

## Guidance for the Management of Severe Acute Respiratory Infection in the Intensive Care Unit

### Introduction

Severe acute respiratory infections (SARI) have been a key presenting feature of two recent novel respiratory pathogens. Avian Influenza A (H7N9) virus in China and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), have caused severe human illness and the need for intensive care unit (ICU) admission for many of the infected persons.

In the event that human cases of these novel viruses emerge in Canada, clinicians will require guidance on the management of patients presenting with SARI in the ICU setting, since most severe cases require ICU admission, mechanical ventilation and frequently multisystem organ support. During the Influenza A(H1N1) pandemic (pH1N1), the Canadian Critical Care Society (CCCS) facilitated the collation and distribution of information, including a guidance document specific to the management of patients with severe pH1N1 infection in the ICU, to help health care workers manage these patients.

The objective of this documents to provide guidance to assist clinicians in the management of patients with SARI in the ICU setting, including specific guidance for avian influenza A(H7N9) and MERS-CoV. The recommendations provided here are based on currently available scientific evidence and expert opinion. This guidance document may be subject to change as new data become available.

### SARI Clinical Presentation

The presentation can vary depending on the etiologic agent. This section describes general features, while specific agents are described in later sections.

SARI is defined primarily by a clinical presentation of [1]:

- **Respiratory symptoms**, i.e. fever (over 38 degrees Celsius) *AND* new onset of (or exacerbation of chronic) cough or breathing difficulty; *and*,
- **Evidence of severe illness progression** (i.e. either radiographic evidence of infiltrates consistent with pneumonia, or a diagnosis of acute respiratory distress syndrome (ARDS) or severe influenza-like illness, which may also include complications such as encephalitis, myocarditis, acute coronary syndrome, sudden death or other severe and life-threatening complications); *and*,
- **Either admission to the ICU/other area of the hospital where critically ill patients are cared for OR mechanical ventilation.**

### Initial Presentation of SARI

Where the causative agent is an influenza virus, the spectrum of illness can range from mild or uncomplicated illness to moderate, progressive, severe or complicated illness. According to a recently published guidance from the Association of Medical Microbiology and Infectious Disease Canada [2], severe or complicated influenza illness is characterized by signs of lower respiratory tract disease (e.g., hypoxia requiring supplemental oxygen, abnormal chest radiograph, mechanical ventilation), hemoptysis, frothy pink or purulent sputum with diffuse lung crackles, central nervous system

abnormalities (encephalitis, encephalopathy), complications of low blood pressure (shock, organ failure), myocarditis, renal insufficiency, or rhabdomyolysis, or invasive secondary bacterial infection with appropriate clinical signs (e.g. persistent high fever and other symptoms beyond three days). Shortness of breath is not typical of uncomplicated influenza virus infection, and is suggestive of severe disease.

- All patients with clinical symptoms consistent with influenza virus infection (as noted above) and new onset shortness of breath warrant close evaluation. Percutaneous oximetric assessment of blood oxygenation should be performed and clinical evaluation of significant hypoxemia should include a chest radiograph, which may demonstrate multi-quadrant mixed alveolar/ interstitial infiltrates.

### **Empiric Management of SARI-Related Critical Illness**

Initial treatment decisions should be based on clinical presentation and epidemiological data and should not be delayed pending laboratory confirmation. The mainstays of initial SARI treatment will include standard and contact isolation precautions, evidenced-based supportive care for respiratory insufficiency and organ dysfunction, and initiation of antimicrobial agents, typically including antibiotics for severe community or hospital-acquired pneumonia, and consideration of influenza-specific antiviral agents such as neuraminidase inhibitors.

### **Empiric Recommendations for SARI-Related Infection Control in ICU**

General guidance on infection prevention and control measures that should be considered by health care workers when caring for patients with acute respiratory illness can be found in the following documents:

- [Routine practices and additional precautions for preventing the transmission of infection in health care settings](#) [3]
- [Infection Prevention and Control Measures for Healthcare Workers in Acute Care and Long-term Care Settings](#) [4]
- [PHAC's Infection Control Guideline for the Prevention of Healthcare-Associated Pneumonia](#) [5]
  - This guidance should be used in conjunction with existing provincial and territorial infection control guidelines as well as those developed for or specific to each ICU setting.
  - Existing institution specific guidelines on infection control issues should be reviewed and adapted as required to ensure they reflect clinical realities in acute care settings (e.g. emergency rooms, ICU).
  - Ventilators differ greatly, therefore health care workers need to be aware of the exhaust system functionality as filters are not always present. Appropriate personal protective equipment should be worn, and N95 respirators should be used during aerosol generating medical procedures (AGMP).

Infection prevention and control staff may *consider* discontinuation of isolation procedures when non-immune compromised patients are PCR or viral culture negative and have demonstrated clinical improvement. Limited etiology-specific guidance follows below.

### **Diagnostic Considerations for Undifferentiated SARI**

#### **Exposures and Risk Factors**

Clinicians should consider the patient clinical presentation and epidemiological links (exposures) when investigating SARI. When considering the possible causative agent of the SARI, 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 clue. It may be difficult for clinicians at the hospital level to recognize this since patients may present to other hospitals. For these reasons, clinicians should consult with local medical officer of health/public health officials, as well as their local infectious disease specialist. Online resources from the Public Health Agency of Canada (PHAC) include:

- [FluWatch](#) [6], Canada's national surveillance system that monitors the spread of influenza and influenza-like illnesses, and,
- [Emerging Respiratory Pathogen's](#) web site [7] provides information about acute respiratory infections that may have a serious public health impact including those caused by either emergence of new variants of known respiratory pathogens or emergence of as yet unknown pathogens including up-to-date risk assessments of the risk these pathogens pose to Canada.

The public health risk posed to Canada by the recent emergence of the novel avian Influenza A(H7N9) and MERS CoV viruses is considered low at this time. As of December 9, 2013, there have been no cases in Canada. Human cases of H7N9 virus have occurred only in China, with travel-related cases in Taiwan and Hong Kong. MERS CoV cases have been reported in several Middle Eastern countries as well as a number of exported cases to European countries. To date there has been no sustained human to human transmission. For the most up to date information on Emerging Respiratory Pathogens, please consult:

[Emerging Respiratory Pathogens](#) [7]

[Summary of Assessment of Public Health Risk to Canada Associated with Avian Influenza A \(H7N9\) Virus in China](#) [8].

[Summary of Assessment of Public Health Risk to Canada Associated with Middle East Respiratory Syndrome Coronavirus \(MERS-CoV\)](#) [9]

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In addition, readers can expect that important updates will be posted to email distribution lists such as the CCCS and Critical Care Canada Google groups, the [CCCS Facebook page](#) and the [CCCS Twitter account](#).

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### **Assessing Exposure History**

Clinicians should assess for epidemiological risk factors by obtaining an exposure history including recent links to affected areas or close contact with an ill person (see below). A close contact is defined as a person who provided care for the patient, including health care workers, family members or other caregivers, who had other similarly close physical contact to the patient or a possible cluster member OR who stayed at the same place (e.g. lived with or otherwise had close prolonged contact within two metres) as a probable or confirmed case while the case was ill.

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**Clinicians should be suspicious that SARI is potentially attributable to novel emerging or re-emerging pathogen if:**

- **No alternate diagnosis within the first 72 hours of hospitalization** (i.e. results of preliminary clinical and/or laboratory investigations, within the first 72 hours of hospitalization, cannot ascertain a diagnosis that reasonably explains the illness); *and*,

**One or more of the following exposures/conditions:**

- **Residence, recent travel** (within  $\leq 10$  days of illness onset) to a country where human cases of novel influenza virus or other emerging /re-emerging pathogens have recently been detected or are known to be circulating in animals.
  - **Close contact with an ill person** who has been to an affected area/site within 10 days prior to onset of symptoms.
  - **Exposure** to settings in which there have 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:
  - **Health care exposure** involving health care workers who work in an environment where patients with severe acute respiratory infections are being cared for, particularly patients requiring intensive care; or,
  - **Laboratory exposure** in a person who works directly with Laboratory biological specimens; or,
  - **Animal exposure** in a person employed as one of the following:
    - Poultry/swine farm worker
    - Poultry/swine processing plant worker
    - Poultry/swine culler (catching, bagging, transporting, or disposing of dead birds/swine)
    - Worker in live animal market
    - Dealer or trader of pet birds, pigs or other potentially affected animals
    - Chef working with live or recently killed domestic poultry, swine or other potentially affected animals
    - Veterinarian worker
    - Public health inspector/regulator.
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### **H7N9**

Exposure history of significance for the avian influenza A(H7N9) virus includes links within 14 days prior to illness onset affected areas, which to date involves China, or close contact with a confirmed or probable case. The median incubation period among initial cases has been noted to be 6 days (range 1-15 days) [10].

### **MERS- CoV**

Exposure history of significance for MERS- CoV links within 14 days prior to illness onset affected areas (i.e. residence or travel), which to date involves several Middle Eastern countries, or close contact with a confirmed or probable case in other locations. The median incubation period is still largely unknown MERS-CoV is still largely unknown but has been reported as prolonged in one documented instance of person-to-person nosocomial transmission (9-12 days) [11].

### **Laboratory Testing**

Laboratory testing should be conducted in accordance with the Canadian Public Health Laboratory Network's Protocol for Microbiological Investigations of Severe Acute Respiratory Infections (SARI) (Figure 1). This guideline has been developed to aid clinicians in the diagnosis of severe respiratory infections due to unknown and known respiratory pathogens that have the potential for large-scale epidemics [12].

Non-specific laboratory findings typically found at SARI presentation include normal or low normal leukocyte counts (in the absence of bacterial super-infection) and occasional evidence of rhabdomyolysis with elevated creatine kinase [13] [14], or other organ-specific dysfunction.

In patients with no epidemiological risk factors for avian influenza A (H7N9) and MERS-CoV, clinicians should rule out the most common pathogens (e.g. conventional bacteria and respiratory viruses including seasonal influenza) while considering other pathogens. For example, **Conventional bacteria** (including *Mycoplasma pneumoniae*, *Legionella pneumophila*) should be investigated with sputum and urine specimens (gram stain and routine culture ± Legionella antigen detection; and, *Mycoplasma pneumoniae* for Polymerase Chain Reaction (PCR)). **Conventional respiratory viruses** (e.g. human influenza, parainfluenza, respiratory syncytial virus, adenovirus, human metapneumovirus, rhinovirus/enterovirus, coronavirus) should be investigated with a nasopharyngeal swab, endotracheal secretions, ± bronchoalveolar lavage, ± throat swab for PCR testing.

- When a clinician suspects SARI they should consult immediately with the local medical officer of health/public health official to obtain guidance on testing and for a risk assessment. MERS-CoV is classified as a Risk Group 3 pathogen. Routine culturing of specimens from suspect patients should be considered in public health laboratories with containment level 3 facilities.

Initial testing for SARI in critically ill patients should include paired nasopharyngeal and tracheal aspirate specimens for Reverse Transcription PCR (RT-PCR) for intubated patients. Influenza viruses that are positive on the initial influenza identification test but cannot be subtyped using RT-PCR should be further characterized. Laboratories that have the capacity to further characterize the specimens by sequencing methods (e.g. sequence the M gene) to determine the subtype of the virus will do so. Those that lack this capacity 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. As was the case with pH1N1, lower respiratory tract secretions are likely more sensitive for detection of both Influenza A, including H7N9, and MERS-CoV [15].

Testing of clinically/epidemiologically high risk patient should be repeated within 48-72 hours if initial tests are negative.

### **Empiric SARI Treatment Considerations**

For undifferentiated SARI in which the causative agent is unknown and there is concern about a novel influenza strain or influenza is circulating in the community, empiric treatment should not be delayed while awaiting the results of diagnostic testing. (Figure 2)

- Oseltamivir is the recommended first- line antiviral agent for neuraminidase-sensitive influenza virus infection, ideally initiated within 48 hours of symptom onset;
- Antiviral therapy is recommended for all severely ill patients, even those >48 hours;
- Treatment duration is routinely 5 days but 10 days of antiviral therapy should be considered for severe pH1N1 infection requiring intubation;
- Intubated patients with influenza illness should receive oseltamivir through a nasogastric tube [16].
- An oseltamivir dose of 75 mg twice daily is appropriate; according to a randomized trial of patients [17] admitted hospital with confirmed severe influenza, there were no virological or clinical advantages with double dose versus standard dose of oseltamivir. Hence, while higher doses may be considered they are not specifically recommended. Published studies(3) and unpublished research communications (courtesy, A Kumar) suggest consistent adequacy of gut absorption with blood levels comparable to those found in ambulatory patients receiving the same dose; Dose reduction is advised for patients with impaired renal function [18]
- Inhaled zanamivir is recommended as the second-line antiviral treatment for severe illness since it does not offer systemic therapy. Zanamivir cannot be administered to patients unable to use the supplied inhalation device, and is not recommended for people with reactive airway disease. Zanamivir is not intended to be used in a nebulizer or mechanical ventilator as this has been associated with ventilator malfunction and the potential for fatal outcomes [19]
- An investigational intravenous formulation of zanamivir is not authorized for use in Canada but may be obtained either through clinical trials (if available) or in specific circumstances through the Special Access Program of Health Canada [20].
- There is no convincing data to support combination therapy with more than one neuraminidase inhibitor, or intravenous over oral therapy unless the oral route cannot be achieved [21] [22] [23] [24]. Similarly, there is no convincing data to recommend prolonged courses of neuraminidase therapy beyond 5-14 days, despite prolonged viral shedding among some patients [25].

### **Initial Supportive Critical Care Recommendations**

Most elements of supportive care for patients with SARI are similar to that for any critically ill patient in the ICU. Almost all patients with SARI in ICU will have deficits in oxygenation and ventilation, and the duration of ventilation required in such patients may be prolonged (two to three weeks median time [13] [14]. A subset will also have shock and renal failure which may occur in part as a consequence of efforts to optimize oxygenation and effective mechanical ventilation [13] [14].

- Standard approaches for acute respiratory distress syndrome (ARDS) such as pressure/volume limited, lung protective strategies and judicious fluid management are recommended as initial therapy [26]
- Prone ventilation may be beneficial when applied early in the course of severe ARDS with refractory hypoxemia secondary to SARI [27]
- Short term (up to 48 hours) of neuromuscular blockage may be beneficial [28]
- Emerging evidence supports a potential role for ECMO but data is still evolving in regard to this issue
- A recent randomized control trial comparing HFO to conventional ventilation in patients with ARDS was terminated due to concern about worse outcome in the HFO group. However, the possibility that HFO may be useful in subsets awaits further evidence but at present there is little data to support that hypothesis [29]
- Clinical experience suggests that diuretic therapy generating a degree of modest hypovolemia may be effective for treatment of refractory hypoxemia early in the course of severe diffuse pneumonitis

A full description of current evidenced-based critical care is beyond the scope of this document; however, are well-summarized in the most current version of the Surviving Sepsis Guidelines [26].

### **Secondary Bacterial Pneumonia**

Data is limited on SARI-related bacterial co-infection as a cause of morbidity and mortality. Recent reports have suggested bacterial pneumonia caused by *Streptococcus pneumoniae*, *Staphylococcus aureus* and Group A streptococci as major causes of death in two large sets of autopsy material examined [30] [31]. A significant minority of total *Staphylococcus aureus* isolates in the two reports were methicillin-resistant. Data on timing of secondary bacterial pneumonia was not available in these reports. In a large Canadian series of progressive or severe pandemic Influenza A (H1N1) infection requiring ICU admission, secondary bacterial pneumonia was seen in 24.4% of cases with *Staphylococcus aureus*, *Streptococcus pneumoniae*, Group A streptococci and *Escherichia coli* being the dominant pathogens [13]. Examination of a subset of Manitoba data with more detailed information reveals that *Staphylococcus aureus* and *Streptococcus pneumoniae* were equally common at any point in the ICU stay. However, Group A streptococci species were usually seen at admission while gram negatives including *E. coli*, were typically seen after several weeks in ICU. The majority of secondary bacterial infections were seen after several weeks of being ventilated.

### **Recent Novel Pathogens Causing SARI**

Severe illness has been a common feature of recent emerging respiratory pathogens, avian influenza A (H7N9) and Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV).

### **Influenza A (H7N9)**

#### **Epidemiology**

As of 12 December 2013, WHO has reported 143 confirmed human cases, including 47 deaths. Almost all cases of Influenza A (H7N9) have been confined to Eastern China with the exception of travel related cases in Taiwan and Hong Kong, with the greatest activity reported by Zhejiang, Shanghai, and Jiangsu. Most human infections are believed to have occurred after exposure to infected poultry or

contaminated environments. Although four small family clusters have been reported among previous cases, suggesting that limited human to human transmission may occur, evidence does not support sustained human-to-human transmission of this virus. The [WHO's Global Alert and Response website](#) [32] maintains the latest updates on the total number of cases .

[Disease Outbreak News DON\(s\)](#)  
[Avian influenza A\(H7N9\) virus](#)

### **Clinical Findings**

While the majority of influenza A(H7N9) cases have been older, with a median age is 60 years, and a majority of cases being male, the attribution risk to specifics of exposure among animal vectors versus host-based risk factors is uncertain [33]. Patients have most commonly presented with fever and cough, some patients also had diarrhea or vomiting (13.5%). On admission to hospital, almost all (97.3%) presented with pneumonia; predictors of severe illness appear to include age of 65 years or older and the presence of at least one coexisting medical condition, in addition to commonly observed laboratory abnormalities co-existing with more severe illness [33].

### **Prognosis and Clinical Course**

Accurate prognosis and descriptions of clinical outcomes of patients with H7N9 are critically dependent upon characteristics of case series described. In other outbreaks, early descriptions have understandably, been challenged by detection bias towards the most severely affected cases and accordingly, reported poorer outcomes than from a broader range of clinical case detection. In the largest published case series of 111 patients with laboratory-confirmed H7N9, 109 of whom were hospitalized, 76.6% were admitted to ICU. Moderate to severe ARDS was the most common complication, of which most were treated with invasive mechanical ventilation (58.6%) and of these, 18% received extracorporeal membrane oxygenation (ECMO). Other complications included shock, acute kidney injury and rhabdomyolysis. At the time of publication, approximately 27% had died, with another 22% remaining critically ill [33].

### **Therapy**

#### *Antiviral Therapy*

AMMI Canada has published guidance on the use of antiviral drugs for avian influenza A(H7N9) entitled *Interim Guidance for Antiviral Prophylaxis and Treatment of Influenza Illness due to Avian Influenza A(H7N9) Virus*. Antiviral therapy should not be delayed while waiting for laboratory confirmation of the infection. Avian influenza A (H7N9) is susceptible to NAIs (e.g. oseltamivir and zanamivir) but resistant to M2 ion channel blockers (e.g. amantadine). Antiviral treatment with oseltamivir or zanamivir is recommended at the time a diagnosis of avian influenza A(H7N9) is suspected, probable or confirmed, even for apparently uncomplicated influenza –like illness (ILI) in a healthy patient.

Further details, including a clinical algorithm can be found on AMMI Canada's guidelines page at: <http://www.ammi.ca/guidelines> [2]

#### *General Therapy*

Supportive therapy remains the mainstay of treatment for patients with influenza A (H7N9), and is characterized by early recognition of ILI and antiviral therapy. Severe Influenza A(H7N9) has been commonly associated with complications requiring specific therapy, including hypoxia and ventilatory insufficiency treated with oxygen and lung-protective positive pressure ventilation, hypotension with intravenous fluids and vasoactive medications to maintain organ homeostasis, and vigilance for secondary injury such as secondary bacterial infection with antibiotics, and renal replacement therapy



for kidney failure [26]. High-dose systemic corticosteroids are not recommended due to their association with prolonged viral shedding in patients with H7N9, and worse clinical outcomes in patients with non-H7N9 influenza [34].

### **Infection prevention and control precautions**

The Public Health Agency of Canada has developed infection prevention and control guidance for acute care settings, specific to the avian influenza A(H7N9) virus [35]. Initiate and adhere to routine practices, contact and droplet precautions should be implemented empirically (i.e. gloves, gowns when entering patients room/cubicle and facial protection when within 2 metres of patient) and airborne precautions for aerosol-generating procedures (i.e. respirator and face/eye protection. Patient should be cared for in a single room if possible.

### **Further Study**

Advancements in knowledge of the biological and clinical features, risk factors, prevention and treatment of H7N9 will be hastened by ongoing rigorously conducted research and knowledge translation and exchange among investigators. Open-access research protocols, prepared by WHO and the International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC), are available for download at [www.prognosis.org/isaric](http://www.prognosis.org/isaric) [36].

## **MERS-CoV**

### **Epidemiology**

Globally, from September 2012 to date, WHO has reported 163 laboratory-confirmed cases of infection with MERS-CoV, including 71 deaths. For the latest updates on the total number of cases and deaths please visit the Global Alert and Response website <http://www.who.int/csr/outbreaknetwork/en/>. MERS-CoV cases have been identified in France, Germany, Italy, Jordan, Kuwait, Kingdom of Saudi Arabia, Qatar, Spain, Tunisia, United Arab Emirates (UAE), and the United Kingdom (UK). All the European and North African cases have had a direct or indirect connection to the Middle East. However, in France, Italy, Tunisia and UK, there has been limited local transmission among close contacts that had not been to the Middle East [37]. Laboratory investigations have demonstrated that camels can be infected with MERS-CoV but there is still insufficient information to precisely indicate the role camels and other animals may play in the transmission of the virus [38].

### **Clinical Characteristics**

The majority of MERS-CoV cases are older males. Most patients presented with severe acute respiratory disease requiring hospitalization and eventual mechanical ventilation or other advanced respiratory support. Pneumonia has been the most common clinical presentation, and classified ARDS in 12%. Additionally renal failure, pericarditis and disseminated intravascular coagulation (DIC) and shock have also occurred. Vomiting and diarrhea occur in one-third of cases [34] [37].

Atypical MERS-CoV presentation with absence of respiratory symptoms has been documented in the presence of comorbidity, notably immune suppression [11].

Limited data suggests that MERS-CoV can present as a co-infection with other viral pathogens. The identification of one causative agent should not exclude MERS-CoV where the index of suspicion may be high [11].

### **Prognosis and Clinical Course**

As with H7N9, accurate prognosis of outcomes are dependent upon full case reporting and detection bias towards the most severely affected cases requires ongoing reassessment during the outbreak. The median times from symptom onset to death is 11.5 days with a median duration of hospitalization to either discharge or death of 7.0 days and 9.0 days, respectively. One patient, treated with ECMO died 298 days after illness onset [37].

### **Therapy**

#### *Treatment of MERS-CoV*

No MERS-CoV virus-specific prevention or treatment (e.g. vaccine or antiviral drugs) of proven value is available. Public Health England, the International Severe Acute Respiratory Infection Consortium (ISARIC) and WHO have posted a treatment decision support tool and highlight convalescent plasma from survivors as the most promising potential treatment to evaluate [39]. Interferon, and protease inhibitors have potential clinical or *in vitro* effects but with potential side effects and should not be considered for use outside of an appropriately planned evaluation of effectiveness. Intravenous immune globulin has little or no evidence of clinical or *in vitro* and should not be considered for use outside of an appropriately planned evaluation of effectiveness. Corticosteroids, ribavirin +/- interferon have no evidence or either *in vitro* or clinical effect and have associated serious side-effects, and should not be considered for use outside of an appropriately planned evaluation of effectiveness.

#### *General Therapy*

The mainstay of MERS-CoV comprises supportive management of critically ill patients who have acute respiratory failure and septic shock as a consequence of severe infection and critical illness-associated complications.

### **Infection prevention and control precautions**

The Public Health Agency of Canada has developed infection prevention and control guidance for acute care settings, specific to the MERS-CoV [40]. Initiate and adhere to routine practices, contact and droplet precautions should be implemented empirically (i.e. gloves, gowns when entering patients room/cubicle and facial protection when within 2 metres of patient) and airborne precautions for aerosol-generating procedures (i.e. respirator and face/eye protection. There should be at least 2 metres separation between patients with suspected or confirmed MERS-CoV and all other patients and visitors. Patient should be cared for in a single room if possible.

Contact and droplet precautions for patients with MERS-CoV infection should be discontinued upon resolution of symptoms, or in accordance to provincial/territorial guidance or the organization's policy. Discontinuation of precautions should be made in conjunction with the infection prevention and control professional or delegate. Full details are available at <http://www.phac-aspc.gc.ca/erie/coronavirus/guidance-directives/nCoV-ig-dp-eng.php>

### **Conclusion**

While Canada has not yet experienced a known case of recent emerging causes of SARI, namely avian influenza A (H7N9) or MERs-CoV, with ever-increasing global connectedness and ease of travel, imported cases are a daily possibility, as are locally emerging or novel pathogens.

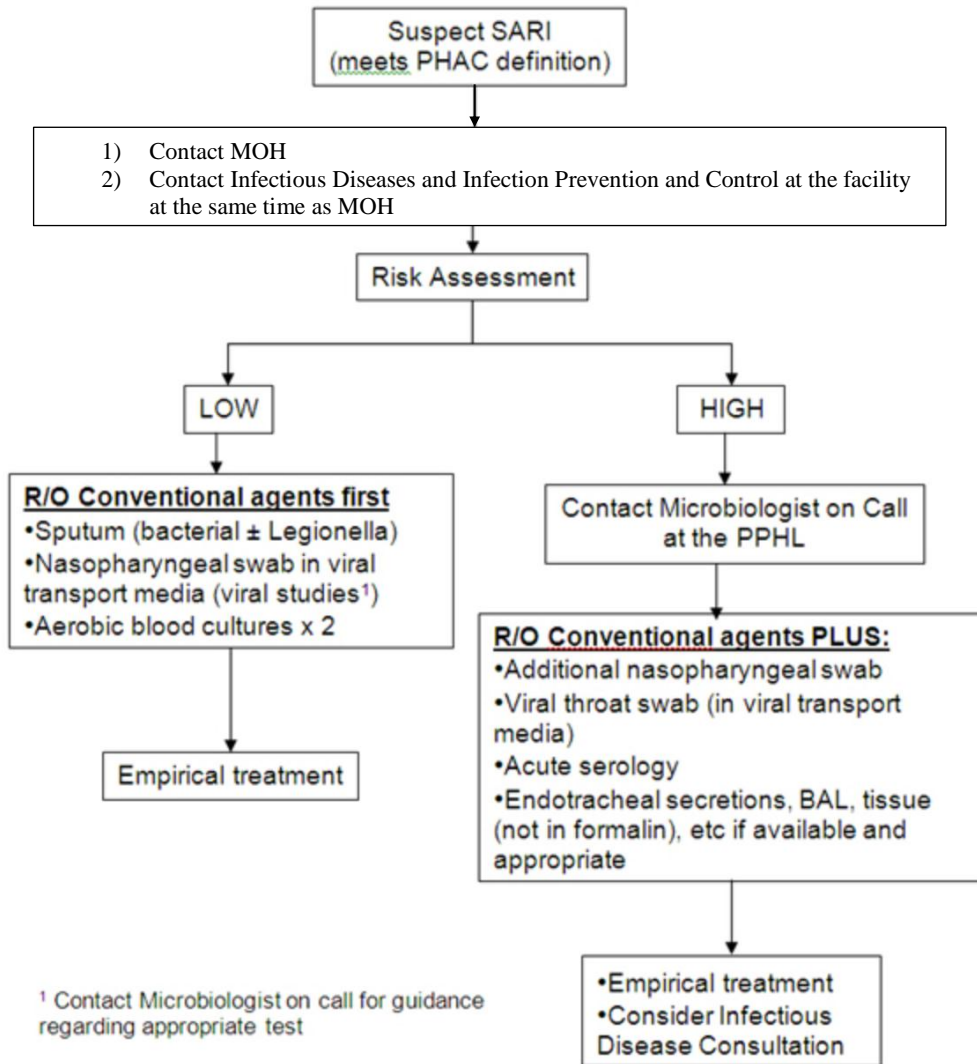
SARI represents and increasingly common consideration for critical care clinicians assessing and treating patients with respiratory insufficiency and critical illness.

Prepared on behalf of the Canadian Critical Care Society\*

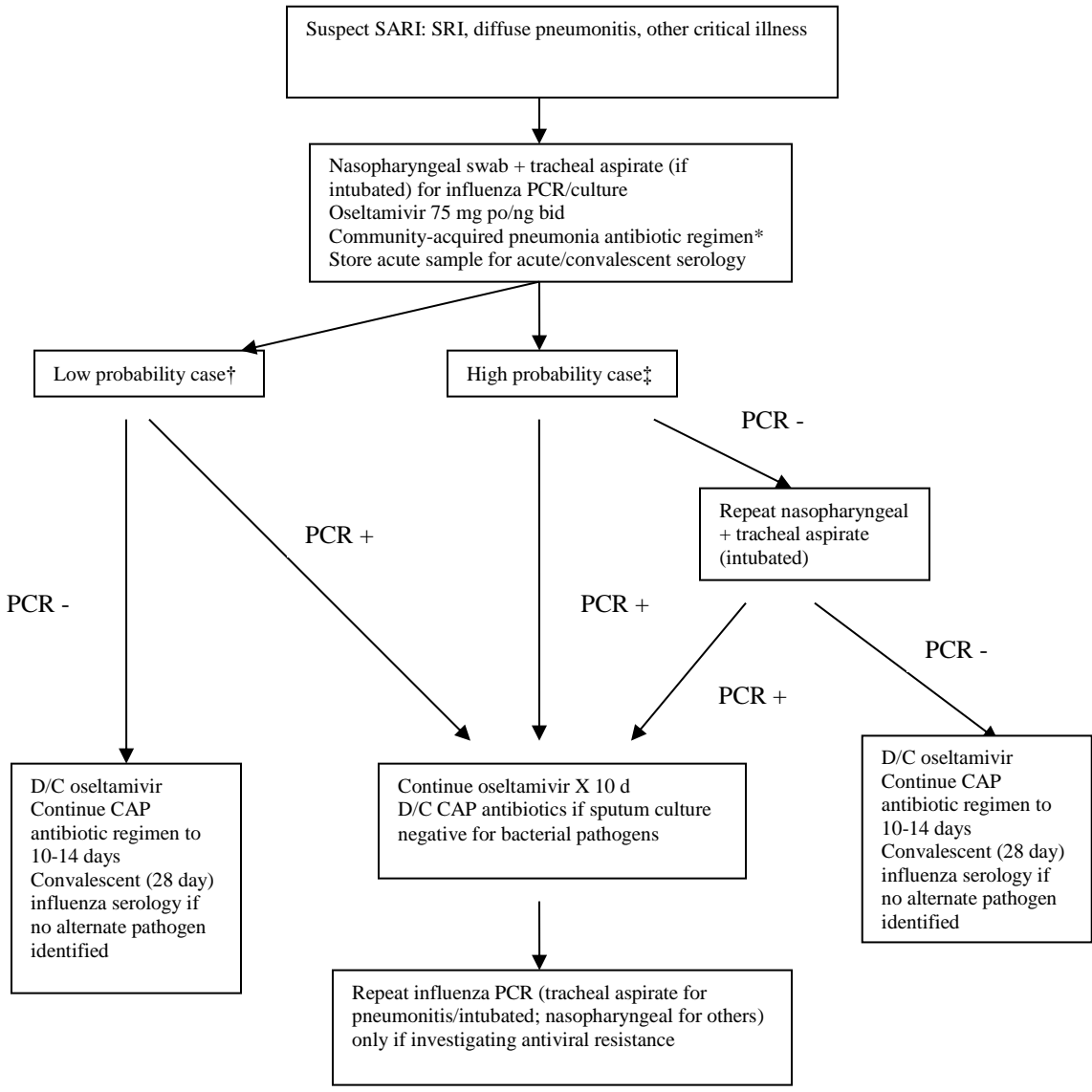
- All patients with signs and symptoms of possible SARI should be questioned about recent travel to, residence in or contact with sources for SARI-related novel and emerging infections.
- Clinicians should be aware of possible clusters in their region through communication with local ID experts and public health offices.
- Initial management should include appropriate infection prevention and control procedures, evidence-based supportive critical care and empiric antibiotic and antiviral therapy while awaiting diagnostic testing that is informed by local and regional public health officials.
- In the event that novel cases of SARI are detected in our intensive care units, clinicians should also support research into the epidemiology and management of these patients. The International Federation of Acute Care Trialists (InFACT) and the International Severe Acute Respiratory Infection Consortium (ISARIC) are two organizations in addition to the Canadian Critical Care Trials Group (CCCTG) that are supporting such research. Current information will be available on their respective websites.

Intensivists may be among the first to suspect and care for patients SARI, and hence, increasingly important public health agents for hospital and health care systems, in addition to providing life-saving patient-specific care.

Figure 1. Diagnostic Considerations when SARI is suspected - adapted [12]



**Figure 2: Clinical Management Recommendations for ICU**



\* recommended CAP antibiotic regimen should include a moderate to high level of activity for *Staphylococcus aureus*. Selection of antibiotics to cover methicillin-resistant *Staphylococcus* should be based on the prevalence of this organism in the community.

† Low probability case as per epidemiologic or clinical presentation

‡ High probability case as per epidemiologic or clinical presentation

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