canada (PHAC)

Canada’s ability to manage and respond to emerging and re-emerging infectious diseases and respiratory infections is led by PHAC in collaboration with provinces and territories. PHAC is involved in the routine detection, monitoring and analysis of national and international trends and spread of infectious disease threats. PHAC is responsible for leading the development of national standards for detection and reporting of such infectious disease threats, including case definitions and protocols for reporting to allow Canada-wide comparison.

Health Canada (HC)

HC, working closely with PHAC, has a role in managing events such as outbreaks involving First Nation and Inuit communities. HC also regulates pharmaceuticals, vaccines and other health products.

3.3 Provincial Government

Department of Health and Wellness (DHW)

Office of the Chief Medical Officer of Health (OCMOH)

The OCMOH coordinates the preparation of the public health aspects of a response to a respiratory pathogen of interest.
The office develops policies, standards, and protocols for the Nova Scotia (NS) public health response to known and emerging respiratory pathogens which may present as ILI or SARI, including seasonal influenza and any respiratory pathogen with the potential to cause outbreaks and epidemics and coordinates, performs, and reports surveillance activities in response to known and emerging respiratory pathogens. The office advises the Minister responsible for the Health Protection Act if a recommendation for public health action should be considered e.g. when a public health emergency exists and a threat to health is imminent. Finally, the OCMOH recommends interventions based on health risk assessment in consultation with other NS government departments, PHAC, and other relevant departments and agencies.

**Provincial Public Health Laboratory Network (PPHLN)**

PPHLN provides direction, consultation, and advice on laboratory investigations for respiratory pathogens including known and emerging respiratory pathogens which may present as ILI or SARI, including seasonal influenza and any respiratory pathogen with the potential to cause outbreaks and epidemics in a timely manner.

Details pertaining to testing and reporting can be found in Appendix E.

**Health Services Emergency Management (HSEM)**

Depending on the severity of the situation, HSEM may be involved. The major focus of HSEM is to enhance the provincial health system’s preparedness to manage local or provincial emergencies, including a national or international health crisis.

**Provincial Biological Depot**

The Provincial Biologicals Depot manages the vaccine inventory, supply and distribution among the main local public health offices.

**Infectious Disease Expert Group (IDEG)**

IDEG is an independent advisory committee that will, through the Chief Medical Officer of Health (CMOH), provide evidence based advice on the prevention and control of infectious/communicable diseases in Nova Scotia to the DHW.

### 3.4 Public Health in the Nova Scotia Health Authority (NSHA)

Provides investigation oversight to relevant situation(s) in order to take reasonable action to protect the public’s health, including issuing public advisories and bulletins; investigating a case or contact of a communicable disease; implementing public health measures to prevent transmission of a communicable disease; monitoring the treatment and condition of a detained person and issuing a certificate for release; implementing enhanced surveillance activities and taking such action as the Medical Officer of Health (MOH) reasonably believes is necessary to prevent, control, or manage a public health emergency.
4.0 Key Components of Respiratory Response Plan

This document outlines several components to help guide the public health response to known and emerging respiratory pathogens which may present as ILI or SARI, including seasonal influenza and any respiratory pathogen with the potential to cause outbreaks and epidemics in a timely manner.

These components are:

- Risk Assessment
- Case Definitions and other Clinical Information
- Surveillance and Reporting
- Public Health Case Management of Respiratory Pathogens
- Outbreak Management
- Immunization

4.1. Risk Assessment

Risk assessment is a systematic process for gathering, assessing and documenting information to assign a level of risk. It provides the basis for taking action to manage and reduce the negative consequences of acute public health risks.

These assessments provide key input into Federal/Provincial/Territorial (FPT) decision-making by identifying what is known about circulating respiratory illness at any point in time, what might occur, when, and the major areas of uncertainty. In Nova Scotia, risk assessments occur in several ways to inform the initial response to any respiratory illness and then periodically as new information emerges.

Assessment of risk is determined on:

- information based on viral characteristics
- the anticipated or experienced impact on the health care system and community
- population immunity
- age and risk groups most affected
- severity of illness
- occurrence of antiviral resistance
- estimated effectiveness of control measures

A risk management response requires access to timely information, analyzed and presented in a
way that is useful. Epidemiological and laboratory surveillance data are key components of the formal risk assessments that will be produced to inform the response. One of the most critical needs is an early assessment of the potential impact of a respiratory illness to prepare the health care system and to plan interventions that are proportional to the situation.

4.2. Case Definitions and other Clinical Information

For case definitions and other clinical information for respiratory illnesses which may present as ILI or SARI, including seasonal influenza and emerging pathogens refer to Appendix A (Seasonal Influenza and ILI) and Appendix B (Emerging Pathogens).

4.3. Surveillance and Reporting

Surveillance

Nova Scotia's respiratory surveillance system involves an extensive network of public health partners. Ongoing surveillance occurs across the province for laboratory-confirmed influenza, ILI, and other respiratory pathogens (i.e. RSV, Pertussis), including emerging pathogens (i.e. SARI, MERS-CoV). The purpose of the respiratory surveillance system is to:

- Identify the start and end of the influenza season
- Detect respiratory pathogen outbreaks
- Monitor the severity of disease
- Identify high risk groups
- Identify and monitor influenza types (and subtypes as necessary), and other circulating respiratory pathogens (including ILI and emerging pathogens)

The PPHLN is consulted annually regarding Nova Scotia's respiratory surveillance plan. The national and provincial laboratories provide valuable expertise with respect to laboratory investigations for respiratory pathogens. Appendix E provides details regarding provincial laboratory procedures and reporting.

The Nova Scotia respiratory surveillance system contributes to the national respiratory surveillance system that coordinates and supports the collection of respiratory pathogen activity from the provinces/territories.

Figure 1 provides an overview of the types of data, the data flow (within the province and to the national level) and the outputs (reports) produced as part of the respiratory surveillance system in Nova Scotia. Details for each of the steps in Figure 1 can be found in Appendix D.

Reporting

The Health Protection Act (HPA) provides the legal framework enabling public health officials to protect the public and to prevent, detect, manage and contain health threats without unduly interfering with civil rights and liberties. It deals with notifiable diseases and conditions, communicable diseases, health hazards, public health emergencies and food safety. Procedures for reporting ILI, laboratory confirmed influenza, and emerging respiratory pathogens and SARI can be found in Appendix D.
**Figure 1: Overview of Nova Scotia Respiratory Surveillance Systems**

<table>
<thead>
<tr>
<th>TYPES OF DATA</th>
<th>LABORATORY-CONFIRMED CASES</th>
<th>INFLUENZA LIKE ILLNESS (ILI)</th>
<th>OUTBREAKS OF INFLUENZA / IRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA FLOW</td>
<td>LABORATORY</td>
<td>EMERGENCY ROOMS</td>
<td>SCHOOL</td>
</tr>
<tr>
<td></td>
<td>NSHA PUBLIC HEALTH</td>
<td>FLOWWATCH (PHAC)</td>
<td>DAYCARE</td>
</tr>
<tr>
<td></td>
<td>DHW</td>
<td>FLOWWATCH (PHAC)</td>
<td>LTC/ACUTE CARE</td>
</tr>
</tbody>
</table>

| OUTPUTS       | RESPIRATORY WATCH          | ANNUAL INFLUENZA SURVEILLANCE REPORT | ANNUAL INFLUENZA IMMUNIZATION REPORT | MONTHLY NOTIFIABLE DISEASE REPORT | ANNUAL NOTIFIABLE DISEASE REPORT |

### 4.4. Public Health Management of Respiratory Pathogens

See Appendix C for details about the public health case and contact management of ILI, seasonal influenza, SARI, and emerging respiratory pathogens.

### 4.5. Outbreak Management

Refer to the following documents for guidance related to outbreak management for ILI, seasonal influenza, emerging pathogens, and SARI:

- Public Health Outbreak Response Plan,
- Annual Guide to Influenza-Like Illness and Influenza Outbreak Control for Long-Term Care Facilities,

In addition to the above documents, refer to Appendix D for further information regarding outbreak reporting procedures. Consult with the MOH to determine further public health follow up in the event of an outbreak (e.g. community based control strategies such as closure of schools/gatherings).
4.6. Immunization

Elements of the influenza Immunization program discussed in this section include:

- Objectives
- Planning Principles and Assumptions
- Vaccine Supply
- Vaccine Safety
- Coverage

Objectives

The objectives of the NS annual seasonal influenza immunization program are to:

- Provide a safe and effective vaccine to all Nova Scotians*
- Allocate, distribute and administer vaccine as rapidly and equitably as possible
- Monitor the safety and effectiveness of the vaccine program
- Limit morbidity and mortality
- Limit societal disruption

*Currently in Canada, vaccine is available for seasonal influenza but not for other respiratory pathogens such as MERS-CoV or H7N9. To prevent seasonal influenza, Nova Scotia has a publicly funded influenza vaccination program for individuals aged 6 months and older. The influenza vaccine is strongly recommended for people at high risk of influenza related complications and for those who live with or care for them as outlined in the National Advisory Committee on Immunization (NACI) guidelines.

Planning Principles and Assumptions

- DHW will provide guidance and communication regarding priority populations and eligibility for vaccine
- Public Health in the NSHA will manage the allocation and distribution of vaccine to immunization providers
- Knowledge of vaccine inventory status at all levels of the Public Health system, at any given time, is required. Accurate real-time knowledge of vaccine supply and inventory allows for adjustments to vaccine shipments or clinic schedules as needed. The inventory system tracks vaccine lots to ensure timely identification of specific products that may be required to be held or recalled in the event of a vaccine safety issue.
- The vaccine will require storage, handling, and transport at +2°C to +8°C
- Extra vigilance is required for adverse events following immunization (AEFI)
Vaccine Supply

Every year, estimates of influenza vaccine supply needed for Nova Scotia to order for the next influenza season are based on previous usage, the influenza season forecast, and the requirements of its immunization programs. Influenza vaccines are brought into the Nova Scotia Provincial Biological Depot and distributed to local public health offices using an annual distribution plan based on population numbers. Vaccine is further distributed to local immunization providers.

Vaccine Safety

Adverse Events Following Immunization (AEFI)

To ensure vaccine safety, close monitoring and timely assessment of suspected adverse events following immunization is carried out. Under the Nova Scotia Health Protection Act and the Regulations under the Act, an AEFI is notifiable and must be reported to the MOH, through the local public health office in accordance with the details outlined on the poster titled It’s the Law: Reporting Adverse Events Following Immunization.

Vaccine Storage and Handling

Efficient vaccine storage and handling is a shared responsibility from the time the vaccine is manufactured until it is administered. For more detail regarding the maintenance of cold chain please refer to the National Vaccine Storage and Handling Guidelines.

Immunization Coverage

Immunization is widely recognized as the most effective means to reduce the morbidity and mortality associated with influenza.

Immunization coverage is an important health indicator to monitor vaccine uptake levels in the population and assess the susceptibility of the population to influenza. Regular monitoring of immunization coverage contributes to the planning of public health interventions and programs (e.g. identifying populations most at risk and subsequent targeting of public health action), as well as the evaluation of immunization programs (e.g. achievement of coverage targets).

Data on the number of individuals who received the influenza vaccine is captured in the following ways:

- Provincial Medical Services Insurance (MSI) physician-billing database (provides data on individuals who received influenza immunizations by physicians);
- MSI Pharmacare database (provides data on individuals who received influenza immunizations by pharmacists); and
- DHW data collection tools used by NSHA public health services (PHS). These data collection tools capture aggregate summaries of immunization data from public health clinics, long term care and acute care facilities (e.g. IWK), and other community agencies (e.g., Victorian Order of Nurses).

DHW data collection tools can be found in the NS Surveillance Guidelines in the section titled Surveillance forms.
5.0 Conclusion

The Respiratory Response Plan is not intended to cover all aspects of respiratory pathogens that have the potential to affect the public health system. It is one tool for public health practitioners to assist with annual seasonal influenza program planning and preparation efforts to ensure a coordinated response to unknown and unexpected threats that may emerge. These efforts are a shared responsibility across the health system in Nova Scotia.

6.0 Appendices

Appendix A: Clinical Information for Seasonal Influenza and ILI
Appendix B: Clinical Information for Emerging Respiratory Pathogens
Appendix C: Public Health Management of Respiratory Pathogens
Appendix D: Reporting
Appendix E: Laboratory: Procedures and Reporting
Appendix F: Q&A Seasonal Influenza Vaccine Information
Appendix G: References
Appendix A: Clinical Information for Seasonal Influenza and ILI

1. Seasonal Influenza and ILI

Case Definitions

ILI surveillance case definition for reporting purposes.

Acute onset* of respiratory illness with fever and cough and with one or more of the following:

- sore throat
- arthralgia
- myalgia
- prostration which is likely due to influenza

In children under 5, gastrointestinal symptoms may also be present. In patients under 5 or 65 and older, fever may not be prominent.

*distinct change from normal status to respiratory illness over 1-3 days, based on clinical judgement

Confirmed case of Influenza

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 (fourfold or greater) in influenza IgG titre between acute and convalescent sera

OR

Detection of influenza RNA

Causative Agent

Influenza viruses belong to the family Orthomyxoviridae and are classified into three distinct types on the basis of major antigenic differences: influenza A, B and C. Influenza A and B are routinely associated with regional and widespread epidemics whereas influenza C is more commonly responsible for sporadic cases and minor localized outbreaks. Influenza A is further categorized into subtypes based on the presence of two surface antigens: hemagglutinin (H) and neuraminidase (N). Hemagglutinin is required for the initial attachment to cells to start infection. Neuraminidase plays a role in facilitating the virus reaching the cell surface by disrupting mucus and the release of progeny virus from infected cells. Although there are 18 different types of HA and 11 types of NA, only limited subtypes have infected humans. Currently H3N2 and
H1N1 strains routinely cocirculate in humans. Other avian related viruses such as H7N9 have sporadically infected humans in South East Asia. Influenza B is more stable than Influenza A, with less antigenic drift. There are two main Influenza B lineages-Yamagata and Victoria.

Source

Humans are the primary reservoir for human infections. Birds and other mammals such as swine may serve as potential sources of new human subtypes thought to emerge through genetic reassortment or antigenic shift.

Incubation

The incubation period for influenza ranges from one to four days. On average, symptoms may appear within two days of exposure to the virus.

Transmission

Primary transmission occurs through large droplets from a cough or sneeze of an infected person propelled (generally up to 2 meters) through the air and deposited on the mouth or nose of people nearby. The virus also can be spread through direct and indirect transmission via surfaces, e.g. a person touches respiratory droplets on another person or an object and then touches their own mouth or nose (or someone else's mouth or nose) before washing their hands. Influenza virus may persist for hours on solid surfaces, particularly in lower temperatures and lower humidity.

Communicability

Adults shed influenza virus from the day before symptoms begin through 5-10 days after illness onset. Young children also might shed virus several days before illness onset, and children and immunocompromised hosts can be infectious for 10 or more days after onset of symptoms.

Symptoms

The clinical features of seasonal influenza include an acute respiratory tract disease characterized by fever, cough (usually dry), headache, myalgia, prostration, coryza, and sore throat. Cough is often severe and can last 2 or more weeks; fever and other symptoms generally resolve in 5-7 days.

For surveillance purposes, NS has adopted the National ILI definition: An acute onset* of respiratory illness with fever and cough and one or more of: sore throat, arthralgia, myalgia or prostration. (* distinct change from normal status to respiratory illness over 1-3 days, based on clinical judgment.) Fever may not be prominent in the elderly and children under five. Nausea, vomiting and diarrhea are uncommon but can occur, especially in children under 5.

Diagnostic Testing

Refer to Appendix E
**Treatment & Prophylaxis**

In Canada, two neuraminidase inhibitors (oseltamivir and zanamivir) are available for use as treatment and prophylaxis against seasonal influenza. Each year, the National Microbiology Laboratory (NML) monitors the susceptibility of circulating strains of influenza to these antivirals and over the past few years, the predominant circulating strains have been sensitive to oseltamivir and zanamivir, but it is important to be aware of the potential for antiviral resistance to occur. The choice of drug depends on resistance patterns of different influenza viruses towards individual antiviral agents; therefore, recommendations may change as new information becomes available.

To be effective, antivirals should be started as soon as possible and are best started within 48 hours of developing symptoms. Antiviral medication is less likely to benefit those who have been ill for more than 48 hours, although some information suggests it still may be effective, especially in those with more severe illness such as those requiring hospitalization. Antiviral treatment is usually continued for a maximum of 5 days.

The use of antivirals for treatment and/or prophylaxis is typically reserved for controlling outbreaks among residents and staff of long-term care facilities and other residential institutions. For further instructions regarding the use of antivirals in outbreak settings, please refer to the *Guide to Influenza-Like-Illness and /Influenza Outbreak Control for LTCF*.

For guidelines on the use of antiviral drugs for treatment, please refer to the Association of Medical Microbiology and Infectious Disease Canada website at [http://www.ammi.ca](http://www.ammi.ca).
Appendix B: Clinical Information for Emerging Respiratory Pathogens

Emerging respiratory pathogens refer to respiratory infections that could have a potential serious public health impact. They include infections caused by the emergence of new variants of known respiratory pathogens or emergence of novel pathogens.

Please note the following:

- The following sections are intended to assist public health professionals manage a case of an emerging respiratory pathogen. It does not give specific guidance to clinicians with respect to the diagnosis of an emerging respiratory pathogen. Appendix E, Laboratory: Procedures and Reporting, offers information such as the “Think/Tell/Test” method regarding what to do if a clinician suspects a case of an emerging respiratory pathogen. The PPHLN will conduct subtyping when requested and therefore it is reliant on the clinician to arrange based on case’s clinical situation, clinician’s diagnosis, and case’s history (e.g. travel, exposure to poultry, swine, etc.). The content of this section is subject to change as the epidemiology and risk evolves.

- The Centre for Immunization and Respiratory Infectious Diseases (CIRID) publishes a monthly “Human Emerging Respiratory Pathogens Bulletin” which is a situational analysis of emerging respiratory diseases affecting humans. Electronic versions of current and previous bulletins are available to CNPHI registered users at **cnphi-rcrsp.ca**

- Novel viruses may arise when human and animal viruses mix together or through genetic mutation. This virus has the potential to spread rapidly around the world, causing a pandemic. Please see the following link for information regarding the Canadian Pandemic Influenza Preparedness document, “Planning Guidance for the Health Sector”:


- and WHO’s website: who.int/csr/disease/en/ to receive updates as new details become available regarding emerging respiratory pathogen clinical case information and management.

Appendix B has 4 sections:

1. SARI
2. Coronaviruses (e.g. MERS-CoV, SARS)
3. Avian Influenza [e.g. A(H7N9) A(H5N1), A(H9N2), A(H5N6)]
4. Variant Influenza Viruses of swine origin [e.g. A(H3N2)v]
1. SARI

Case Definition

The national surveillance case definition can be found here:

Causative Agent

When considering the possible causative agent, clinicians should maintain an awareness of currently circulating respiratory pathogens including novel respiratory viruses circulating elsewhere in the world and as well as virus-specific risk assessments for Canada. Recognition of a cluster or similar cases within a family or in the community is a very important detail.

Symptoms

Symptoms of severe acute respiratory illness defined primarily by acute onset of respiratory symptoms such as:

• Fever (over 38°C). Fever may not be prominent in patients under 5 years or 65 years and older as well as in immunosuppressed individuals. Failure to clinically obtain temperature should not rule out a history of self-reported fever.
• New onset of (or exacerbation of chronic) cough or breathing difficulty.
• Clinical, radiological or histo-pathological evidence of pulmonary parenchymal disease (e.g. pneumonia, pneumonitis, or Acute Respiratory Distress Syndrome [ARDS]), typically associated with the need for hospitalization, intensive care unit monitoring and/or other severity markers (such as death).
• A spectrum of illness is recognized for most infectious diseases inclusive of mild or asymptomatic infection.
• Atypical presentations with absent respiratory symptoms can occur in some emerging pathogens in the presence of comorbidity, notably immunosuppression. Therefore, clinician and public health judgment should be used in assessing patients with milder or atypical presentations, where, based on contact, comorbidity or cluster history, the index of suspicion may be raised.
• In addition to the symptoms of ILI, severe ILI may include complications such as encephalitis, myocarditis or other severe and life-threatening complications.

Diagnostic testing

Refer to Appendix E

Treatment

Clinical management of cases should be guided by the illness in the patient including early treatment with appropriate antiviral medication where recommended.

To access guidance about managing patients with severe acute respiratory infection, including MERS-CoV, in the intensive care unit setting, please see the following document: Guidance for the Management of Severe Acute Respiratory Infection in the Intensive Care Unit
2. Coronaviruses

2a) Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

Case Definition


Causative agent

MERS-CoV is a zoonotic virus.

Source

Research to date suggests the emergence of MERS-CoV to be of bat origin before it was transmitted to camels at one point in time. Recent studies point to the role of camels as a primary source of MERS-CoV infection in humans through direct or indirect contact with infected camels or camel-related products (e.g. raw camel milk). Outbreaks of MERS-CoV have mainly resulted from nosocomial transmission in healthcare facilities.

Incubation

Incubation period for MERS-CoV is estimated to be 2-14 day (median approximately 5 days) Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) also demonstrated a prolonged incubation period (median 4-5 days; range 2-10 days) compared to other human coronavirus infections (average 2 days; typical range 12 hours to 5 days). Allowing for inherent variability and recall error and to establish consistency with other emerging respiratory virus monitoring, exposure history based on the prior 14 days is a reasonable and safe approximation.

Transmission

Current pattern of disease suggest that the virus can spread between humans, however, there has been no sustained person-to-person transmission and the risk of contracting this infection is still considered to be low.

Communicability

The period of communicability for MERS-CoV is unknown at this time.

Symptoms

Illness criteria: Focus is on the detection of severe acute respiratory illness (SARI) defined primarily by respiratory symptoms, i.e. fever (over 38°C) AND new onset of (or exacerbation of chronic) cough or breathing difficulty as well as clinical, radiological or histo-pathological evidence of pulmonary parenchymal disease (e.g. pneumonia, pneumonitis, or Acute Respiratory Distress Syndrome [ARDS]), typically associated with the need for hospitalization, intensive care unit monitoring and/or other severity marker (such as death).
A spectrum of illness is recognized for most infectious diseases inclusive of mild or asymptomatic infection. Atypical MERS-CoV presentation with absent respiratory symptoms has been documented in the presence of comorbidity, notably immunosuppression. Therefore, clinician and public health judgment should be used in assessing patients with milder or atypical presentations, where, based on contact, comorbidity or cluster history, the index of suspicion may be raised. Additional information can be found in the Interim Guidance For Containment When Imported Cases With Limited Human-To-Human Transmission Are Suspected/Confirmed In Canada.

Clinician discretion, epidemiologic context and local feasibility should be taken into account in discussion with local/provincial health authorities. Illness onset is defined by the earliest start of respiratory symptoms associated with the current episode.

**Treatment**

At this time, there is no specific treatment targeting the virus. However, many of the symptoms caused by this virus can be managed; therefore, treatment should be based on the symptoms of the patient.

**2b) Severe Acute Respiratory Syndrome (SARS)**

**Case Definition**


**3. Avian Influenza**


Also, consult the WHO website for up-to-date information: [http://www.who.int/influenza/human_animal_interface/influenza_h7n9/en/](http://www.who.int/influenza/human_animal_interface/influenza_h7n9/en/)

**3a) A (H7N9)**

**Case Definition**

Symptoms

**Illness criteria:** While mild presentations with fever and cough, or even asymptomatic cases have been noted following infection with Avian Influenza A (H7N9), particularly in children, focus is on the detection of SARI. SARI is defined above.

Therefore, clinician and public health judgment should be used in assessing patients, where, based on contact, comorbidity or cluster history, the index of suspicion may be raised. Additional information can be found in the *Interim Guidance for Public Health Management of Human Illness Associated with Avian Influenza A (H7N9).*

Atypical presentations may occur in the presence of immunosuppression or other comorbidity. Clinician discretion, epidemiologic context and local feasibility should be taken into account, in discussion with local/provincial health authorities. Illness onset is defined by the earliest start of influenza-compatible symptoms associated with the current episode.

**Incubation**

Incubation period for H7N9 has been reported as prolonged (median 6 days; range, 1 to 15 days) among initial cases compared to typical human influenza viruses (average 1-3 days). Allowing for inherent variability and recall error and to establish consistency with other emerging respiratory virus monitoring, exposure history based on the prior 14 days is a reasonable and safe approximation.

**Source**

Migrant aquatic birds are most likely the original infection source.

**Transmission**

The available epidemiological and virological information strongly indicates that most known human H7N9 infections result from direct contact with infected poultry, or indirect contact with infected poultry (for example, by visiting wet markets and having contact with environments where infected poultry have been kept or slaughtered). A minority of cases appear to have resulted from limited person to person transmission. Because H7N9 infections do not cause severe disease in poultry, this infection can spread “silently” among poultry. Under such circumstances, the exact exposure for individual cases of human infection may be difficult to establish.

Although there have been clusters of infection, the virus does not appear to transmit easily from one person to another and further sustained human-to-human transmission has not been reported despite investigations and follow up of cases and close contacts of cases.

**Communicability**

Limited human-to-human transmission reported, whereby transmission probably occurred during close unprotected contact with a severely ill patient.

**Treatment**

For information regarding antiviral use in the context of Avian Influenza A (H7N9) virus infection, please consult AMMI Canada: [https://www.ammi.ca/?ID=122&Language=ENG](https://www.ammi.ca/?ID=122&Language=ENG)
3b) A(H5N1)

Symptoms

Human H5N1 illness, usually occurring after exposure to infected poultry or their environments, typically manifests as severe pneumonia. Common initial symptoms are fever (usually >38 degrees C) and cough, plus signs and symptoms of lower respiratory tract involvement including dyspnea. Upper respiratory tract symptoms such as sore throat and coryza are occasionally present. Gastrointestinal symptoms were frequently reported in cases in Thailand and Vietnam in 2004, but less frequently since 2005. Severe lower respiratory tract manifestations often develop early in the course of illness, and clinically apparent pneumonia with radiological changes has usually been found at presentation. The disease progresses rapidly, and often to an acute respiratory distress syndrome.

Incubation

For A (H5N1) infection associated with poultry exposure, incubation can be 7 days or less, and mostly 2-5 days.

Source

Domestic poultry are likely the main source of human infections. In about one quarter of patients, the source of exposure is unclear and infection arising from exposure to contaminated environments remains possible.

Transmission

Most human infections by animal influenza viruses are thought to result from direct contact with infected animals. Migratory birds may sometimes spread A (H5N1) viruses to new geographic regions, but their importance as a vector for spread is uncertain. For A (H5N1) virus infection, the exact mode and sites of the viral entry are incompletely understood.

Communicability

Human-to-human transmission is thought to have occurred in some instances when there had been very close and prolonged contact between a very sick patient and caregivers who have usually been family members. Limited data suggests individuals may remain infectious for as long as 3 weeks and in immunocompromised individuals may be longer.

Treatment

For H5N1 disease, early treatment with oseltamivir is recommended using the standard regimen indicated for treatment of seasonal influenza. There is accumulated evidence suggesting the antiviral treatment improves survival, although the optimal dose and duration of therapy are uncertain. Please consult an Infectious Disease specialist for current treatment details.

3c) Other Avian Influenza may include A (H9N2), A(H5N6) etc.

For further information regarding other Influenza A virus subtypes H5, H7 and H9, please see the following website: https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/influenza-a-virus-subtypes-h5-h7-h9.html
4. Variant Influenza Viruses of swine origin

4a) A (H3N2)v

Symptoms

Clinical characteristics of human infections with variant viruses generally have been similar to signs and symptoms of uncomplicated seasonal influenza, including fever, cough, pharyngitis, rhinorrhea, myalgia, and headache. Vomiting and diarrhea also have been reported in some infections in children. Milder clinical illness is possible, including absence of fever. The duration of illness appears to be similar to uncomplicated seasonal influenza, approximately 3 to 5 days. While assumed to be similar to seasonal influenza virus infection, the duration of viral replication and possible infectiousness of variant virus infection has not been studied. Current routine testing cannot differentiate swine variant strains from circulating seasonal human strains.

Incubation

For infections with influenza viruses normally circulating in swine, an incubation of 2-7 days has been reported.

Source

Swine influenza viruses are endemic in pigs.

Transmission

For swine influenza virus infections in humans, close proximity to ill pigs or visiting a place where pigs are exhibited has been reported for most cases, but some human-to-human transmission has occurred, such as during the outbreak of influenza A (H3N2) in the USA in 2012.

Communicability

Limited human-to-human spread of this virus has been detected in the past but no sustained or community spread of H3N2v has been identified.

Treatment

Please consult an Infectious Disease specialist for current treatment details.
Appendix C: Public Health Management of Respiratory Pathogens

This section contains the following information:

1. **Case Management**
   - Education
   - Case Exclusion

2. **Contact Management**
   - Lab Confirmed Seasonal Influenza
   - Emerging Respiratory Pathogens (Probable and Confirmed)

3. **Infection Prevention and Control Measures for Healthcare Settings**

4. **Travel and Border Related Issues**

1. **Case Management**

Ideally, laboratory confirmation will guide the extent of an investigation (see Figure 2). However, because collection, shipment, and testing of specimens often require several days or longer, the investigation may need to begin before laboratory test results are available. Even if laboratory confirmation is not possible, an investigation should still be launched especially if a patient is strongly suspected to have SARI or an emerging pathogen infection, such as MERS-CoV. In this case, the patient and/or family members/guardian (if the patient is too ill to be interviewed or has died) should be interviewed within the first 24-48 hours of the investigation to collect basic demographic, clinical, and epidemiological information. A sample case investigation/reporting form for the interview can be found on the PHAC’s website.

Essential basic information may include:

- Outbreak or cluster related
- Sex
- Age
- Date of onset
- Symptoms
- Whether hospitalized/Date of hospitalization
- Whether in ICU/Date of ICU admission
- If deceased/Date of death
- Lab-date of sample collection, test method and result (when available)
- Travel history
- Other possible exposures (e.g. ill contact, animal, food)
Clinical management of Emerging Respiratory Pathogen (e.g. SARI cases) should be guided by the illness in the patient including early treatment with appropriate antiviral medication where recommended. Upon notification of a suspect case, the Medical Officer of Health will:

- Review the clinical status; review the radiological, laboratory findings and travel/occupational exposures.
- Ensure consultation with an infectious disease physician and/or medical microbiologist regarding the laboratory protocol.

Case investigations for emerging respiratory pathogen and SARI cases should include identification of close contacts (see definition of close contacts and contact management below).

Active daily monitoring of emerging respiratory pathogen and SARI cases’ individual health status for the duration of illness, or until a probable case no longer meets the case definition (e.g., due to further testing results or symptoms are resolved) is mandatory.
Education

Provide information regarding:

- illness care in the home;
- when/where to go for medical assessment, and instruct case to report travel history or contact history immediately upon presenting to a health care setting; and
- prevention of illness transmission

Case Exclusion

In general, people with ILI should be advised to stay away from work, school, daycares, etc. until they are feeling well and are able to fully participate in their usual day-to-day activities.

However, Health Care Workers who are symptomatic/infected with influenza should be excluded from work until 7 days after onset of symptoms with the first day of symptoms being counted as day 1, unless they have been immunized at least two weeks previously and have started on antiviral therapy.

For situations that are not clear, consult with the MOH to determine on a case-by-case basis, what further public health follow-up may be required.

2. Contact(s) Management

Lab Confirmed Seasonal Influenza

In situations involving laboratory confirmed seasonal influenza, the identification and follow-up of contacts is relevant only in the context of an outbreak in a LTCF. Please refer to the annual Guide to Influenza-Like-Illness and /Influenza Outbreak Control for LTCF.

Emerging Respiratory Pathogens (probable and confirmed)

Contact tracing for confirmed and probable cases of emerging respiratory pathogens (SARI, Coronaviruses, and Variant Influenza Viruses) assists public health:

- to better understand the epidemiology of these viruses during the period where questions remain about issues such as person-to-person transmission and the reservoir for infection
- with the rapid identification of symptomatic contacts to reduce the opportunity of transmission to others
- to review what is known about emerging respiratory pathogens and their associated illness (such as H7N9 and novel coronavirus) with contacts

Since contact management depends on current/known epidemiology and the objective (i.e. stop versus limit spread), it is important to review plan of action with the MOH.

Contact management of cases of SARI and emerging respiratory pathogens (Coronaviruses, Avian, Variant Influenza) usually involves active monitoring by public health staff, ensuring that these individuals are contacted daily for the duration of the self-monitoring period (14 days from
the last close contact) or until a probable case no longer meets the case definition (e.g., due to further testing results).

**Close Contact:** In such cases, a close contact is defined as:

- Anyone who provided direct care for a case (confirmed or probable), including health workers and family members or anyone who had other similarly close physical contact.

*OR*

- Anyone who stayed at the same place (e.g. lived with, visited within the same room, shared meals, or other contact within two metres) as a probable or confirmed case while the case was symptomatic

Advise close contact of case, for 14 days following the last close contact or until the probable case no longer meets the case definition (e.g. the laboratory investigation has ruled out MERS-CoV infection/H7N9), to:

- Self-monitor for fever and new onset of symptoms of influenza-like-illness. Consider staying in an area where health care is readily accessible, if possible.
- Maintain good respiratory etiquette and hand hygiene practices.
- If sharing living arrangements with a non-hospitalized case avoid close contact as much as possible and follow relevant advice provided under case management section.
- Should symptoms develop, self-isolate as quickly as possible and contact local public health for further direction.

**Should any contact develop symptoms compatible with ILI within 14 days of last known exposure to the case or shared exposure, that individual should be considered a person under investigation and laboratory testing should be performed.**

Additional contact management measures (e.g. quarantine and aircraft related travel contact tracing procedures) will be done as requested by the MOH.

For information regarding antiviral prophylaxis for close contacts in the context of Avian Influenza A(H7N9) virus infection, please consult AMMI Canada Interim Guidance for Antiviral Prophylaxis and Treatment of Influenza Illness due to Avian Influenza A(H7N9) Virus.
3. Infection Prevention and Control Measures for Health Care Settings

The principles of IPAC must be adhered to at all times in all health care settings for all patients/residents. For viral respiratory pathogens (e.g. ILI, influenza, MERS-CoV, H7N9), routine practices and additional precautions remain the cornerstone of prevention of the spread of infection. The elements of routine practices include frequent hand hygiene with alcohol-based hand rub (ABHR) or soap and water, appropriate use of PPE, environmental cleaning and disinfection, the use of a point-of-care risk assessment (PCRA), as well as other pertinent practices.

In addition to routine practices, droplet and contact precautions are also required when managing cases with suspected or confirmed respiratory illness (e.g. annual influenza, MERS-CoV, H7N9). Droplet and contact precautions also require the following:

- Patient/resident accommodation (single rooms preferred)
- Long-sleeved gowns and gloves
- Facial protection (eye protection and mask)

It is important to try and maintain a special separation of 2 meters between cases and other vulnerable peoples, and restricting cases to their rooms until symptoms have resolved.

Refer to the Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings by the PHAC for more detailed information on routine practices and additional precautions.

When managing SARI or new or emerging pathogens, there may be modifications to the recommended additional precautions:

- Recommendations for the management of MERS-CoV and Influenza H7N9, include the use of airborne precautions (including the use of a respirator) when performing aerosol generating medical procedures (AGMP) on cases.

Recommendations may be adapted or changed as new information is gathered on novel pathogens.

For health care workers (HCWs) who must enter home settings, routine practices, including a point-of-care risk assessment and droplet/contact precautions are required. Care of an individual with ILI or confirmed influenza should be performed in a location with spatial separation from others in the home, preferably in a well-ventilated (e.g. open window) room of their own. If a separate room is not feasible, a two-metre distance should be established in a shared room whenever possible. AGMPs should not be carried out in the home setting.

**Infection prevention and control guidance documents for health care facilities:**


For seasonal influenza, outbreak control measures in long term care and residential care facilities can be found in the *Guide to Influenza-Like-Illness and /Influenza Outbreak Control for LTCF*. 
• IPAC guidance for acute care settings can be found here:

• Further information regarding guidance for the home setting is available here:

• NSHA and IWK may also have their own organizational plans.

4. Travel and Border Related Issues

PHAC’s Office of Border Health Services will be involved in the reporting and case management of arriving or departing international passengers who may be persons under investigation (PUI); with the Quarantine Officer notifying local public health authorities should such situations arise. Quarantine officers have no authority over domestic flights. Agency environmental health officers will provide information to the operator regarding the cleaning of the conveyance.

The Office of Border Health Services at PHAC may be of assistance with requesting passenger manifests from conveyance operators, when requested to do so by a local public health authority. Local public health authorities can contact the manager on-call by phoning 1-416-MANAGER (626-2437).

Visit PHAC’s website at the following link: https://www.canada.ca/en/public-health/services/emerging-respiratory-pathogens.html to receive updates as new details become available regarding public health management of emerging respiratory pathogens.
Appendix D: Reporting

The following section outlines reporting mechanisms related to:

1. Influenza-like-illness
2. Laboratory confirmed influenza
3. Hospitalizations and deaths
4. Emerging respiratory pathogens and SARI
5. Canadian Network Public Health Intelligence
6. Influenza immunization coverage

1. Reporting Influenza-Like-Illness (ILI)

Influenza-like-illness (ILI) is reported to public health from:

- Emergency departments
- Primary health care settings
- School and childcare facilities
- Long-term care/acute care facilities

1.1. Emergency Departments (ED)

Emergency departments (EDs) in hospitals and out-patient centres across Nova Scotia are monitored for ILI activity daily. The ED surveillance system was implemented in April 2009 with the support of infection control practitioners across Nova Scotia. Infection control practitioners report ILI data to DHW from the EDs for which they are responsible. DHW coordinates and maintains the ED surveillance network (see figure 3).

Figure 3: Emergency reporting of ILI

*Data includes:
  - Total number of patients seen/day
  - Total number of patients meeting the ILI case definition/day

1.2. Schools and Daycares

School and daycare-based surveillance for ILI is ongoing in Nova Scotia. Schools are requested to report absenteeism that may be due to ILI, directly to their local public health office.
It is important to distinguish between respiratory and gastrointestinal illness, noting that schools commonly refer to vomiting and diarrhea illness as the ‘flu’. The School Surveillance Tool or Daycare Surveillance Tool should be used to ensure complete information.

### 1.3. Long Term Care Facility (LTCF) and Acute Care Facility

LTCF and acute care facilities are required to immediately report outbreaks or suspected outbreaks of influenza and/or ILI to the local public health office. Local public health will report outbreaks using Flu Watch and notify the public health system as appropriate, via the Canadian Network for Public Health Intelligence (CNPHI). Please refer to the Guide to Influenza-Like-Illness and /Influenza Outbreak Control for LTCF for more detailed information.
2. Reporting Laboratory Confirmed Influenza

The flow of information related to laboratory-confirmed influenza is described in Figure 5.

- Please refer to Figure 2 for information pertaining to case management, including case report form completion.
- For information on laboratory testing for respiratory pathogens, please refer to Appendix E.

Figure 5: Information flow for laboratory confirmed influenza

3. Reporting Hospitalizations and Deaths

Case follow-up is required for all hospitalized cases and deaths of influenza, regardless of type. Hospitalized cases and deaths of influenza must be reported to DHW via the Public Health Electronic Information System (Application for Notifiable Disease Surveillance (ANDS)/Panorama). Hospitalized cases must be followed by public health until discharge or death (maximum follow-up of 4 weeks).

Deaths may also be reported from Nova Scotia Vital Statistics to DHW. Under the HPA, the registrar of Vital Statistics must forward any death certificate which lists a notifiable disease or condition. The death registration will be forwarded to local public health for appropriate follow-up.
4. Reporting Emerging Respiratory Pathogens and SARI

To ensure rapid alerting of senior PH officials and consistent and immediate public messaging, the following steps (Figure 6) need to be taken in a suspect case of SARI and an emerging or novel respiratory infection/pathogen identified in Nova Scotia. Please refer to Figure 2 for information pertaining to case management, including case report form completion.

**Figure 6:** Procedure for reporting a suspect case of SARI and an emerging or novel respiratory infection/pathogen in Nova Scotia.
5. **CNPHI**

5.1. **Public Health Alerts**

Public health alerts will not be used routinely to report school/daycare absenteeism or outbreaks in LTCF/acute care facilities (this is done in Outbreak Summaries). However, public health may consider the use of a public health alert to notify other jurisdictions of certain outbreaks or unusual events (note that the definition of unusual is subjective and may require a certain level of public health professional discretion). For probable/confirmed cases of SARI and emerging respiratory pathogen cases, a public health alert is required to alert the nation.

5.2. **FluWatch**

For details on FluWatch reporting, see the following link:
http://novascotia.ca/dhw/populationhealth/public-health-notifications.asp

5.3. **Outbreak Summaries**

Outbreak Summaries is used to report outbreaks in LTCF and acute care facilities. Outbreaks must be reported in Outbreaks Summaries by local public health as soon as notification is received.

6. **Influenza Immunization Coverage**

Data on influenza vaccines administered by physicians and pharmacists are captured in the respective physician and pharmacist billings databases.

DHW provides data collection tools to NSHA to capture the number of influenza vaccines received in various settings. Data is collected from influenza vaccine clinics (held by Public Health or other community agencies), long term care facilities and acute care facilities and can be broken down by the following target groups:

- Pregnant women
- Children 6 to 59 months
- Seniors (65 +) living in the community
- Aboriginal persons living on reserve
- Health care workers in acute care facilities
- Residents and staff of long-term care facilities

Public health at the zone level receives the data from individual facilities and clinics and produces a zone summary that is submitted to DHW. The tools for influenza immunization data collection are found here: http://novascotia.ca/dhw/populationhealth/surveillanceguidelines/Surveillance_Forms.pdf
Appendix E: Laboratory: Procedures and Reporting

This appendix includes:

1. Laboratory Procedures for Influenza
2. Laboratory Procedures for Emerging Respiratory Pathogens and SARI (e.g. MERS-CoV, H7N9)

1. Laboratory Procedures for Influenza

1.1. Laboratory Diagnosis/Overall Testing Rationale

Respiratory pathogen testing including Influenza testing will be available for the acute care setting and long term care facilities. Routine testing from the community will not be performed unless special circumstances exist and on the approval of a Microbiologist.

1.2. Specimen Collection

Appropriate specimen types:
- Nasopharyngeal swab and aspirate
- Endotracheal aspirate
- Bronchial Wash/Lavage
- Tissue

Non-appropriate specimen types (will be rejected by lab):
- Nose
- Throat and throat washings

Specimen Container:
- Flocked swab supplied with viral transport medium. These can be stored at room temperature until use. Viral collection kits may be obtained from the local/regional laboratory

Collection Notes:
- Please check the expiration date of the container as out of date swabs will be rejected by the laboratory.
- Specimens should be collected within 5 days of onset of symptoms, preferably within 48 hours.
- Sampling beyond 5 days may be considered in patients with persisting or worsening symptoms regardless of age; in young children or the elderly; and in the immunocompromised.
- An instructional collection video is available here: http://www.youtube.com/watch?v=TFwSezeIHU
1.3. Specimen Labeling Requirements

All specimens must be appropriately labelled with 2 unique patient identifiers and accompanied by a completed requisition with corresponding information. One identifier must be the patient’s legal name and the other can be the medical record number for in-patient and ambulatory care patients or the provincial health card number for referred-in patients. If the patient does not have either a medical record or health card number, other unique identifiers associated with the patient should be used, such as:

- registered health card equivalent
- passport number
- Health Authority invoice number
- private insurance policy number
- immigration number
- physician office's patient chart number

Outbreak numbers are provided by local public health and should be clearly identified on the laboratory requisition.

The patient/resident setting should be clearly indicated on the laboratory requisition.

- LTC name
- Inpatient facility name and location (ICU, Floor, etc.).

1.4. Specimen Transport Conditions

Specimens should be collected and transported on cold packs (4°C) to the district/regional hospital laboratory as soon as possible. If specimens cannot be shipped to the influenza testing laboratories within 72 hours, specimens should be frozen at -70°C and transported on dry ice by the shipping laboratory. If -70°C / dry ice is not available they should remain at 4°C and shipped as soon as possible.

1.5. Laboratory Testing

All submitted specimens will undergo nucleic acid amplification assay (NAAT) testing, however, the type of test will vary depending on the primary laboratory (IWK, vs Cape Breton Regional vs QEII) and the timing during the influenza season. At the QEII, laboratory testing during the non-peak influenza season will consist of a multiplex NAAT for a broad range of respiratory viral pathogens. This includes: Influenza A, Influenza B, Respiratory Syncytial Virus as well as other viral agents. Please refer to Figure 7, Influenza Testing Algorithm 2018-19.

Laboratory testing during the peak influenza season will consist of primarily a streamlined NAAT for the detection of Influenza A, Influenza B, Respiratory Syncytial Virus only. Additional use of the multiplex assay will be limited to critically ill acute care patients unless otherwise determined in consultation with a Microbiologist. It is important to discuss these cases with a Microbiologist to access special testing including specific agent testing or influenza subtyping.

Patients with epidemiologic links to areas of concern for MERS-CoV or novel influenza virus such as H7N9 who present with respiratory disease should be notified to public health and testing for these novel pathogens considered. The microbiologist on call should be notified to help guide testing.
Public health surveillance subtyping of influenza virus type A positive samples will be performed in consultation with the PPHLN or during a SARI case investigation. The QEII anchor microbiology laboratory also participates in the WHO influenza program offered through the National Microbiology Laboratory (NML) in Winnipeg. This program provides valuable reference/surveillance services for influenza strain characterization, antiviral susceptibility and molecular typing.

Influenza testing services are available at the QEII Health Sciences Centre, Cape Breton Regional Hospital and IWK Health Centre laboratories. Testing frequency (weekday/weekend) is assessed on an ongoing basis by the testing facilities. Please note that turn-around time for results may be further impacted by transportation from zonal/regional labs to the testing facility(s).

IWK Health Centre microbiology (PPHLN Pediatric Anchor Lab) performs viral respiratory testing for its facility. This service is under the guidance of the IWK Microbiology, Division Head.

Cape Breton Regional microbiology laboratory performs viral respiratory testing for the Nova Scotia Health Authority Eastern zone. This service is under the guidance of the Cape Breton Regional Hospital Microbiologist. Both facilities refer specimens to the QEII for additional use of the multiplex assay as indicated in Figure 7.

**Figure 7: Influenza Testing 2018-2019**

**INFLUENZA TESTING ALGORITHM 2017-2018 (QEII / CBRH / IWK lab based testing)**
1.6. Point of Care Testing (POC)

Rapid Influenza detection tests (RIDT) also referred to as Near-patient or POC tests, use antigen detection technologies which can generate results in less than 30 minutes.

Although there may be some utility in using RIDTs during seasonal influenza the primary limitation of currently available RIDTs is poor sensitivity which can be as low as 10% for pH1N1. This translates into an inability to rule out the diagnosis of influenza. As such, RIDT have limited utility in the management of individual patients presenting with ILI.

1.7. Reporting of Results

- Positive influenza reports including subtyping will be reported via telephone for individuals in acute care and LTCF settings.
- Positive influenza results will be reported to local public health.
- Reports for identifiable outbreaks will be followed up with public health.
- All other results will be sent to the referring entity via regular reporting mechanisms.
- Results inquiries can be directed to your local/regional lab.
- Public health may contact the PPRLN Program Coordinator at 902-473-8280 for questions about results.
- For other questions contact the laboratory director.

1.8. After Hours

The Microbiologist on call is accessible through QEII Locating at 902-473-2222.

2. Lab Procedures for Emerging Respiratory Pathogens and SARI (e.g. MERS-CoV, H7N9)

Although the protocol for Severe Acute Respiratory Infections (SARI) was initially developed as a response to the 2003 SARS outbreak, its intended use is to facilitate the diagnosis of severe respiratory infections due to both unknown and known respiratory pathogens that have the potential for large scale epidemics. With both the novel coronavirus (e.g. MERS-CoV) and the emerging H7N9 influenza virus, a key factor is the determination of risk based on epidemiologic factors, which is in turn related to exposure in an “area of concern”. The initial risk assessment must be completed and SARI alerts should trigger clinicians to “Think, Tell and Test”

- **Think** about the possibility of an emerging respiratory infection (e.g. novel influenza A virus)
- **Tell** the local medical officer of health or local public health official
- **Test** for pathogen only after appropriate consultation and based on clinical symptoms
2.1. Laboratory Protocol (Figure 8)

Although the risk assessments will be modified as new information becomes available, at this time, the probability that a severe acute respiratory illness is due to a novel coronavirus or H7N9 is extremely low. Therefore, in patients with no epidemiological risk factors the most common pathogens should be ruled out before considering an unusual or more highly virulent pathogen. This may be done at the local laboratory or the provincial public health laboratory (PPPHL) depending on local capacity and expertise.

Specimens to be considered for collection include sputum, nasopharyngeal swab (NPS), bronchoalveolar lavage (BAL), endotracheal secretions, and throat swab. For pediatric patients, a nasopharyngeal aspirate is a suitable replacement to a NPS.

Pathogens that should be excluded on preliminary testing include:

Conventional bacteria (including *Mycoplasma pneumoniae*, *Legionella pneumophila*):

- Specimen: *sputum and urine*
- Testing: *gram stain and routine culture ± Legionella*.
  - *Mycoplasma pneumoniae* PCR,
  - *Legionella* urinary antigen

Conventional respiratory viruses (e.g. *human influenza*, *parainfluenza*, *respiratory syncytial virus*, *adenovirus*, *human metapneumovirus*, *rhinovirus/enterovirus*, *coronavirus*):

- Specimens: NPS, endotracheal secretions, BAL, +/- throat swab and sputum.
  - NPS is the primary specimen type for respiratory viruses including seasonal influenza. However, deeper specimens such as endotracheal secretions or BAL must be collected in cases of severe respiratory infection with negative NPS.
  - A number of Avian Influenza A viruses, including H7N9, have been detected in throat swabs. Recently, H7N9 was only detectable in sputum specimen in 1 of 4 patients. While sputum and throat swabs are not ideal for most influenza viruses, until the ideal specimen for H7N9 can be identified, multiple specimens types should be considered in patients suspected of having Avian Influenza A viruses.

- Testing:
  - Influenza A and B by RT-PCR with subtyping (H3N2 or H1N1) should be the primary method for detection of influenza (24 hour turnaround time).
  - Respiratory multiplex RT-PCR for parainfluenza, human metapneumovirus, coronavirus, rhinovirus/enterovirus, and adenovirus should be done on negative influenza specimens (48 hour turnaround time) when there is a clinical indication to detect non-influenza viruses.
  - RIDTs should not be used to rule out influenza A. The sensitivity of currently available RIDT for human influenza strains is suboptimal. The performance characteristics of currently available commercial tests for detection of H7N9 are unknown and likely to be poor based on the suboptimal sensitivity of these assays for other Avian Influenza strains.
Novel influenza A viruses and the novel coronavirus (e.g. MERS-CoV) are classified as Risk Group 3 pathogens. Routine culturing of specimens from suspect patients should only be considered in public health labs with containment level 3 facilities.

- If more invasive samples are collected they should be processed for a wide range of pathogens:
  - Bronchial-alveolar wash for all cultures (bacteria, viruses, mycobacteria, fungi)
  - Open lung biopsy – for all cultures, RT-PCR and histology (ensure specimen is not put in formalin for microbiology testing.)

2.2. When to suspect the novel coronavirus (MERS-CoV):

Limited data suggests that MERS-CoV can present as a co-infection with other viral pathogens. As such, in addition to specimens that are negative for conventional pathogens, those that do have other identified pathogens but are consistent with suspect cases of novel coronavirus based on the PHAC case definition should be tested for the MERS-CoV. The details regarding testing and some control materials for method development are available from the National Microbiology Laboratory (NML). To date only a few PPHLs have developed the capacity to test for this pathogen in-house. All other PPHLs will forward the suspect specimens to the NML for further testing.

2.3. When to suspect a novel influenza virus (including H7N9):

Influenza viruses that are positive on the initial influenza identification test but cannot be subtyped using RT-PCR should be further characterized. NS will rely on the NML for further characterization. However, given that subtyping assays are usually less sensitive than the identification assays, weak positives may not be able to be typed. Based on local experience, each laboratory should evaluate these on a case by case basis in concert with their local clinicians and public health colleagues.

Influenza positive specimens outside the influenza season or obtained from patients with a history of exposure animals (e.g. pigs or chickens), should be identified so that they can be submitted to the NML for characterization.

NOTE: While initial analysis of in-house assays used by many labs suggest they should be effective in identifying H7N9, it is difficult to determine the effect on the sensitivity of testing. This is particularly true of the performance of commercial assays whose primer sequences are not known.

2.4. If a front-line laboratory suspects a novel respiratory pathogen:

The initial tests (as outlined above) would be similar but supplemental testing will be required at the anchor laboratory of PPHLN. If the laboratory is informed by a Public Health representative in the NSHA, or the clinician, that a novel respiratory pathogen is suspected, the laboratory should communicate with the clinician to ensure that the following specimens are collected:

- A second NPS/endotracheal aspirate or BAL to be used for confirmation by the NML
- A viral throat swab (in viral transport media) – A number of Avian Influenza A viruses including the H7N9 have been detected in throat swabs. Until the ideal specimen can be collected multiple specimen types should be considered
- Acute and convalescent sera
- Conjunctival swab if clinically appropriate (in viral transport media)
2.5. If a PPHLN laboratory suspects a novel respiratory pathogen:

- The laboratory director will notify the MOH immediately when a suspect specimen is identified.
- All specimens with suspected novel respiratory pathogens (as outlined below) will be forwarded to the NML for confirmatory testing.
- Specimens suspected to contain a novel respiratory virus will be handled using CL2 with enhanced PPE if manipulated outside a BSC.

The laboratory and/or Public Health should also communicate with the PPHLN that a suspect novel respiratory pathogen sample is being transported.

**Figure 8: Laboratory Testing for SARI**
2.6. Transportation of Specimens

If the case has been linked to another proven case of a novel respiratory virus, or has strong epidemiological evidence to link it with avian influenza, then the specimen should be handled in the manner described below; otherwise treat specimens as routine clinical specimens:

Transport by Land:

If the suspected agent is classified as Risk Group 3, use a Type 1A package. (There is a modification possible for transport by air, see below.)

Other requirements of the TDG regulations such as training, labeling, marking and documentation apply.

Transport by Aircraft:

The International Civil Aviation Organization (ICAO) Technical Instructions (TI) with some additional provisions of the TDG Regulations may be used for the transportation of diagnostic specimens by aircraft. Consignments prepared this way may be transported by road to and from the airport as well.

Under the ICAO TI, the shipping name DIAGNOSTIC SPECIMEN, UN3373 must be used for all diagnostic specimens if they may contain influenza Risk Group 3 agent. Diagnostic specimens are exempted from other requirements in the ICAO technical instructions if they are packaged in packaging of good quality, capable of passing a 1.2m drop test. A Type 1A package meets these requirements. A Type 1B package may only be used if it meets the additional ICAO requirements regarding cushioning of the secondary receptacle, drop test and pressure retention capability.
Appendix F: Q&A – Seasonal Influenza Vaccine Information

http://novascotia.ca/dhw/cdpc/info-for-professionals.asp
Appendix G: References


