Interim Guidance: Public Health Management of Cases and Contacts Associated with Novel Coronavirus (COVID-19) in the Community

June 9, 2021
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Introduction

CONTEXT

The British Columbia Centre for Disease Control (BCCDC) has adapted the interim guidance from the Public Health Agency of Canada (PHAC) for Regional Health Authorities (RHA) for public health management of human illness caused by the novel coronavirus (COVID-19).

This guidance is based on currently available scientific evidence and expert opinion and is subject to change as new information on the clinical spectrum, transmissibility, and epidemiology becomes available. This guidance builds upon relevant Canadian guidance developed for the current and previous coronavirus outbreaks (e.g. MERS-CoV and SARS-CoV), in addition to available guidance from the World Health Organization (WHO). It should be read in conjunction with relevant provincial and local legislation, regulations and policies. This guidance has been developed based on the Canadian situation; therefore, may differ from guidance developed by other countries. For information regarding current global status of COVID-19, visit the BCCDC, Canada.ca and WHO Novel Coronavirus websites. This guidance is also based upon current knowledge and it should be understood that guidance is subject to change as new data become available and new developments arise with this new virus; furthermore, unique situations may require some discretion in adjusting these guidelines which are meant to be supportive, not prescriptive.

AUTHORITY

The authority for the control of communicable diseases, through case and contact management, including for COVID-19, exists under the BC Public Health Act (2008).

GOAL

The objectives of this guideline are:

- Promote prompt identification and reporting of probable and confirmed cases of COVID-19 and contact
- Management of cases and contacts
- Supplement existing guidelines provided by the Public Health Agency of Canada related to case and contact management in the community
THE PATHOGEN

Coronaviruses have been identified as human pathogens since the 1960s. To date, seven coronaviruses have been shown to infect humans, including SARS-CoV-2 (1). Common coronaviruses include OC-43, HKU1, 229E, NL63; these cause illnesses ranging from common colds to severe respiratory illnesses. Other coronaviruses have emerged in recent years: SARS-CoV (2002) and MERS-CoV (2012). In late 2019, a novel coronavirus, SARS-CoV-2, was identified as the causative agent of a cluster of pneumonia cases (COVID-19) in Wuhan, China.

There are a number of emerging variants of SARS-CoV-2 of public health importance being identified that may have implications related to transmission dynamics and vaccine effectiveness. Further information on variants of public health concern can be found in Appendix 5.

For the purpose of this guideline, confirmed or probable cases are considered cases. The updated case definitions can be found here.

CLINICAL ILLNESS

COVID-19 presents with varied clinical features, as listed in Table 1 from the Public Health Agency of Canada (2). Symptoms absent at the onset of illness may develop over time with disease progression. Based on available data, neither the absence nor presence of signs or symptoms are accurate enough to rule disease in or out (3). As such, confirming the diagnosis via laboratory testing is important; therefore, people suspected of having COVID-19 should be tested. People should always be encouraged to seek medical consultation if experiencing new or worsening symptoms.

The BCCDC COVID-19 Symptoms page provides a list of key symptoms that are more likely related to COVID-19.

The BCCDC page on vulnerable populations provides more information on risk factors for severe COVID-19 illness and death and other priority populations.

Many symptoms are present in other diseases. Clinical symptoms of COVID-19 may be mild or severe, with about 1 out of 6 infected people showing no symptoms (4-8). In Canada, children have been found to be asymptomatic in up to 36% of cases (9). For children, a cough and runny
nose were the two most common symptoms; however, they were also common among those with negative test results and cannot be interpreted as predictive symptoms (9). The loss of smell and taste, nausea/vomiting, headache and fever were the most predictive symptoms in children.

Children might have their first identification of a COVID-19 infection when developing the Multi-system inflammatory syndrome in children and adolescents (MIS-C). MIS-C is reportable in BC with the case definition found here. MIS-C may begin weeks after a child is infected with SARS-CoV-2 (10). The child may have been infected from an asymptomatic contact, and, in some cases, the child and their caregivers may not even know they had been infected.

An evidence review from the PHAC suggests the time from infection to MIS-C to be between 15 to 24 days (11). The delay in onset is further supported by low positivity rates (<50%) using RT-PCR compared to IgG serology (>75%). This suggests that MIS-C is often a post-infection syndrome, having a delayed onset after the acute COVID-19 infection.

Up to March 6, 2021, in British Columbia, 5% of confirmed cases of COVID-19 have required hospitalization, and 2% of cases have resulted in death (12).

Table 1. Reported frequency of symptoms from the Public Health Agency of Canada:

<table>
<thead>
<tr>
<th>More frequent (&gt;50%)</th>
<th>Less frequent (&lt;50%)</th>
<th>Rare (&lt;10%)</th>
</tr>
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<tbody>
<tr>
<td>• Fever (44-91%)</td>
<td>• Sputum production (28–33%)</td>
<td>• Confusion</td>
</tr>
<tr>
<td>• Cough (57-74%)</td>
<td>• Muscle aches (11–44%)</td>
<td>• Runny nose</td>
</tr>
<tr>
<td>• Shortness of breath (31–63%)</td>
<td>• Chest pain (16-36%)</td>
<td>• Fainting</td>
</tr>
<tr>
<td>• Fatigue (31–70%)</td>
<td>• Diarrhea (5-24%)</td>
<td>• Skin manifestations</td>
</tr>
<tr>
<td>• Loss of appetite (39-84%)</td>
<td>• Nausea/vomiting (5-19%)</td>
<td></td>
</tr>
<tr>
<td>• Loss of smell and/or taste (54-88%)</td>
<td>• Headache (6-70%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Dizziness (9-17%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sore throat (11-13%)</td>
<td></td>
</tr>
</tbody>
</table>

**IMMUNE RESPONSE TO NATURAL INFECTION**

Following infection, more than 90% of individuals will develop IgM and IgG antibodies within weeks of symptom onset(13). As stated by the Public Health Agency of Canada guidelines, the relationship between antibody levels and the level of protection against reinfection remains
undetermined, as well as the role of cellular immunity in preventing reinfection (including cross-protective immunity following exposure to common coronaviruses).

REINFECTION

However, this might be affected by the emergence of variants of concern with mutation enabling immune escape.

As explained by the US CDC (14), "Reinfection with a SARS-CoV-2 variant virus has been reported in Brazil, the U.K., and South Africa. The risk of reinfection may be increased in the future with exposure to SARS-CoV-2 variant virus strains that are not neutralized by immune antisera, such as one recently described in South Africa." The risk of reinfection also depends on the nature of exposure to an infectious case of COVID-19. The use of prevention strategies can lower the risk of transmission and reinfection.

A recent PHAC review indicates that the time to reinfection can vary from 15 days to more than 220 days, with a median time to reinfection below between approximately 60 to 80 days (15). For confirmed reinfection, studies suggest the risk is decreased by more than 95%, while studies of suspected reinfection suggest 83 to 94% protection. Most studies conclude that the vast majority of individuals with prior infection are at very low risk of reinfection in the first 6 months, and likely protected for longer.

Some studies indicate the relative risk of reinfection is significantly lower in those with detectable antibodies, even several months after infection (16, 17). Those who did not seroconvert may not have the same degree of protection from reinfection as those with high titers of antibodies; older age, duration of symptoms, and the number of symptoms correlate with higher IgG responses after primary infection, while an immune-compromised status, and older age in some studies, is correlated with a lower antibodies response.

There are too few cases to determine the clinical presentation in a second infection and how it may differ. To date, there has not been any evidence of antibody-dependent disease enhancement observed.

As serological testing for the detection of SARS-CoV-2 antibodies becomes more widely available, the results are expected to provide further insight into the questions on reinfection and the duration of immunity. BC CDC guidelines for serological testing are found here.

Guidance for repeated PCR testing in individuals previously positive for COVID-19 provides considerations on repeating PCR testing in individuals previously found to have COVID-19.
INFECTION PREVENTION AND CONTROL

COVID-19-specific IPC guidance has been developed for acute health care settings and can be found on the [BCCDC website](#).

INCUBATION PERIOD

The incubation period is the time interval between initial contact with an infectious agent and the appearance of the first sign or symptom of the disease in question. The incubation period for COVID-19 is believed to be 2-14 days, with a median of 5 to 7 days. A very small proportion of individuals would still be incubating at 14 days, likely about 1%, perhaps up to 6.7% (18). There was some evidence that the average incubation period may be longer for children and older adults than adults, with the longest incubation period reported to be 32 days.

Some individuals could develop their infection after the end of their quarantine. Some individuals can be infectious even at the end of their quarantine without knowing it because they are asymptomatic, pre-symptomatic or very mildly symptomatic.

EPIDEMIOLOGY

The British Columbia Centre for Disease Control (BCCDC) has developed a [COVID-19 dashboard and produces weekly situation reports](#) that provide a more in-depth look at COVID-19 epidemiology.

TRANSMISSION

HUMAN TO HUMAN TRANSMISSION

- Contact/Droplets and aerosols [droplets vary in size from large droplets that fall to the ground rapidly [within seconds or minutes], to smaller droplets [i.e., aerosols] which linger in the air under some circumstances, such as within settings with poor ventilation] (19)
- Fomites (duration of virus survival on surfaces could be days)
- Consider potential fecal-oral transmission
The BCCDC page that discusses how COVID-19 is spread for the general public is found here.

**ZOONOTIC TRANSMISSION**

At this time, there is evidence that cats, dogs, ferrets, gorillas, and minks can naturally acquire SARS-CoV-2 infections from contact with human COVID-19 cases and can develop clinical signs. Onward transmission to other animals has been noted in cats, ferrets and minks. Dogs are considered to have low susceptibility to SARS-CoV-2.

Appendix 4 provides more details, including information on the management of companion animals when a pet owner has been diagnosed with COVID-19, or when animals are visiting or residing in a facility affected by COVID-19, as well as animal testing guidelines. It also provides some information about mink farms and SARS-CoV-2.

**PERIOD OF COMMUNICABILITY**

The period of communicability is the time during which an infectious agent may spread directly or indirectly from an infected person to another person, from an infected animal to human, or from an infected person to animal—also known as the 'infectious period'.

At this time, there is no evidence to suggest that the period of communicability is different in the pediatric population compared to the adult population. Therefore, public health follow-up in pediatric cases mirrors that of adult cases.

Please use the definitions provided in the next section to determine the severity of COVID-19 illness and level of immune compromise; both factors influence the length of an infected person's infectious period.

**DEFINITIONS OF ILLNESS SEVERITY AND IMMUNE COMPROMISE**

For the purpose of determining the infectious and isolation period, we use the definitions below, aligned with updates to the Guidance for Discontinuing Additional Precautions Related to COVID-19 for Admitted Patients in Acute Care and in High-Risk Outpatient Areas, available here. For evidence related to the period of communicability, please go to Appendix 8.
COVID-19 Illness Severity Criteria (applies to children and adults)

Asymptomatic illness: Cases with no COVID-19 compatible symptoms at the time of testing, and who do not develop symptoms during their isolation (if they develop compatible symptoms, they should be reclassified in the appropriate category based on severity of illness)

Mild to moderately severe illness: Cases that do not reach the threshold for severe illness. If a patient was admitted to the hospital for reasons unrelated to their COVID-19 illness, they should not automatically be considered as having severe COVID-19 illness.

Severe to critical illness in adults: Individuals for whom COVID-19 causes any one of the following: experienced oxygen saturation below 94% on room air, pneumonia, hypoxemic respiratory failure, multiple organ dysfunction, or septic shock(20, 21), hospitalized because of the severity of COVID-19 illness (hospitalization in those who have COVID-19 can be for other reasons than COVID-19 severity of illness, e.g. for a surgical procedure, for relief of LTC capacity, for another medical condition...).

Level of immune compromise

Mildly immune compromised: Those with mild immune compromising conditions, such as diabetes, advanced age, and end-stage renal disease are treated the same as those without immune compromising conditions.

Moderately immune compromised (22, 23): – individual with one or more of the following:

- Persons on chemotherapy for solid organ cancer (as determined by the most responsible physician (MRP))
- Human Immunodeficiency Virus (HIV) with a CD4 count of 50 - ≤200 cells/mm³ (inclusive)
- Any person taking a biologic/immunomodulatory therapy, prednisone of >20 mg/day (or equivalent dose) for ≥14 days, tacrolimus, sirolimus, mycophenylate, methotrexate, or azathioprine

Based on their clinical judgement, MRPs may determine that there are other diagnoses and/or medications not listed above that support considering patients as moderately immune compromised. Consult an infectious disease specialist as needed.

Severely immune compromised (23-27): individuals with one or more of the following (in consultation with the most appropriate care provided if needed):
- Bone marrow transplant
- Chronic lymphocytic leukemia
- Lymphoma
- Hypogammaglobulinemia
- Human Immunodeficiency Virus (HIV) with a CD4 count of < 50 or AIDS
- Chimeric antigen receptor T-cell therapy
- Use of rituximab

There may be other diagnoses or a combination of diagnoses and/or medications that support considering patients as severely immune compromised. Current evidence may not have demonstrated prolonged live viral shedding with such diagnoses and/or medications yet. Thus, clinical judgement remains important to determine if these patients should be considered as severely immune compromised to determine their communicability period.

**Period of communicability**

*Cases with asymptomatic illness*

In general, the duration of infectiousness is from 48 hours before a COVID-19 positive sample was taken until 10 days after the sample was taken. Since the exact start of the infection is difficult to establish in asymptomatic cases, some case-by-case assessment is warranted. Sometimes, an earlier onset of infectiousness date may be considered to identify further potential exposures, especially if someone has been in a high-risk setting. If the case is immune compromised, the infectious period is longer, and extends generally to 20 days after testing.

*Cases with mild to moderately severe illness, and who are not immune compromised, or only mildly immune compromised*

From 48 hours prior to onset of symptoms to 10 days after onset of symptoms (see Clinical Illness). All possible symptoms should be considered, with particular attention to those that may be mild and/or nonspecific (e.g., fatigue, muscle pain) and those less common.

*Cases with severe or critical illness, or moderately immune compromised*

From 48 hours prior to onset of symptoms to 20 days after onset of symptoms (see Clinical Illness). All possible symptoms should be considered, with particular attention to those that may be mild and/or nonspecific (e.g., fatigue, muscle pain) and those less common.

*Cases who are severely immune compromised*
From 48 hours prior to onset of symptoms to potentially more than 20 days after onset of symptoms. In those individuals, it is recommended to consult with a Medical Health Officer and a test based strategy might be recommended to determine the most likely end to the infectious period.

Based on their clinical judgement, most responsible physicians in consultation with Infectious Disease, Medical Microbiology or IPC, may determine that there are other diagnoses and/or medications not listed above that warrant considering patients as moderately or severely immune compromised. In those cases, in acute care or in high-risk outpatient settings, a test-based strategy might be used to cease the use of additional precaution. When this occurs, as part of discharge planning, consultation with an MHO is recommended.

**DIAGNOSTIC TESTING**

B.C. is conducting COVID-19 diagnostic testing for patients who need it with compatible symptoms, however mild; see Appendix 6 for more details on testing considerations, including lower threshold, and asymptomatic testing.

Up to date laboratory testing guidelines for clinical purposes can be found on the [BCCDC Health Professionals page](https://www.bccdc.ca). These guidelines are not meant to direct public health practice related to testing.

Medical Health Officers may recommend testing for individuals who are part of a public health investigation of a case, cluster or an outbreak, regardless of symptom profile.

For those who have had close contact with a COVID-19 case, and have even a single of the specific symptom included in the testing guidelines, testing is recommended.

Asymptomatic testing is not routinely recommended, but can be useful in specific circumstances as determined by the Medical Health Officer. [Canadian guidelines](https://www.canada.ca/en/public-health/services/diseases/coronavirus-covid-19/public-health-professionals/coronavirus-covid-19-testing.html) suggest that asymptomatic testing of close contacts may be warranted to interrupt more chains of transmission.

A discussion with a Medical Health Officer (MHO) is warranted when considering asymptomatic testing.
Point-of-care (POC) testing may assist in addressing the gaps in access to timely COVID-19 testing. Use of POC testing continues to be evaluated in the COVID-19 response, as well as the role of serology and genomic testing. POC testing has different sensitivity and specificity compared to nucleic acid tests widely used so far. Some may need confirmatory testing. General guidelines for testing can be found here, and POC testing guidelines will be added as needed.

SURVEILLANCE AND REPORTING

The Public Health Agency of Canada updated its case definition in early 2021, leading to an update in the BC case definitions. These case definitions can be found on the BCCDC website on the Case Definitions page, clicking on the COVID-19 link. Revised case definitions adjust the confirmed and probable criteria and include point-of-care and serological testing considerations.

Front line health care providers must notify local public health of any confirmed and probable cases. Local public health reports confirmed and probable cases to BCCDC via Panorama or the COVID-19 case report form within 24 hours of identification. Updates to information on the case report forms should be submitted to BCCDC within 24 hours of changes to case classification, information collected in the hospitalization section, or outcome (hospitalized, fully recovered, fatal, etc.). For health authorities entering data directly into Panorama within these timelines, entry into Panorama is sufficient notification. BCCDC will report confirmed and probable cases of COVID-19 nationally to the PHAC within 24 hours of notification.

Health authorities are asked to inform BCCDC of situations that can assist in the surveillance of variants, including potential variants not previously recognized. Situations that warrant informing BC CDC include:

- Severe rapidly spreading outbreaks or unusual outbreaks
- Severely immune compromised cases with a long period of COVID-19 symptomatic disease
- Infection confirmed in individuals who have received at least one dose of vaccine, and they received their first dose more than 14 days prior to the start of their infectious period.
- Suspected reinfection
INTERJURISDICTIONAL NOTIFICATIONS

In some instances, cases or contacts of cases are identified with epidemiological linkages that span two or more jurisdictions between provinces/territories or other countries. Regional health authorities should send these notifications to the BCCDC (covid@bccdc.ca) to enable timely case and contact management. Examples where this may be required include when a case travelled between jurisdictions during their communicable period or when contacts reside in a different jurisdiction than a case. This notification should include the following:

**Notification for a case:**
- Name:
- Address/city of residence:
- Phone number:
- Infectious period:
- Include lab report

**Notification for a Contact:**
- Name:
- Address/city of residence:
- Phone number:
- Exposure date(s):
- Nature of contact:

PUBLIC HEALTH MANAGEMENT OF CONFIRMED AND PROBABLE CASES

Public Health will provide overall coordination with health care providers and the BCCDC Public Health Laboratory for the public health management of the case and establish communication links with all involved health care providers for the full duration of the public health recommended observation and isolation period.

If a case lives in a First Nations community, lives off-reserve and receives services in a First Nations community, or has identified contacts within a First Nations community, the COVID-19 Adapted Regional Health Authority - First Nations Health Authority Communicable Disease Protocol provides information on the roles, responsibilities and activities of the First Nations Health Authority and the regional Health Authorities to guide the collaborative follow-up of such individuals.

Based on clinical need, hospital admission may be recommended for a case whose clinical condition requires acute care to ensure effective isolation and appropriate monitoring of illness. If transferring a case from the community to an acute care facility, it will be important to
CLINICAL MANAGEMENT

Guidance on the clinical management of people with COVID-19 can be found at:

CASE MANAGEMENT IN THE COMMUNITY

In the event that a case is being managed in the community (e.g., in situations where hospitalization is not feasible or necessary) the following measures and activities are recommended:

- A case should remain isolated at home or in a suitable alternative environment if isolating at home is not possible (see Appendix 1 for self-isolation considerations).
- A case should be instructed to isolate in a room alone as much as feasible. If it is unavoidable to be in the same room as someone else, the case and the other(s) in the room should wear a well-constructed and well-fitting non-medical mask over their nose and mouth, keep a 2 meter distance from others, and promote good ventilation in that space.
- Local public health to conduct active daily monitoring of the case's health status for illness duration as long as feasible based on available resources. An active daily monitoring form has been developed for local public health to follow a case in the community.
- Provide public health advice to the case about measures recommended on the BCCDC self-isolation website to prevent spreading COVID-19, and protective measures to household (or co-living setting) contacts or their caregivers. There are scenarios where someone with COVID-19 has to take care of dependents or people with COVID-19 need care from someone who does not have COVID-19, and maintaining a 2-meter distance or wearing masks might not be feasible. Children’s psychological needs still need to be tended to, including physical contact and comfort from a caregiver. It might also be impossible to prevent interaction between young siblings. Please refer to the section on CONTACT IDENTIFICATION AND MANAGEMENT for specific considerations for caregivers and dependents, as well as to Appendix 1 with self-isolation considerations.
CEASING ISOLATION OF CASES

International travellers must adhere to the requirements of the Quarantine Act. Note: self-isolation recommendations extend beyond 14 days for certain circumstances, including a case diagnosed after their first day of quarantine, as outlined in the Act. See Appendix 2.

This section provides general guidance on criteria for ceasing isolation. The decision to discontinue isolation should be made by local public health in collaboration with the responsible health care provider(s), if needed, based on the potential risk of transmission to others. Public health will determine when isolation ends for cases managed in the community, including for the purpose of attending most medical appointments, in most settings. Particularly high-risk settings will have specific guidance (e.g. dialysis units). Health care providers can consult infection prevention and control practitioners and collaborate with public health, if relevant; to ensure appropriate infection prevention and control measures are applied. See COVID-19 infection prevention and control guidelines for health care professionals in general and discontinuation of precaution.

Table 2: General criteria for ceasing isolation of cases that are not under a federal quarantine order – to use in conjunction with the definitions in the infectious period section.

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
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| Asymptomatic, mild or moderate illness | a. At least 10 days have passed since onset of symptoms (or test date for asymptomatic cases); AND 
   b. Fever has resolved for 24 hours without use of fever-reducing medication; AND 
   c. Symptoms (respiratory, gastrointestinal, and systemic) have improved |
| Severe or critical illness, and those who are moderately immune compromised | a. Twenty days have passed since onset of symptoms (or test date for asymptomatic cases) AND 
   b. Fever has resolved for 24 hours without use of fever-reducing medication; AND 
   c. Symptoms (respiratory, gastrointestinal, and systemic) have improved |
| Severely immune compromised | Those who are severely immune compromised can cease isolation when determined by the Medical Health Officer, at least 20 days, potentially longer; consider a test-based strategy. |
Coughing may persist for several weeks and does not mean the individual is infectious and must self-isolate.

Additional factors that should be considered about the individual when determining the end of isolation include:

- Whether the person is confirmed to be infected with a variant of concern with different transmission dynamics
- What are the activities of the recovering person
- If the person has close contact with vulnerable populations (e.g., seniors, immunocompromised)
- The person’s ability to follow infection prevention measures (e.g., hand hygiene etc.)
- Their potential risk of understaffing in health care facilities
- Other individual and situation-specific factors

**Test-based cessation of isolation**

In general, repeat laboratory testing (e.g. a negative test result) as the basis for discontinuing home isolation is not recommended. In exceptional circumstances, a test-based strategy might be considered, at the discretion of the MHO, in the community. In health care settings, the decision would be based on the Discontinuation of Precaution guidelines, available [here](#), while other Infection Control Guidelines are available [here](#). Based on their clinical judgement, most responsible physicians in consultation with Infectious Disease, Medical Microbiology or IPC, may determine that there are other diagnoses and/or medications that warrant considering a test-based strategy to cease the use of additional precaution. When this occurs, as part of discharge planning, consultation with an MHO is recommended.

**Table 2b. Test-based cessation of isolation**

<table>
<thead>
<tr>
<th>Symptomatic patients</th>
<th>Asymptomatic patients**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with severe COVID-19 illness and/or who are moderately immune compromised, and for whom ceasing isolation prior to 20 days is critical:</td>
<td>Patients who are moderately immune compromised, and for whom ceasing isolation prior to 20 days is critical:</td>
</tr>
<tr>
<td>a. At least 10 days have passed since onset of symptoms¹ AND</td>
<td>a. At least 10 days have passed since the date of the first positive COVID-19 test AND</td>
</tr>
<tr>
<td>b. At least 24 hours have passed since last fever without the use of fever-reducing medication AND</td>
<td>b. Symptoms did not develop after the first positive test THEN re-test</td>
</tr>
<tr>
<td>c. Symptoms (respiratory, gastrointestinal and systemic) have improved⁰</td>
<td>c. Two consecutive negative nasopharyngeal (NP) specimens collected at least 24 hours</td>
</tr>
</tbody>
</table>

¹Symptom definition and duration vary by age and underlying health conditions.  
²Recovery does not mean that a person is no longer contagious, and infectiousness may persist for several weeks.  
³This parameter may be removed if the person has been confirmed to be infected with a variant of concern with different transmission dynamics.  
⁰This parameter may be removed if the person has been confirmed to be infected with a variant of concern with different transmission dynamics.
| Test-based strategy | THEN re-test  
|---------------------|-------------------
| d. Two consecutive negative nasopharyngeal (NP) specimens collected at least 24 hours apart\(^{iii}\) | Patients who are severely immune compromised:  
| a. At least 20 days have passed since onset of symptoms\(^{i}\) AND  
| b. At least 24 hours have passed since last fever without the use of fever-reducing medication AND  
| c. Symptoms (respiratory, gastrointestinal and systemic) have improved\(^{i}\) THEN re-test  
| d. Two consecutive negative nasopharyngeal (NP) specimens collected at least 24 hours apart\(^{iii}\) | Patients who are severely immune compromised:  
| a. At least 20 days have passed since the date of the first positive COVID-19 test AND  
| b. Symptoms did not develop after the first positive test THEN re-test  
| c. Two consecutive negative nasopharyngeal (NP) specimens collected at least 24 hours apart\(^{iii}\) |

\(^{i}\) If unable to determine date of symptom onset, use collection date of initial positive laboratory result as the date of symptom onset.

\(^{ii}\) Improvement does not necessarily apply to pre-existing or chronic respiratory symptoms known to be caused by another etiology. Coughing may persist for several weeks and does not mean the patient is infectious and must remain on additional precautions, providing that the patient is afebrile and other symptoms have improved.\(^{i}\)

\(^{iii}\) Consult a Medical Health Officer when:

- An individual refuses repeat testing, or if a NP specimen cannot be collected
- the initial specimen that tested positive was not a NP swab to determine what type of specimen is needed for repeat testing
- the repeat test result is positive to get guidance on when to re-test again. The individual should remain in isolation until then.

In individuals with persistently positive COVID-19 test results (e.g., individuals whose symptoms have resolved, but polymerase chain reaction testing still indicates the presence for virus RNA), consult a medical health officer and potentially a medical microbiologist. Based on their organizational risk assessment, health authorities may choose to identify a specific time period for when additional precautions can be discontinued for patients who persistently test positive.

Ct values of laboratory specimens may also be considered to determine when repeat testing should be done. This should only be done in consultation with a medical microbiologist.
CONTACT IDENTIFICATION AND MANAGEMENT

OBJECTIVES OF CONTACT TRACING

For the purpose of this section, a case refers to a confirmed or probable case.

It is important to identify and manage the contacts of a COVID-19 case as soon as possible, as this underpins the effectiveness of contact tracing (18). Several objectives may be achieved through contact management activities by regional health authorities, including:

1. To facilitate rapid identification of new cases and reduce community transmission by:
   o Identifying contacts of the case;
   o Testing contacts as per jurisdictional parameters;
   o Isolating any secondary confirmed, or probable cases as quickly as possible;
   o Advising all contacts at high risk of exposure to quarantine (self-isolate) if applicable, and providing them with information regarding infection prevention and control measures they should follow; and
   o Providing contacts with the information about what symptoms to self-monitor for and what to do if they develop symptoms, as well as any other relevant instructions specific to their situation.

2. To identify additional individuals or events as potential exposure sources and subsequently additional cases and/or chains of transmission (see Backward Contact Tracing below).

3. To gain a better understanding of the epidemiology of this coronavirus.

CONTACT MANAGEMENT

Contacts of a case should be identified and managed as per the recommendations in this document, where feasible based on public health resources. The level and intensity of public health actions may vary among health authorities according to the local epidemiology of COVID-19 at a given time. Alternative contact management strategies that health authorities may consider when resources are constrained are detailed in Appendix 7. This guidance will be updated as evidence emerges.
Contacts are mostly managed by the level of risk of the COVID-19 exposure and their immunity against infection. Since quarantine has negative social and economic impacts, we must ensure that self-isolation requirements are necessary and that the benefits outweigh the harms. There is a high and growing proportion of the general population who has received at least one dose (more than 74% of the adult population and 39% of those 12 to 17 years old as of June 6, 2021). This means that more contacts, including household contacts, are at least partially protected against COVID-19. There is increasing scientific evidence, especially for mRNA vaccines, that they offer substantial protection against developing even an asymptomatic infection, including after one dose. There is also evidence that when someone develops COVID-19 after being immunized, that individual transmit less to its contacts. A summary of the evidence is presented in Appendix 7.

For contacts who are deemed fully immunized or have had a recent prior COVID-19 infection, recommendation for the high risk/close contact exposure category still applies, but quarantine is replaced with self-monitoring for the 14 days after the last exposure. For contacts that are partially immunized, unless they are household-like contacts, can also self-monitor rather than quarantine for that period. Please refer to Table 3 and Table 4.

Additional factors to consider that may influence the risk stratification and public health management of contacts include:

- Use of PPE by the contact at the time of exposure
- Duration of the contact’s exposure (e.g., a longer exposure time likely increases the risk)
- Household-like type of exposure versus other types of high risk exposure
- The case's symptom severity (coughing or severe illness likely increases transmission risk)
- Persons who engage in high-risk settings, e.g. daycares and health care, or situation where there is interaction with those at the extremes of age, who are immune compromised, medically extremely vulnerable or at risk of severe COVID-19 illness, etc.
- Whether the contact had exposure to a case infected with a variant of concern

**CONTACT DEFINITIONS BY EXPOSURE RISK LEVEL**

Exposure may be classified as high, medium or low risk. The risk categories are not absolute and may be modified by the Medical Health Officer due to other factors. Recommended actions for a contact based on their exposure risk in tables 3 and 4 apply to exposures occurring when the case was deemed infectious; see details in previous sections on the period of communicability and section on ceasing isolation.
For personal protective equipment (PPE) to be considered sufficient, at least a medical-grade mask and eye protection need to be worn by someone who has received appropriate training in the use of PPE and associated infection prevention and control practices. Wearing non-medical masks by either or both of the case and contact, in most situations, would not nullify an exposure. It is difficult to assess adequacy of mask's fit and material, and how consistently individuals were masks.

Although outdoor settings are not generally considered high risk, the potential for transmission still exists under certain circumstances, such as close conversations or rigorous exercise when participants are in close proximity and are not wearing masks, case-by-case risk-assessment should be carried out of outdoor exposure.

**High-risk exposures (close contact) are defined as:**

- Anyone who has been within 2 meters of a case for more than 15 minutes cumulatively in a day
- Anyone who is exposed to the infectious body fluids of a case
- Anyone who is a household-like contact, such as
  - Anyone who lived with a case before the case started isolation, or if the case is unable to isolate adequately in the household setting anyone who lives with the case during his or her isolation period; or
  - Anyone who has direct physical contact with a case, including the case's caregiver\(^A\), an intimate partner or a child receiving care from the case\(^B\) even if not residing in the same household as the case.
  - Others, as determined by the MHO.
- A healthcare worker who provided direct physical care to a case, or a laboratory worker handling COVID-19 specimens, without consistent and appropriate use of recommended PPE and infection prevention and control practices.
- Anyone who has been identified by the local MHO as a possible high-risk contact.

\(^A\) The caregiver should reduce their risk of COVID-19 infection by wearing a medical mask if available (preferred), or a well-constructed and well-fitting non-medical mask, when providing direct care, or within 2 metres of the case. They should also use appropriate eye protection. However, in most cases, this will not be sufficient to avoid the classification of the exposure as high-risk.

\(^B\) There are scenarios were someone with COVID-19 has to take care of dependents, or dependents with COVID-19 need care from someone without it. Psychological needs of children need to be attended too, frequently including physical contact and comfort from a caregiver. It might be impossible to prevent all interaction between young siblings.
Medium-risk exposures (contact) are defined as:

- Anyone who has been in an indoor setting where a case engaged in singing, significant shouting, or heavy breathing (e.g., exercise), in close proximity, without both the case and the contact consistently wearing a well-fitted, well-constructed mask, even if for less than 15 minutes.
- Non-close contacts (do not meet a high-risk definition; e.g., household contacts after the case started isolation and are not within 2 metres of the case, or for trained health care workers if they did not consistently use sufficient PPE and infection prevention control measures, as per outlined previously)
- Anyone who has been identified by the local MHO with a medium-risk exposure

Low-risk exposure is defined as:

- Healthcare workers who provided direct physical care to a case, or a laboratory worker handling COVID-19 specimens, with consistent and appropriate use of recommended PPE and infection prevention and control practices.

Table 3: Quarantine recommendation for high risk exposures/ close contacts with a recent prior infection or immunization

<table>
<thead>
<tr>
<th></th>
<th>Partially immunized(^1)</th>
<th>Fully immunized(^2) OR With a recent prior infection(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household-like contacts (see details above)</td>
<td>Self-isolate/quarantine</td>
<td>Self-monitor</td>
</tr>
<tr>
<td>Other close/high-risk contacts</td>
<td>Self-monitor</td>
<td>Self-monitor</td>
</tr>
</tbody>
</table>

1. An exposure in a partially immunized individual is defined as an exposure occurring more than 21 days after receiving a first dose of COVID-19 vaccine.
2. An exposure in a fully immunized individual is defined as an exposure occurring more than 7 days after receiving a second dose of vaccine.
3. An exposure in someone with a recent prior infection is defined as occurring less than 91 days since recovery from that prior infection.
### Table 4. Other contact management recommendations by exposure risk level

<table>
<thead>
<tr>
<th>Contact responsibilities</th>
<th>Public Health responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGH RISK</strong></td>
<td></td>
</tr>
<tr>
<td>• Quarantine (self-isolation) at home for 14 days from last exposure, unless self-monitoring is allowed as per Table 3</td>
<td>• Consider active daily monitoring</td>
</tr>
<tr>
<td>• Follow recommended personal preventive practices. If living with the case, avoid further exposure to the case; if in a shared space (e.g., same room) with the case, wear a well-constructed and well-fitting, non-medical mask and stay at least 2 meters apart.</td>
<td>• Manage as probable case if symptomatic, until testing can be arranged</td>
</tr>
<tr>
<td>• Follow health authority directions related to testing requirements.</td>
<td>• If testing for COVID-19 is negative, continue self-isolation for 14 days since the last exposure</td>
</tr>
<tr>
<td>• Self-monitor for the appearance of symptoms consistent with COVID-19 for 14 days following their last exposure to the case.</td>
<td></td>
</tr>
</tbody>
</table>
Contact responsibilities | Public Health responsibilities
--- | ---
**MEDIUM RISK**
- Daily self-monitoring for 14 days
- If symptoms occur, isolate away from others as quickly as possible, put on a medical mask if available (preferred), or well-constructed and will-fitting non-medical mask, and contact public health for further direction, which will include: where to go for care, appropriate mode of transportation to use, and infection and prevention control precautions to be followed.
- Where possible, avoid interactions with individuals at higher risk for severe illness
- Follow PHA directions related to testing requirements
- Follow recommended personal preventive practices
- Daily public health monitoring generally not required; may be considered at the discretion of the MHO
- Manage as a case if symptomatic, until testing can occur
If testing for COVID-19 is negative, continue self-isolation for 14 days since the last exposure

**LOW RISK**
- Follow action recommended for the entire population
- Community level information
- Individual advice if required
- Follow recommended personal preventive practices

In some circumstances, reinfection is suspected and can lead to more diagnostic testing and isolation. Exposure to variant of concern strain associated with a higher risk of reinfection(28). Reinfection can be more common with immune escape variants of concerns such as P.1 and B.1.351. Against those variants, natural immunity might not be as good as immunity provided by some vaccine (29).

Discussion of the immune response to COVID-19 infection is found in the clinical illness section. Regardless of time since infection, for those who develop symptoms after exposure to COVID-19, if another etiology cannot be identified for the symptoms, the US CDC suggests re-testing(14). The testing results should be interpreted in consultation with the appropriate expert.

**CONTACT TRACING IN OUTBREAK SITUATIONS**

In an outbreak context, contact tracing and management also serves the purpose of active case finding during an investigation. Where an outbreak is suspected, the regional health authority may adopt a situation-specific definition for those at high risk of exposure (i.e., "close contact")
to help efficiently target their contact investigation and case finding efforts. For example, all individuals at an event associated with a high risk of transmission could be assessed as close contacts (i.e. all guests at a wedding, or participants of an indoor fitness class). This approach may be considered when the outbreak setting results in a high risk of exposure for most participants, or where individual risk assessments are not feasible.

Outbreaks may have a significantly higher impact in some populations due to their vulnerabilities or their potential for widespread transmission. For case and contact finding in the context of an outbreak in these populations, it may be useful for the regional health authority to adopt a more sensitive definition for those at high risk of exposure (i.e., close contacts), to facilitate case finding.

Guidelines for Outbreaks in Long Term Care Facilities are found here, and for schools, daycares and camps guidance documents are found here.
APPENDICES

Appendix 1: Self-isolation considerations for cases

The location where a person will self-isolate will be determined by their healthcare provider and their health authority. When determining the location, several factors to determine the suitability of the home setting are described below. 'Case' refers to confirmed and probable cases.

- **Severity of illness.** The case is exhibiting mild symptoms that do not require hospitalization, taking into consideration their baseline health status including older age groups, or chronic underlying or immunocompromising conditions that may put them at increased risk of complications from COVID-19. The ill person should be able to monitor their own symptoms and maintain respiratory etiquette and hand hygiene.

- **Suitable home care environment.** In the home, the case should ideally stay in a room of their own so that they can be isolated from other household members. If residing in a dormitory, such as at a post-secondary institution or where there is overcrowded housing, efforts should be made to provide the case with a single room (e.g., relocate any other roommates to another location) with a private bathroom. If a separate room is not feasible, ensure that shared spaces are well ventilated (e.g., windows open, as weather permits) and that there is sufficient room for other members of the home setting to maintain a two-metre distance from the case whenever possible. If it is difficult to separate the case physically in their own room, hanging a sheet from the ceiling to separate the ill person from others may be considered. If the ill person is sleeping in the same room as other persons, it is important to maintain at least 2 meters of separation from others (e.g., separate beds and have people sleep head-to-toe, if possible). If a separate bathroom is not available, the bathroom should be cleaned and disinfected frequently, and ventilated as feasible. Information on cleaning and disinfection can be found here.

- **Cohorting cases in co-living settings (e.g., those living in university dormitories, work camps, shelters, overcrowded housing, and group homes).** Special consideration is needed to support cases in these settings when self-isolating. If it is not possible to provide the case with a single room and a private bathroom, efforts should be made to cohort ill persons together. If there are two cases who reside in a co-living setting and single rooms are not available, they could share a double room.
• **Access to supplies and necessities.** The case should have access to food, running water, drinking water, and supplies for the duration of the period of self-isolation. Those residing in remote and isolated communities may wish to consider having additional supplies, as well as food and medications usually taken, if it is likely that the supply chain may be interrupted or unreliable.

• **Risk to others in the home.** Household members with conditions that put them at greater risk of complications of COVID-19 (e.g., underlying chronic or immunocompromising conditions, or the elderly) should not provide care for the case and alternative arrangements may be necessary.
  o For breastfeeding mothers: considering the benefits of breastfeeding and the insignificant role of breast milk in transmission of other respiratory viruses, breastfeeding can continue. If the breastfeeding mother is a case, she should wear a medical mask, or if not available, a non-medical mask or facial covering (e.g., homemade cloth mask, dust mask, bandana), when near the infant, practice respiratory etiquette, and perform hand hygiene before and after close contact with the infant(30).
  o Other cases in the home, e.g., non-breastfeeding parent or other caregiver should refrain from contact with the infant.

• **Access to care.** While it is expected that the case convalescing at home will be able to provide self-care and follow the recommended preventative measures, some circumstances may require care from a household member (e.g., the case is a child). The caregiver should be willing and able to provide the necessary care and monitoring for the case.

**Psychosocial Considerations.** Health authorities should encourage individuals, families and communities to create a supportive environment for people who are self-isolating to minimize stress and hardship associated with self-isolation as the financial, social, and psychological impact can be substantial. Obtaining and maintaining public trust are key to successful implementation of these measures; clear messages about the criteria and justification for and the role and duration of self-isolation and ways in which persons will be supported during the self-isolation period will help generate public trust. Additional information is available on the [BCCDC website](https://www.bccdc.ca).
Appendix 2: Travel

The Quarantine Act (S.C. 2005) was introduced to prevent the spread of communicable diseases. All international travellers must respect the requirements from the federal order under the Quarantine Act. The order specifies exceptions of certain exempted groups (see international travellers who are essential workers below).

Not respecting the mandatory requirements is a serious offence with consequences and penalties.

Instructions for Canadian travellers from the Government of Canada can be found here. Information specific to BC self-isolation and travel are here: BC's self-quarantine requirements.

Flight exposure
If a COVID-19 confirmed case was on a flight (international or domestic) or other conveyance during the communicable period, the information will be posted in the public domain on the BCCDC and PHAC websites (see Appendix 3).

International travellers who are essential workers or otherwise exempt from quarantine
Several groups are considered essential for the continued functioning of the health care system and the transportation of essential goods. International travellers who are deemed essential workers or exempt from quarantine requirements must follow all other public health guidance to reduce the risk of disease transmission. These individuals are also required to self-monitor for 14 days, and if they develop symptoms, should self-isolate immediately, contact 8-1-1 and their employer. For more information on which workers are considered essential, see information for Employers and Businesses.
Appendix 3: Follow-up for exposure in airplane, cruise, long-distance bus or train

Routine follow-up of airline contacts is not routinely recommended as there is no direct evidence at present that contacting individual air travellers/crew has facilitated early case finding. Nor is there evidence of change in transmission risk in relation to flight duration. However, health authorities and BCCDC may collaboratively decide to pursue contact tracing of close contacts on flights in some instances. The decision to pursue contact tracing in such instances will depend on a number of factors, including risk of transmission, available resources, and time elapsed since the flight.

Health authorities should inform BCCDC if a confirmed COVID-19 case was on a flight (international or domestic), cruise, long distance bus or train during the communicable period. The following information should be sent to the BCCDC Communicable Diseases & Immunization Service via email to covid@bccdc.ca:

Flights:
- Case's name
- Case's symptom onset date
- Airline/flight number
- Departure airport
- Departure date and time
- Arrival airport
- Arrival date and time

Cruises, including river cruises:
- Name of cruise company/ship
- Dates/ports of embarkation and disembarkation

Tour Group
- Dates and location of tour
- Name and contact information of tour company/organizer

Long distance bus or train travel
- Name of bus line or railway company
- Date, time and location of origin of trip
- Date, time and location of destination
- Any available details about the route and stops
Appendix 4: Evidence summary regarding zoonotic transmission and case management

At this time, there is evidence that cats, dogs, ferrets, gorillas, and minks can naturally acquire SARS-CoV-2 infections from contact with human COVID-19 cases and can develop clinical signs. Onward transmission to other animals has been noted in cats, ferrets and mink. Dogs are considered to have low susceptibility to SARS-CoV-2.

Experimental studies have shown the following levels of susceptibility to SARS-CoV-2 in animals:

- High susceptibility: bats (Egyptian fruit bats), cats (domestics and big cats), deer mice, ferrets, hamsters, minks, non-human primates, raccoon dogs, deer, rabbits, and tree shrews
- Medium to high: bank voles, bushy-tailed woodrats, deer
- Medium: skunks
- Extremely low: cattle, swine
- None: Big brown bats, house mice, poultry (chickens, ducks, geese, quail, turkeys), prairie dogs, raccoons, and squirrels (fox and Wyoming ground).

There is currently no evidence that household pets or food-producing animals are a source of transmission to humans. Mink can transmit the virus back to humans and has been noted in Denmark and the Netherlands (see below).

Routine testing of animals for SARS-CoV-2 is not recommended at this time. However, if indicated, testing can be performed by veterinarians at regular clinics in accordance with the veterinary guidance and in consultation with the Chief Veterinarian's Office and the BC Centre for Disease Control.

**Companion animals**

There is currently no evidence demonstrating pet to human transmission; however, it is theoretically possible. Cat to cat transmission has been demonstrated; however, there is no evidence for cat to human transmission.

When a pet owner has been diagnosed with COVID-19 the following measures are recommended to protect the pet and other animals:

- Limit contact with pets and all other animals during illness
- If possible, have another member of the household take care of the pets
- If an infected person must care for a pet, they should wash their hands before and after interacting with the pet, its food and supplies
- Avoid close contact with the pet, such as snuggling and letting them sleep on the bed
- Pet owners should restrict their animal's contact with other people and animals outside their home until their illness has resolved

In cats, too few natural infections have been reported to accurately assess the incubation period. The current recommendation for pet monitoring after a SARS-CoV-2 exposure is 14 days based on public health guidance for human cases.

In the case of an animal testing positive for SARS-CoV-2 in the household, the above measures apply with the addition of a ten-day isolation after onset of clinical symptoms. These recommendations are also based on the public health guidance for human cases.

Specific considerations need to be made for companion animals living in Assisted Living and LTC facilities with their owners. In case of an outbreak, pets and service animals should be restricted from entering the facility until the outbreak is declared over.

For pets that reside in the facility, the recommendations are as follows:
- Isolate the animals for the duration of the outbreak and in the location of the outbreak in the facility
- Do not let animals intermingle with other animals that reside in areas of the facility that are not included in the outbreak
- Practice hand hygiene after any animal handling or interaction (petting, feeding, etc.)
- If an animal becomes symptomatic, contact the veterinarian to discuss the need for treatment and/or testing.

If the facility opts to arrange for alternate housing of animals during outbreak, then animals should be put in isolation at new location for 14 days after last exposure event at the LTC facility.

**Mink Farms**
A significant number of outbreaks of SARS-CoV-2 in mink have been detected on mink farms worldwide. Several mutations have been detected, but only the Cluster 5 variant (a cluster of 4 cumulative mutations in the spike protein) has raised significant concerns due to its effect on antigenicity. This mutation was found in 12 people in Denmark. However, it is considered no longer circulating since September 2020. Significant regional public health measures have been implemented in affected regions globally. This situation is being monitored closely by public health and animal health experts.
BC has several mink farms, with all active mink farms located in the Fraser Health Authority region. Intensive surveillance and control measures are in place to rapidly identify and prevent spread of SARS-CoV-2 related to mink farms.

Appendix 5: Public Health Variants of Concern

Information on new SARS-CoV-2 variants of public health concern is constantly emerging. Further information can be found from these sources:

BC Centre for Disease Control:  
http://www.bccdc.ca/health-info/diseases-conditions/covid-19/about-covid-19/variants

Centers for Disease Control and Prevention:  

PHAC:  
https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html#VOC
Appendix 6: Testing threshold for cases and contacts

Lower testing threshold apply to many situations detailed in the BC testing guidelines. Consider a lower testing threshold for symptomatic individuals who:

- Are residents or staff of long-term care facilities
- Require admission to hospital or are likely to be admitted
- Are healthcare workers
- Are travellers who in the past 14 days returned to BC from outside Canada, or from an area with higher infection rates within Canada
- Are residents of remote, isolated, or Indigenous communities
- Live in congregate settings such as work-camps, correctional facilities, shelters, group homes, assisted living and seniors’ residences
- Are homeless or have unstable housing
- Are essential service providers, such as first responders
- Have a chronic medical condition, are at risk for severe illness, or are immunocompromised due to medication or treatment
- Live with someone at risk of severe disease from COVID-19 infection (e.g., elderly, chronic conditions)

Canadian guidelines suggest that asymptomatic testing of close contact can be warranted to interrupt more chains of transmission. The following groups of individuals without symptoms should be considered for testing for reasons of contact tracing or outbreak management:

- Close contacts of a case in the community;
- Health care workers and staff who work in health care facilities with reported outbreaks;
- Residents and workers in high-risk congregate living settings (e.g., long-term care facilities, correctional facilities, homeless shelters, other temporary shelters, single-room occupancy residences and work camps) with reported outbreaks;
- Work settings where physical distancing cannot be maintained (e.g., meat and poultry-processing facilities) and where there are reported outbreaks;
- Other outbreak or cluster investigations.

It suggests that asymptomatic testing of close contact is part of diagnostic testing rather than screening (31).
Testing of asymptomatic contact at different times after exposure has different implications (18, 32, 33). Testing earlier or later in after exposure can help interrupt chains of transmission through different mechanisms. Testing early after exposure, for example, before day 4, will result in a high false-negative rate (as many would still be incubating without much detectable virus)(32). However, it can identify cases that were exposed to the same index patient(s) as the case, and would detect a small proportion of case with a very short incubation period. This would enable faster isolation and contact tracing for the individuals found to be infected. As the speed of isolation is a key determinant of contact tracing effectiveness, this strategy can help in some circumstances (18).

As noted in a recent evidence review by the PHAC (32), early in an infection, the virus load may be very low, and there is a high likelihood of a false negative result. The likelihood decreases as virus load increases; an example from a meta-analysis indicates false-negative results are ~100% on days 1-3, 67% on day 4, 38% on day 5 (symptom onset) and 20% on day 8 post exposure. It is important to interpret the results of such early testing adequately and should not result in avoiding quarantine.

The sensitivity of the RT-PCR increases rapidly two days before infection to over 80% and remains high for eight or more days after symptom onset. Testing at or after day 7 post exposure would find most secondary cases, and has been suggested as a strategy to shorten quarantine in some jurisdictions, and/or improve epidemic control when adherence to quarantine is poor. There is evidence in multiple jurisdictions that adherence to quarantine is sub-optimal (33). Individuals self-reporting symptoms, those with a confirmed COVID-19 test and those who received a COVID-19 diagnosis (suspect or confirmed) from a healthcare provider were more likely to comply with isolation instructions compared with people told to quarantine due to their contacts with other COVID-19 cases and those who were not feeling ill themselves.

Testing close to the end of a 14 days quarantine would prevent further transmission by detecting some who might still be incubating, but would not assist in isolating cases early, or enabling early contact tracing.
Appendix 7: Contact tracing strategies and considerations

Summary of evidence of decreased infection and transmission after COVID-19 vaccination

There is evidence that mRNA vaccine, and potentially others, decreases COVID-19 transmission. Vaccine effectiveness after one dose is estimated to be about 60 to 70%, and more than 85% after two doses against the Alpha VOC (B.1.1.7), and more than 72% against the Beta VOC (B.1.351) (14, 34-38). There is significant vaccine effectiveness against asymptomatic infections, and transmission if someone is infected after immunization (likely around 50% decrease transmission after infection) (14, 34-38). A single dose of mRNA vaccine reduced the risk of covid-19 in adults ≥70-years-old in BC, with protection only minimally reduced against B.1.1.7 and P.1 variants (vaccine effectiveness of 72% (95% CI 58-81), 67% (95% CI 57-75) and 61% (95% CI 45-72) for non-VOC, B.1.1.7 and P.1, respectively)(39). Vaccine effectiveness studies are lacking for most other variants and vaccines, but because mRNA vaccine provide broad immunogenicity (not only antibodies, but also good cellular immunity), experts suspected that they will retain effectiveness against the currently circulated variants, such as observed against B.1.351 variant, considered a more potent immune escape variant than P.1 or B.1.617(40-44). There is some evidence that vaccines might generate a stronger immune response than natural infection, and evidence of a significant decrease in case incidence after immunization(45), as well as potentially better protection against some VOCs than prior infection(29).

Alternative contact management approaches:

To accommodate limited local resources, regional health authorities may consider alternative approaches to traditional contact tracing when experiencing a local increase in cases(46). These may include the following:

- Using well-trained non-public health staff and volunteers for certain contact tracing activities;
- Repurposing existing resources, such as call centres or hotlines;
- Reducing the intensity of follow-up of contacts based on risk assessment, for example, automated calls or text messages to low-risk contacts, or follow-up text messages instead of daily calls; and
- Leveraging available technology, such as contact tracing software, as well as web-based and mobile phone applications.
During local peaks in COVID-19 cases and declared outbreaks, regional health authorities may also consider prioritizing contact tracing activities for specific settings where transmission may have occurred (for example, schools, events, workplaces, etc.), and/or specified contacts (for example, those who are vulnerable, provide care to someone who is vulnerable, etc.)(14)

Regional health authorities may also consider alternative approaches where cases, employers, or event coordinators notify contacts (i.e., simple referral); or notify contacts and provide additional information related to infection prevention and control, quarantine (self-isolation), and symptom monitoring (i.e., enhanced referral)(47). Evidence suggests that these approaches will be less effective than traditional contact tracing approaches, and there is no evidence currently available to support these approaches in the context of COVID-19 (14).

**Backward or bidirectional contact tracing**

In addition to traditional (forward) contact tracing, regional health authorities may consider 'backward' contact tracing, which focuses on trying to determine where and when the case likely acquired their infection. It is considered to be most effective when localized outbreaks may be occurring in areas experiencing relatively low levels of transmission. The single most helpful question to assist in backward contact tracing is: Where do you think you have contacted COVID-19?

While COVID-19 has been observed to spread steadily in the community, with one case infecting one or two other cases on average, clusters have been identified where some individuals disproportionately infect a larger number of secondary cases. This is the statistical concept called over-dispersion, where a single case infects more people than expected. These clusters have been referred to as super-spreading events (SSEs).

In these circumstances, 'backward' contact tracing may help to:

1. Find additional cases by focusing on the setting where a case's exposure likely took place; and
2. Interrupt more chains of transmission by then employing traditional (forward) contact tracing for the newly identified additional cases.

Backward contact tracing is considerably more challenging when there is widespread community transmission, due to the volume of cases and uncertainty created by having multiple potential sources of transmission for any given case. It may also be less useful during periods of restrictive public health measures, due to fewer events or localized settings where outbreaks or SSEs might occur. Employing backward contact tracing approaches may have
significant resource implications, depending on the specific contact tracing strategies used, approaches to testing, and local epidemiology.

There is currently some evidence regarding the effectiveness of backward, or bidirectional tracing in relation to COVID-19. A limited number of countries have utilized this strategy. In these countries beneficial impact was correlated with low incidence and limited community transmission.

A recent review on the effectiveness of contact tracing strategies (18) found that "bidirectional contact tracing (contact tracing as early as 6 days prior to symptoms) more than doubles the reduction to Re when compared with only forward tracing (contacts of the case from 1-2 days prior to symptoms until isolation) (8, 13). However, the latter requires more public health capacity. Bidirectional contact tracing to identify the primary case of a cluster was found to be 2-3 times more effective against the spread of SARS-CoV-2 when compared to forward contact tracing alone (23)."

Provinces/territories (PTs) should consider the utility of backward contact tracing based on their individual circumstances and available resources and, if implemented, consider evaluating the effectiveness in order to contribute to the evidence base for this practice.
Appendix 8: Evidence related to the period of communicability

As explained by the US CDC (14): "The likelihood of recovering replication-competent virus also declines after onset of symptoms. For patients with mild to moderate COVID-19, replication-competent virus has not been recovered after 10 days following symptom onset.

Recovery of replication-competent virus between 10 and 20 days after symptom onset has been reported in some adults with severe COVID-19; some of these cases were immunocompromised. However, in this series of patients, it was estimated that 88% and 95% of their specimens no longer yielded replication-competent virus after 10 and 15 days, respectively, following symptom onset.

Detection of sub-genomic SARS-CoV-2 RNA or recovery of replication-competent virus has been reported in severely immunocompromised patients (e.g., patients with chronic lymphocytic leukemia and acquired hypogammaglobulinemia, lymphoma and immunochemotherapy, hematopoietic stem-cell transplant, chimeric antigen receptor T-cell therapy, or AIDS) beyond 20 days, and as long as 143 days after a positive SARS-CoV-2 test result.

In a large contact tracing study, no contacts at high risk of exposure developed infection if their exposure to a case started 6 days or more after the case patient's infection onset.

Recovered patients can continue to have SARS-CoV-2 RNA detected in their upper respiratory specimens for up to 12 weeks after symptom onset. Investigation of 285 "persistently positive" adults, which included 126 adults who had developed recurrent symptoms, found no secondary infections among 790 contacts to these cases."
References


47. Ferreira A, Young T, Methews C, Zunza M, Low N. Strategies for partner notification for sexually transmitted infections, including HIV. Cochrane Database of Systematic Reviews. 2013;10.