

# Appendix A: Disease-Specific Chapters

**Chapter: Severe Acute Respiratory Syndrome (SARS)**

Effective: February 2019

# Severe Acute Respiratory Syndrome (SARS)

Communicable

Virulent

**Health Protection and Promotion Act:  
O. Reg. 135/18 (Designation of Diseases)**

## 1.0 Aetiologic Agent

SARS is caused by a coronavirus, called SARS-coronavirus (SARS-CoV) similar on electron microscopy to animal coronaviruses.<sup>1</sup> Coronaviruses are large, enveloped ribonucleic acid (RNA) viruses named after their corona- or crown-like surface projections observed on electron microscopy.<sup>2</sup>

## 2.0 Case Definition

### 2.1 Surveillance Case Definition

Refer to [Appendix B](#) for Case Definitions.

### 2.2 Outbreak Case Definition

The outbreak case definition varies with the outbreak under investigation. Please refer to the *Infectious Diseases Protocol, 2018* (or as current) for guidance in developing an outbreak case definition as needed.

The outbreak case definitions are established to reflect the disease and circumstances of the outbreak under investigation. The outbreak case definitions should be developed for each individual outbreak based on its characteristics, reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definition. The case definitions should be created in consideration of the outbreak definitions.

Outbreak cases may be classified by levels of probability (*i.e.* confirmed and/or probable).

## 3.0 Identification

### 3.1 Clinical Presentation

Early signs and symptoms of SARS are nonspecific and consistent with influenza-like illness.<sup>1</sup> Most common initial symptoms include a fever greater than 38°C (100.4°F), often accompanied by myalgia, malaise, chills, a non-productive cough, and rigor. After 2 to 7 days, this is followed by respiratory symptoms such as a dry cough, shortness of breath, difficulty breathing or hypoxia. In some cases, the respiratory symptoms become increasingly severe, and patients require oxygen support and mechanical ventilation.

Similar to other cases of atypical pneumonia, physical signs upon chest examination are minimal compared with radiological findings, which typically show ground-glass opacities and focal consolidations. Diarrhea is the most common extra-pulmonary manifestation.<sup>3</sup>

Cases can become severe quickly, progressing to respiratory distress coinciding with peak viraemia that occurs during the second week of illness (e.g., 10 days).<sup>1</sup>

Nearly all confirmed infected adult cases developed pneumonia or acute respiratory distress syndrome.

## 3.2 Diagnosis

See [Appendix B](#) for diagnostic criteria relevant to the Case Definitions.

**Note:** Serology and virology tests confirm SARS and include polymerase chain reaction (PCR), enzyme-linked immunosorbent assay (ELISA) and immunofluorescence assay (IFA); clinical specimens include clotted blood or serum for serology, nasopharyngeal swab (NPS) or NP aspirate, bronchoalveolar lavage (BAL)/bronchial washings and stools for viral RNA detection.

Clinical presentation and epidemiological evidence supports the diagnosis.

For further information about human diagnostic testing, contact the Public Health Ontario Laboratories or refer to the Public Health Ontario Laboratory Services webpage: <http://www.publichealthontario.ca/en/ServicesAndTools/LaboratoryServices/Pages/default.aspx>

## 4.0 Epidemiology

### 4.1 Occurrence

SARS is thought to have originated in the Guangdong province of China, with emergence into human populations sometime in November 2002. The 2002-2003 epidemic was characterized by outbreak worldwide including in Canada, Singapore, Viet Nam and China (originating in Guangdong Province and spreading to major cities in other areas, including Beijing, Taipei and the Special Administrative Region of Hong Kong).<sup>1</sup>

The disease spread internationally along major airline routes and resulted in 8,096 reported SARS cases in 29 countries with 774 deaths (9.6%).<sup>1</sup> The exposure settings for most cases were hospitals and among families and close contacts of hospital workers.<sup>1</sup>

As of September 5, 2003, 438 cases of SARS have been reported in Canada. The first Canadian cases were identified in March 2003 in people who had traveled to Hong Kong and returned to Canada. The majority of cases were in Ontario, but cases were also reported in British Columbia, Alberta, New Brunswick, Prince Edward Island and Saskatchewan.<sup>4</sup>

The last reported cases of SARS were in a cluster linked to a laboratory worker in China who was thought to have been infected in April 2004 at a laboratory where the virus was

being studied.<sup>1</sup> There has been no documented human-to-human transmission of SARS-CoV since 2004.<sup>1</sup>

## 4.2 Reservoir

The Himalayan masked palm civet (*Paguma Larvata*) is considered the main source of animal-to-human transmission of SARS-CoV. Cave-dwelling Chinese horseshoe bats are a reservoir of SARS-like coronaviruses that are closely related to those responsible for the SARS epidemic.<sup>1</sup> Data suggest SARS-CoV evolved from a natural reservoir of SARS-CoV-like viruses in horseshoe bats through civets or intermediate animal hosts in wet markets of China.<sup>2</sup>

## 4.3 Modes of Transmission

SARS is transmitted from person to person by close contact (i.e. within 2 metres) with infectious respiratory secretions or body fluids of a suspected case of SARS.

The SARS virus is thought to be transmitted most readily through respiratory droplets produced when an infected individual coughs or sneezes and possibly through fomites (inanimate objects including surfaces or objects contaminated with infectious droplets).

In one instance, the virus is thought to have been transmitted from person to person through some environmental vehicle, possibly aerosolized sewage or transport of sewage by mechanical vectors.<sup>1</sup>

## 4.4 Incubation Period

2-10 days (mean 5-6 days), with isolated reports of longer incubation periods.<sup>1</sup>

## 4.5 Period of Communicability

Not completely understood. Initial studies suggest that transmission does not occur before onset of clinical signs and symptoms, and that maximum period of communicability is less than 21 days.<sup>1</sup> Communicability is at its greatest from severely ill patients or those experiencing rapid clinical deterioration. Transmission usually occurs on or after the 5th day of illness, which coincides with peak viral load in nasopharyngeal secretions on around the 10th day of illness.<sup>3</sup>

Because of the physical stability of SARS-CoV, it can survive for 4 days in diarrheal stool samples with an alkaline pH, and it can remain infectious in respiratory specimens for over 7 days at room temperature.<sup>5</sup>

During the 2003 outbreak, health workers were at great risk of disease acquisition, especially before the diagnosis of SARS and when involved in aerosol-generating procedures such as intubations or nebulization.<sup>1</sup> In 2003, health care workers served as an entry point of the disease into the community in North America.

## 4.6 Host Susceptibility and Resistance

Unknown, but susceptibility is assumed to be universal. Race and gender do not appear to alter susceptibility. The clinical course appears to be much milder and shorter among cases less than 12 years of age.<sup>2</sup> In patients over 65 years of age the case-fatality rate exceeds 50%. SARS in pregnant women carries a significant risk of mortality.<sup>3</sup>

## 5.0 Reporting Requirements

As per Requirement #3 of the “Reporting of Infectious Diseases” section of the *Infectious Diseases Protocol, 2018* (or as current), the minimum data elements to be reported for each case are specified in the following:

- *Ontario Regulation 569* (Reports) under the *Health Protection and Promotion Act* (HPPA);<sup>6</sup>
- The iPHIS User Guides published by Public Health Ontario (PHO); and
- Bulletins and directives issued by PHO.

Please note that this disease requires immediate notification to the Ministry of Health and Long-Term Care (ministry). The reporting of this event will be notified to Public Health Agency of Canada (PHAC) and the World Health Organization under the International Health Regulations. Reporting of this disease is by phone and through the ministry during business hours by calling 416-327-7392. After-hours and on weekends and holidays please call the ministry’s Health Care Provider Hotline at 1-866-212-2272.

## 6.0 Prevention and Control Measures

### 6.1 Personal Prevention Measures

Measures:

- Since there is no SARS vaccine, the most effective measure to prevent SARS is to prevent transmission from infected persons to susceptible persons;
- All individuals presenting to a health care facility with symptoms of an acute respiratory infection (ARI) should receive information about, and the importance of, respiratory etiquette and hand hygiene; and
- Ensure early recognition and prevention of transmission of SARS-CoV and other respiratory viruses at the initial encounter with a health care facility using the assessment protocol including travel history found in Annex B of PIDAC’s Routine Practices and Additional Practices, Prevention of Transmission of Acute Respiratory Infection.<sup>7</sup>

### 6.2 Infection Prevention and Control Strategies

Strategies focus on the use of routine infection prevention and control practices in healthcare settings and among health care workers:

- All health care workers should be educated in regards to Routine Practices related to infection prevention and control.
- All health care workers should wear appropriate Personal Protective Equipment (PPE) when assessing patients with suspect acute respiratory infections.<sup>7</sup>

Educate health care staff about the importance of strict adherence to, and proper use of, routine infection prevention and control measures especially hand hygiene as well as isolation procedures and use of appropriate PPE.<sup>7</sup>

Encourage and maintain respiratory hygiene and cough etiquette in order to reduce transmission of all forms of respiratory pathogens, including SARS-CoV. Persons with signs and symptoms of respiratory infection should:<sup>7</sup>

- Cover their nose and mouth when coughing and sneezing;
- Use tissues to contain respiratory secretions;
- Dispose of tissue in the nearest waste receptacle after use; and
- Perform hand hygiene after contact with respiratory secretions and contaminated objects and materials.

Refer to PHO's website at [www.publichealthontario.ca](http://www.publichealthontario.ca) to search for the most up-to-date information on Infection Prevention and Control.

### 6.3 Management of Cases

In addition to the requirements set out in the Requirement #2 of the "Management of Infectious Diseases – Sporadic Cases" and "Investigation and Management of Infectious Diseases Outbreaks" sections of the *Infectious Diseases Protocol, 2018* (or as current), the board of health shall investigate cases to determine the source of infection. Refer to Section 5: Reporting Requirements above for relevant data to be collected during case investigation.

- Epidemiological investigation:
  - Symptoms and date of symptom onset;
  - Travel history;
  - History of exposure or risk factors;
  - Earliest and latest exposure dates;
  - Occupational history; and
  - Residency/attendance at a facility or institution.

Cases should not go to work, school, or other public areas until 10 days after fever and respiratory symptoms have resolved. During this time, infection prevention and control precautions for SARS patients should be followed.

For more information refer to the PHAC document, Public Health Management of SARS Cases and Contacts Interim Guidelines.

### 6.4 Management of Contacts

A contact is a person who cared for, lived with, or had direct contact with the respiratory secretions, body fluids and/or excretion of a probable or confirmed SARS case.<sup>1</sup>

- Contacts should be identified and traced by determining the following:
  - Patient's contact history during period of communicability;
  - Assessment of type and duration of contact and probability of transmission;
  - Identification of contacts for follow-up including patients with acute respiratory infection (ARI) or suspected ARI;
  - Occupational history; and
  - Residency/attendance at a facility or institution.

Management of asymptomatic contacts:

Contacts who were exposed but not symptomatic should be instructed to monitor themselves for symptoms and be advised of home isolation and medical evaluation if symptoms appear. Board of health staff should stress to the contact that fever is usually the first symptom.<sup>1</sup>

Management of symptomatic contacts:

- Immediate clinical investigation (including chest x-ray and laboratory investigation) at a site where appropriate infection prevention and control precautions can be ensured. Symptomatic contacts would be a probable or suspect case and would likely be hospitalized, and
- Monitor results of clinical investigation including radiographic evidence of infiltrates consistent with pneumonia or respiratory distress and laboratory results, which may result in a change of case status (i.e., change to “probable” or “confirmed” case or exclusion of the case based on determination of an alternative diagnosis that can fully explain the illness).

## 6.5 Management of Outbreaks

Please see the *Infectious Diseases Protocol, 2018* (or as current) for the public health management of outbreaks or clusters in order to identify the source of illness, manage the outbreak and limit secondary spread.

One confirmed case of SARS will constitute an outbreak.

For more information on management of respiratory outbreaks, please refer to the Provincial Infectious Diseases Advisory Committee (PIDAC) Annex B – Best Practices for Prevention of Transmission of Acute Respiratory Infection (2013, or as current).<sup>7</sup>

## 7.0 References

1. Heymann DL, editor. *Control of Communicable Diseases Manual*. 20 ed. Washington, D.C: American Public Health Association; 2015.
2. Committee on Infectious Diseases, American Academy of Pediatrics. Section 3: Summaries of Infectious Diseases: Coronaviruses, Including SARS and MERS. In: Kimberlin DW, Brady MT, Jackson MA, Long SS, editors. *Red Book: 2018 Report of the Committee on Infectious Diseases*. 31 ed. Itasca, IL: American Academy of Pediatrics; 2018.
3. Government of Canada. Pathogen Safety Data Sheets: Infectious Substances – Severe acute respiratory syndrome (SARS) associated coronavirus [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada; 2011 [updated September 8, 2011; cited July 31, 2018]. Available from: <https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/severe-acute-respiratory-syndrome-sars-associated-coronavirus.html>
4. Government of Canada. SARS - Severe Acute Respiratory Syndrome - Diseases and Conditions - Health Canada [Internet]. Ottawa, ON: Her Majesty the Queen

in Right of Canada; 2008 [updated July 8, 2008; cited July 31, 2018]. Available from: <https://www.canada.ca/en/health-canada/services/health-concerns/diseases-conditions/sars-severe-acute-respiratory-syndrome.html>

5. Cheng VC, Chan JF, To KK, Yuen K. Clinical management and infection control of SARS: lessons learned. *Antiviral Research*. 2013;100(2):407-19.
6. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018). Available from: <https://www.ontario.ca/laws/regulation/900569>
7. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Annex B: Best Practices for Prevention of Transmission of Acute Respiratory Infection. Annexed to: Routine Practices and Additional Precautions in All Health Care Settings. Toronto, ON: Queen’s Printer for Ontario; 2013. Available from: [http://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/Routine\\_Practices\\_Additional\\_Precautions.aspx](http://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/Routine_Practices_Additional_Precautions.aspx)

## 8.0 Document History

**Table 1: History of Revisions**

Revision Date	Document Section	Description of Revisions
January 2014	General	<p>New template.</p> <p><b>Section 9.0 Document History Added.</b></p> <p>Title of Section 4.5 changed from “Susceptibility and Resistance” to “Host Susceptibility and Resistance”</p> <p>Title of Section 5.2 changed from “To Public Health Division (PHD)” to “To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry”</p>
January 2014	3.2 Diagnosis	<p>Clinical specimens updated.</p> <p>Addition of direction to contact Public Health Ontario Laboratories or PHO website for additional information on human diagnostic testing.</p>

<b>Revision Date</b>	<b>Document Section</b>	<b>Description of Revisions</b>
January 2014	4.1 Occurrence	<p>Third paragraph revised to indicate that the last reported case of SARS occurred in China in 2004.</p> <p>Fourth paragraph revised to refer to the Ontario Annual Infectious Diseases Epidemiology Reports and the Monthly Infectious Diseases Surveillance Report for more information.</p>
January 2014	4.2 Reservoir	Changed from “unknown” to “Identification of the SARS coronavirus has been reported from raccoons, dogs, bats and humans”.
January 2014	4.3 Modes of Transmission	Close contact changed from “within 1 to 2 metres” to “within 2 metres”.
January 2014	4.4 Incubation Period	Changed from “3 – 10 days” to “2-10 days (mean 5 days), with isolated reports of longer incubation periods”.
January 2014	6.2 Infection Prevention and Control Strategies	Addition of reference to PIDAC IPAC best practices documents.

Revision Date	Document Section	Description of Revisions
January 2014	6.3 Management of Cases	<p>First sentence of fourth paragraph changed from “While receiving institutional health care, SARS-infected cases should be placed on droplet precautions.” to “While receiving institutional health care, SARS-infected cases should be placed on <b>"droplet/contact precautions", preferably in a single room, with a minimum of 12 air exchanges per hour"</b>”.</p> <p>The following two paragraphs were deleted:</p> <p>“There are no specific treatment recommendations for SARS. (The application of intensive supportive therapy and empirical antimicrobial therapy, to cover other infective agents is the usual approach).”</p> <p>“While ribavirin, corticosteroids, oseltamivir, protease inhibitors and other medications have been used in the treatment of SARS, thus far there is no consensus on an optimal treatment regimen.”</p> <p>First sentence of fifth paragraph changed from “Cases should not go to work, school, or other public areas until 10 to 14 days after fever and respiratory symptoms have resolved” to “Cases should not go to work, school, or other public areas <b>until 10 days after</b> fever and respiratory symptoms have resolved”.</p>
January 2014	6.4 Management of Contacts	<p>Section on identification and tracing of contacts revised.</p> <p>Section on management of asymptomatic contacts revised.</p>
January 2014	6.5 Management of Outbreaks	<p>Outbreak definition changed from “One suspected, probable or confirmed case of SARS will constitute an outbreak” to “One confirmed case of SARS will constitute an outbreak”.</p>
January 2014	7.0 References	Updated.

<b>Revision Date</b>	<b>Document Section</b>	<b>Description of Revisions</b>
January 2014	8.0 Additional Resources	Updated.
February 2019	General	Minor revisions were made to support the regulation change to Diseases of Public Health Significance, SARS is designated a disease of public health significance and is now classified only as communicable and not virulent. Common text included in all Disease Specific chapters: Surveillance Case Definition, Outbreak Case Definition, Diagnosis, Reporting Requirements, Management of Cases, and Management of Outbreaks. The epidemiology section and references were updated and Section 8.0 Additional Resources was deleted.
February 2019	3.1 Clinical Presentation	Entire section revised.
February 2019	4.1 Occurrence	Entire section revised.
February 2019	4.2 Reservoir	Entire section revised.
February 2019	4.5 Period of Communicability	Entire section revised.
February 2019	4.6 Host Susceptibility and Resistance	Removed sentence: "Because of the small number of cases reported among children, it has not been possible to assess the influence of age." Sentences added to the end of the paragraph: "In patients over 65 years of age the case-fatality rate exceeds 50%. SARS in pregnant women carries a significant risk of mortality."

