Early Detection of Severe Emerging or Re-emerging Respiratory Infections through Severe Respiratory Illness (SRI) surveillance

1.0 Background:

On 14 August 2003, the World Health Organization (WHO) developed guidelines for Alert, verification and public health management of Severe Acute Respiratory Syndrome (SARS) in the SARS post-outbreak period (see http://www.who.int/csr/sars/postoutbreak/en/). On 10 and 11 September 2003, Health Canada hosted an international meeting of experts to discuss enhanced surveillance and case definitions. At the meeting it was agreed that individual countries, particularly developed countries, need to adapt the WHO SARS Alert recommendations based on their own risk assessment, resource requirements and experience.

Since October 2003 (and possibly earlier), outbreaks of avian influenza affecting poultry also involving human cases have underscored the importance of increased vigilance for any severe respiratory illness (SRI) of potential public health importance. The recommendations and guidelines for enhanced SRI surveillance in this document were developed in response to SARS yet aimed at being flexible enough to include other severe respiratory illnesses, including severe influenza-like illness[1] (severe ILI), see definitions in section 5.1.

The lessons learned from both SARS and previous outbreaks of influenza A (H5N1) involving humans, have underscored the importance of preparatory planning and surveillance infrastructure for the detection and monitoring of emerging respiratory infections. Based on Canada's experience, the Pandemic Influenza Surveillance Working Group terms of reference have been revised to include SARS and other emerging and re-emerging respiratory infections. National and expert surveillance working groups, including the Respiratory Infection Surveillance Committee (RISC) and the Vaccine Preventable and Respiratory Infections Surveillance (VPRIS[2]) working group have been tasked with this role. To this end, in 2003-2004 RISC recommended surveillance for sporadic cases of SRI, including severe influenza-like-illness (severe ILI), in all acute care facilities, in addition to surveillance of nosocomial clusters of SRI in selected (sentinel) acute care facilities[3]. These recommendations are consistent with the WHO recommendations for SARS cited above but adapted to the Canadian setting and expanded to include other emerging respiratory illnesses of public health importance. In 2005-2006, VPRIS reviewed and updated these recommendations based on additional information and lessons learned from domestic events as well as ongoing outbreaks of avian influenza globally.

The following document is intended for public health purposes and details the goals, objectives, methods and reporting of SRI through enhanced surveillance activities and a system of alerts. These recommendations outline minimum national standards and guidelines, developed through a consensus process, involving public health partners at the Federal (Immunization and Respiratory Infections Division (IRID), Public Health Agency of Canada (PHAC)) and Provincial/Territorial level (Ministries of

---

[1] Influenza-like illness (ILI),for the general population, (as per the FluWatch national case definition):
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. Severe ILI: In addition to the symptoms of ILI noted above, severe ILI may also include complications such as pneumonia, Acute Respiratory Distress Syndrome (ARDS), encephalitis or other severe and life threatening complications.

[2] An expert working group, the Vaccine Preventable and Respiratory Infections Surveillance working group (VPRIS), was formed in December 2005 in order to recommend and guide the development of new surveillance initiatives and/ or the enhancement of current systems and processes that would address gaps and needs as identified through the National Immunization Strategy. The work of RISC is being re-directed to VPRIS. RISC will continue to be involved in surveillance activities/developments in a P/T consultative role and members are encouraged to bring any surveillance issues to the working group for consideration.

[3] Acute care facilities: A hospital where lengths of stay average less than 30 days, and where a variety of services are provided, including surgery and intensive care.

Health). For jurisdiction specific protocols, hospitals and/or other primary care providers should refer to their local or provincial/territorial public health department(s), as appropriate.

2.0 Minimum National Standards:

While a jurisdiction may choose, based on its own risk assessment and experience, to increase the sensitivity of monitoring (i.e. by increasing time frames, increasing the geographic extent of a perceived zone of re-emergence risk or decreasing the minimum number of individuals defining a cluster), for the purposes of national reporting, the minimum standards defining a nationally reportable alert are laid out below in sections 5.0, 5.1 and 5.2.

3.0 Goal:

To prevent large-scale epidemics and outbreaks of respiratory infections associated with increased morbidity and mortality, through the establishment of ongoing surveillance for severe or emerging respiratory infections and rapid implementation of prevention and control measures.

4.0 Objectives:

- To detect, in a timely manner, unusually severe morbidity and mortality caused by both unknown and known respiratory pathogens (e.g. influenza, avian influenza, SARS-associated coronavirus [SARS-CoV]) that have the potential for large-scale epidemics or pandemics.
- To rapidly detect possible cases of emerging or re-emerging respiratory infections (e.g. SARS, novel influenza virus).
- To provide an early warning mechanism in order that available control measures may be implemented at the appropriate time to minimize transmission.
- To ensure appropriate systems are in place to detect sporadic cases and clusters of emerging or re-emerging respiratory infections as recommended by the World Health Organization.

5.0 Methods:

During the period of heightened vigilance for emerging or re-emerging respiratory infections, it is proposed that each jurisdiction implement, at a minimum, surveillance for persons hospitalised with SRI, including severe ILI or other severe acute respiratory illness not yet diagnosed (NYD), who have one or more exposures as specified in the definition (see section 5.1). In addition, it is recommended that sentinel hospital-based surveillance for nosocomial clusters of SRI linked to a health care unit be conducted at a minimum in selected (sentinel) hospitals, as specified in section 5.2. However, the scope and implementation of these surveillance activities should be determined by the Province and Territory (P/T). Some jurisdictions may choose to expand nosocomial cluster surveillance to additional hospitals, based on risk assessment and resource availability.

Furthermore, jurisdictions may choose to implement enhanced surveillance activities (e.g. Febrile Respiratory Infections (FRI) surveillance) and/or specific activities as appropriate.

Potential zones of emergence/re-emergence

South East Asia, in particular China, is an important region for influenza surveillance given that most novel influenza viruses are known to have emerged from this area of the world. Coupled with the fact that China is the most populous country in the western pacific region, animals, particularly poultry and swine, live in close proximity to humans. Both population density and animal husbandry practices present increased opportunities for mixing and reassortment of influenza viruses and can lead to the emergence of new and more virulent forms of these viruses.

Upon detection of any emerging or re-emerging pathogens internationally, including novel influenza viruses (e.g. H5N1), the list of “currently affected areas” will be reviewed and updated as necessary. For the latest listing of these areas refer to http://www.phac-aspc.gc.ca/h5n1/index.html. As additional

information becomes available and as the situation evolves, PHAC will disseminate disease-specific alerts as needed.

SRI Alert

The SRI Alert evolved out of the SARS post-outbreak enhanced surveillance period (WHO SARS Alert[4]). This expanded SRI Alert, modified by RISC/VPRIS, aims to provide an operational definition to ensure that individuals meeting specific criteria are identified in a systematic way to allow for prompt population risk assessment and implementation of appropriate public health measures while diagnosis is pending. All events meeting the criteria for an "SRI Alert", defined below, should be reported to the Public Health Agency of Canada (PHAC).

SRI Alerts are intended to identify:

I. Persons with a potential epidemiologic link who are hospitalised with SRI, including, severe ILI or other acute emerging or re-emerging respiratory illness-NYD (see section 5.1)

II. Clusters of severe respiratory illness (SRI) within a health care unit[5] in an acute care facility (see section 5.2)

III. Any person who has a laboratory evidence of a novel influenza or other emerging or re-emerging virus infection.

5.1 Surveillance for Persons with a Potential Epidemiologic Link who are Hospitalised with SRI

It is recommended that all P/Ts implement, at a minimum, hospital-based surveillance for sporadic cases of SRI, including severe ILI and/or other severe acute respiratory illness-NYD, meeting the following case definition.

SRI case – must meet criteria in each of four categories for **(A)** Hospitalised or **(B)** Deceased, including: I. respiratory symptoms + II. severity + III. unknown diagnosis + IV. epidemiological exposure, as detailed in the case definitions below**:**

SRI case (A)
A person **admitted to hospital** with:

I. Respiratory symptoms [6], i.e.:

- Fever (over 38 degrees Celsius) **AND** New onset of (or exacerbation of chronic) cough or breathing difficulty

AND

II. Evidence of severe illness progression, i.e.:

- Radiographic evidence of infiltrates consistent with pneumonia or acute respiratory distress syndrome (ARDS).

OR

- Severe ILI, which may also include complications such as encephalitis or other severe and life threatening complications

AND

[4] The WHO SARS Alert is an operational definition to ensure that appropriate infection control and public health measures are implemented until SARS has been ruled out as a cause of the atypical pneumonia or RDS.

[5] The definition of the health care unit in which the cluster occurs will depend on the local situation. Unit size may range from an entire health care facility if small, to a single department or ward of a large tertiary hospital. A jurisdiction may choose, based on its own risk assessment and experience, to increase the minimum period for defining a cluster beyond 10 days.

[6] Non-respiratory symptoms/presentations may be possible, (i.e. encephalitis, gastroenteritis)

III. No alternate diagnosis within the first 72 hours[7] of hospitalisation, i.e.:

- Results of preliminary clinical and/or laboratory investigations, **within the first 72 hours of hospitalisation with no response to treatment**, cannot ascertain a diagnosis that reasonably explains the illness.

AND

IV. One or more of the following exposures/conditions, i.e.:

- Residence, recent travel or visit to an affected area where a novel influenza virus or other emerging or re-emerging respiratory virus has been identified [refer to table of currently affected areas/sites: http://www.phac-aspc.gc.ca/h5n1/index.html.]

- Close contact (including health care providers) of an ill[8] person who has been to an affected area/site within the 10 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 primary care providers exposed to patients linked to an ongoing outbreak investigation or sick/dying animals;

    OR

    - **Laboratory exposure** in a person who works directly with emerging or re-emerging pathogens;

    OR

    - **Animal exposure** in a person employed as one of the following:
        - domestic poultry/swine farm worker;
        - domestic poultry processing plant worker;
        - domestic poultry culler (catching, bagging, or transporting birds, disposing of dead birds/swine);
        - worker in live animal market
        - dealer or trader of pet birds or other potentially affected animals
        - chef working with live or recently killed domestic poultry or other potentially affected animals

OR

SRI case (B)

A deceased person with:

I. 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

II. Autopsy performed with findings consistent with SRI, i.e.:

- autopsy findings consistent with the pathology of ARDS without an identifiable cause

AND

III. No alternate diagnosis that reasonably explains the illness

---

[7] 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). Non-typeable influenza specimens should be sent for immediate subtyping. Also requires immediate infection control and public health action, see the appropriate guidelines.

[8] A jurisdiction may choose to include, based on its own risk assessment and experience, only contacts of severely ill returned travellers.

AND

IV. One or more of exposures/conditions, as listed above.

SRI CASE EXCLUSION CRITERIA

- A person should be excluded if an alternate diagnosis can reasonably explain their illness.

5.2 Surveillance for Clusters of Severe Respiratory Illness (SRI) within a Health Care Unit in an Acute Care Facility

It is recommended that Canadian provinces and territories implement surveillance through all or a representative sample (sentinel) of hospitals in their jurisdiction to monitor for clusters (described below) of SRI within a health care unit. Investigation of these clusters should involve testing for emerging or re-emerging pathogens, including the CPHLN recommended laboratory testing for SRI NYD, when appropriate (see http://www.phac-aspc.gc.ca/eri-ire/pdf/CPHLN-Lab-testing-for-patients-with-SRI-NYD.pdf)

The most likely health care settings to detect severe emerging or re-emerging respiratory infections, including novel influenza virus infections, in Canada include acute care facilities where persons who have a SRI are expected to present. As such, it is considered very unlikely that cases would be first identified in a long term care (LTC) facility as LTC facilities are, for the most part, closed settings with a somewhat stable population that has relatively little contact with the general population.

For the purposes of surveillance, a cluster is considered to be: **hospital acquired illness** in **2 or more health care workers** or **3 or more persons** (health care workers and/or other hospital staff and/or patients and/or visitors) **within a health care unit** with onset of illness in the same 10-day period[9] who are admitted to hospital and with:

I. Respiratory symptoms, i.e.:

- Fever (over 38 degrees Celsius) **AND** New onset of (or exacerbation of chronic) cough or breathing difficulty

AND

II. Evidence of severe illness progression, i.e.:

- Radiographic evidence of infiltrates consistent with pneumonia or acute respiratory distress syndrome (ARDS);

OR

- Autopsy findings consistent with the pathology of ARDS without an identifiable cause.

AND

III. No alternate diagnosis within the first 72 hours

- Results of preliminary clinical and/or laboratory investigations, within the first 72 hours of hospitalisation, cannot ascertain a diagnosis that reasonably explains the illness.

5.3 Other enhanced surveillance: Continued Vigilance for ARDS-Not Yet Diagnosed

Provinces and Territories, particularly those that receive a large number of persons from the potential zone of emergence/re-emergence (areas affected by novel influenza viruses and/or other emerging/re-emerging respiratory pathogens, see PHAC table of currently affected areas/sites), may wish to consider surveillance of all ARDS of unknown cause and pursue investigation of these cases for influenza and other emerging or re-emerging respiratory infections. Laboratory diagnosis of these cases should follow the CPHLN recommended laboratory testing for recommended laboratory testing for SRI NYD.

[9] A jurisdiction may choose, based on its own risk assessment and experience, to increase the minimum period for defining a cluster beyond 10 days.

6.0 Proposed National Reporting of Outcomes of Surveillance for Severe and/or Emerging Respiratory Infections

It is proposed that all P/Ts report to CIDPC, PHAC, the following:

- **SRI hospitalisations:** All persons admitted to hospital and meeting the definition for SRI (including severe ILI or other emerging or re-emerging respiratory illness-NYD with a potential epidemiological link/risk factor).

- **SRI clusters:** all clusters of SRI in acute care facilities.

- **Laboratory confirmed cases with identification of an emerging pathogen, including influenza A (H5N1), other novel influenza viruses, SARS, etc.**

7.0 Limitations

7.1 Surveillance and Response to Emerging Respiratory Infections

The purpose of this document is to outline minimum definitions for surveillance and to establish standards for national reporting of SRI as a means of early detection and response to potential emerging respiratory infections.

7.2 Use of Surveillance Definitions

Surveillance definitions are public health tools designed for monitoring purposes. They set out certain criteria which once met, can lead to an event being reported to public health, or included in an outbreak analysis, *in a consistent manner*. Typically there are several categories of definitions for a health event. These may be based on clinical, diagnostic, laboratory and/or epidemiological criteria.

Definitions are chosen to represent a suitable balance between sensitivity (correctly identifying true events) and specificity (correctly excluding false events). The appropriate balance between these two characteristics may vary at different phases of an outbreak period or among jurisdictions, depending if they are affected by an outbreak.

Surveillance definitions are not designed to be used for clinical diagnosis or management of individuals/events. To meet these needs, clinical descriptions, diagnostic tools or algorithms, and guidelines for decision making are required. Individuals may meet a surveillance definition but not be judged, on clinical grounds, to have the disease, or vice versa. This is especially true if the disease is mild or atypical in its presentation. Due to the balance between sensitivity and specificity and the arbitrary nature of surveillance definitions, it is not possible to include all possible manifestations of a disease in a case definition. Surveillance definitions ensure that all jurisdictions count disease events in a systematic and consistent manner to enable comparison and analysis of trends

8.0 Limiting laboratory overtesting, while ensuring appropriate testing where warranted

- Appropriate testing for routine respiratory pathogens should be reinforced
- SRI alerts 4.1/4.2 should trigger clinicians to “Think, Tell and Test”, ONLY WHEN APPROPRIATE.
    - **Think** about the possibility of an emerging respiratory infection, e.g. novel influenza 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
- Development and implementation of a case/unique case identifier tracking system is recommended to ensure linkage of laboratory and epidemiological data while providing a practical mechanism to control/limit laboratory testing.

9.0 Prioritizing influenza testing

- Appropriate testing for routine respiratory pathogens should be reinforced.
- Any difficult to identify viruses should be referred to the National Microbiology Laboratory in Winnipeg (NML), immediately.
- Laboratories should ensure that specimens are forwarded in the most timely manner possible and that any samples with a **positive travel history, severe and/or unexpected presentation or unusual epidemiology** notation are forwarded to NML immediately for subtyping and/or identification, as necessary (do not cohort these specimens for batch mailing).