Asymptomatic Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) Infection in Adults is Uncommon using Rigorous Symptom Characterization and Follow-up in an Acute Care Adult Hospital Outbreak

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Abstract

Asymptomatic COVID-19 has been reported as a significant driver of COVID-19 outbreaks. Our hospital ward outbreak analysis suggests that comprehensive symptoms and signs assessment, in combination with adequate follow-up, allows for a more precise determination of COVID-19 symptoms and revealed asymptomatic infection was quite uncommon amongst adults in this setting.
Introduction

Although some data suggests asymptomatic SARS-CoV-2 infected individuals are less infectious than symptomatic cases\(^1\), other studies have suggested that transmission via presymptomatic and/or asymptomatic individuals plays a major role in driving transmission\(^2\). The rigor to which infected persons are assessed as truly asymptomatic or presymptomatic and their role in overall SARS-CoV-2 transmission is important\(^3,4\).

Asymptomatic COVID-19 was defined originally by the WHO as positive detection of SARS-CoV-2 nucleic acid in patients by reverse transcriptase polymerase chain reaction (RT-PCR) without typical clinical symptoms or signs of disease, and no apparent abnormalities in any radiologic imaging\(^3\).

Studies to estimate the magnitude of asymptomatic COVID-19 cases have found the proportion of asymptomatic COVID-19 ranges widely from 1.4\%-78.3\%\(^5\). A recent systematic review and meta-analysis\(^6\) which focused on higher quality studies, excluding studies with no or unclear follow-up or those without data on asymptomatic cases, found the overall proportion of asymptomatic cases to be only 17\% (95\% CI 14-20\%) which is lower than those estimated in many earlier and highly publicized studies\(^2,7\).

In September 2020, at an 1100-bed tertiary healthcare facility, a COVID-19 outbreak (wildtype) was declared on three linked cardiac units. Over 7 weeks, 86 cases (all unvaccinated) were identified, including 39 patients, 42 healthcare workers (HCWs) and 5 visitors. Given the disparities regarding the frequency of symptomatic/asymptomatic illness with COVID-19, we sought to carefully assess the symptoms/signs of all cases and patient non-cases to determine the true proportion of symptomatic/asymptomatic infected individuals as the focus of this concise report.
Methods

See File S1 for supplementary methods, definitions, outbreak description, testing, analysis and response. In brief a standardized COVID-19 patient symptom identification and monitoring tool (COVID-19SIMT, File S2) using a comprehensive repertoire of 26 COVID-19 symptoms and signs was applied in real-time by experienced healthcare personnel to a total of 197 at-risk patients (39 cases;158 non-cases). A similar tool was used for symptom assessment of 42 HCW and 5 visitor cases. Nasopharyngeal swabs, and occasionally throat swabs, were collected every 2-5 days and tested for SARS-CoV-2 using RT-PCR®.
Results

The outbreak occurred during a time of relatively low community transmission (active cases 30.7/100,00; www.csm.covid.ca) with patient cases occurring unrecognized at the beginning of the outbreak, due to the many overlapping symptoms of cardiac disease and COVID-19.

Of the 86 COVID-19 cases (Table 1) identified during the outbreak period, 84 (97.7%) were found to be symptomatic (Figure 1). For symptomatic patients, HCWs and visitors that were RT-PCR positive, having core influenza-like-illness (ILI) symptoms/signs was most common, occurring in 84.9% of cases, followed by expanded symptoms at 70.9%. Core ILI with expanded symptoms was the most common combination of symptom/sign categories seen (45.3%). In most cases, a combination of 2 or more categories of symptoms/signs were seen together, with a single symptom category seen less often (core ILI in 1.2%, core gastrointestinal (GI) in none and expanded in 5.8%; Figure S1). Only one case (inpatient) had fever only with no other ILI symptoms. No individuals had core ILI symptoms without fever/chills/rigors.

Of 158 admitted patient non-cases, of which 156 (98.7%) were confirmed RT-PCR negative, 9 (5.7%) were found to be symptomatic, with core ILI being most commonly found (5.1%)

Overall, 90.5% of cases were symptomatic before or on the day of RT-PCR positivity for COVID-19 (Table 1). A median of 1, 2 and 2 days were found between symptom onset and RT-PCR positivity in HCWs, patients and visitors, respectively. A total of 42 HCWs tested positive by RT-PCR, of which 34 (83%), disclosed having symptoms on initial interview. Five additional HCWs went on to develop symptoms 24-48h after testing positive and were deemed to be presymptomatic at the time of RT-PCR positivity. Two of the 42 HCWs (4.8%) did not report
developing symptoms/signs up to 10 days post RT-PCR positivity. Overall 40/42 (95.2%) HCWs had symptomatic COVID-19 (Table 1).

We identified a significant difference between HCWs and patients in terms of age (p<0.01), with a median age of 34 years for HCWs versus 78 years for patients and 70 years for visitors. However, the proportion of symptomatic cases in each category was similar; HCWs (95.2%), patients (100%) and visitors (100%), suggesting that younger adults did not differ from older adults in this study.

In our study 27/39 (69%) patients had some symptoms prior to being tested for COVID-19, with 5 patients being symptomatic for more than 5 days prior to being isolated and tested. For patients and visitors, 36/39 (92.3%) and 5/5 (100%), respectively, were symptomatic at the time of RT-PCR positivity. Two of 39 (5.1%) patients (initially presymptomatic) went on to develop symptoms within 24 hours and 1/39 (2.6%) was identified as symptomatic 5 days later. We would have overlooked eight cases without repeated assessments, highlighting the importance of adequate follow-up, for the typical incubation period.
Discussion

While some reports have noted high proportions of asymptomatic COVID-19 cases, our real-time comprehensive approach using a standardized symptom identification and monitoring tool (COVID-19SIMT, File S2) raises questions about significant degrees of ascertainment and recall bias in previous studies².⁷.

Meyerowitz et al.⁹ discussed the challenges and importance of agreement on an accurate and systematic characterization of COVID-19, the importance of consistency of symptom reporting and adequate follow-up in ascertaining the true proportion of asymptomatic COVID-19.

No cases in our dataset had core ILI symptoms without fever/chills/rigors and only one case (inpatient) had fever with no other ILI symptoms. This latter observation supports the importance of using GI and expanded symptoms/signs as part of the overall assessment.

Some have suggested that a difference in the proportion of cases that are asymptomatic relates to age⁹ but we found no differences.

Presymptomatic individuals may still be capable of transmitting virus, which emphasizes the need to continue physical distancing, universal masking and hand hygiene in high-risk environments. Our data, using comprehensive and frequent screening, suggests that asymptomatic COVID-19 may be much lower than estimated in many earlier studies and raises important questions regarding the assumptions made in modelling asymptomatic SARS-CoV-2 transmission².

Isolation of COVID-19 infected individuals is key to curtailing transmission. Patients admitted via the cardiac service may have symptoms of dyspnea, chest pain, cough and difficulty
breathing which overlap with COVID-19, leading to interpretation difficulties. Careful clinical assessment, continuous symptom monitoring and a high index of suspicion is required to identify COVID-19 in cardiac patients. We recognize the limitations of our study including that it reflects an unvaccinated population, may not reflect variants such as Omicron, which have milder symptoms and did not follow all discharged patients. Nonetheless, it furthers our understanding of the rate of truly asymptomatic COVID-19 in unvaccinated persons when using a comprehensive and standardized symptom/sign tool along with adequate follow-up and is consistent with a recent study of HCWs where 12/12 (100%) confirmed SARS-CoV-2 cases were symptomatic, using a robust symptom monitoring methodology.¹⁰
Acknowledgments

The authors would like to acknowledge the support and assistance of the Calgary Zone Workplace Health and Safety Occupational Health Nursing team, with special thanks to Durwin Luc, the Public Health Communicable Disease team, the Foothills Medical Centre Site Command Post and the Cardiology medical team for their assistance with queries related to healthcare worker and visitor data acquisition. The HCW component of this study was presented in abstract form as a poster at AMMI Canada-CACMID Annual Meeting in 2021.


Declarations

Ethics approval: This study was conducted as a component of an Epidemiologic Investigation under Public Health in the Province of Alberta and was thus considered a quality improvement project and as such did not require ethical review. It also was assessed using the ARECCI (A Project Ethics Community Consensus Initiative) tool, which confirmed this project as fitting with a quality improvement project.

Conflicts of interest: All authors will have filled out an ICMJE Disclosure form. None of the authors have relevant conflicts of interest to declare related to any aspect of the submitted manuscript. All authors have read the version of the manuscript, which has been submitted.

Funding: This study did not receive any funding.
References


8. Berenger BM, Conly JM, Fonseca K, et al. Saliva collected in universal transport media is


Table 1. Demographics and days from symptom onset to COVID-19 RT-PCR positivity of SARS-CoV-2 cases

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>HCWs (n=42)</th>
<th>Patients (n=39)</th>
<th>Visitors (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of symptomatic cases (%)</td>
<td>40 (95)</td>
<td>39 (100)</td>
<td>5 (100)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (Standard Deviation)</td>
<td>38 (±12)</td>
<td>75 (±12)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>71 (±9)</td>
</tr>
<tr>
<td>Median (Range)</td>
<td>34 (23–65)</td>
<td>78 (34–91)</td>
<td>70 (57–81)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (%)</td>
<td>11 (26%)</td>
<td>23 (59%)</td>
<td>1 (20%)</td>
</tr>
<tr>
<td>F (%)</td>
<td>31 (74%)</td>
<td>16 (41%)</td>
<td>4 (80%)</td>
</tr>
<tr>
<td>Days from symptom onset to COVID-19 RT-PCR positivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (Range)</td>
<td>1 (-2 to 8)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2 (-5&lt;sup&gt;c&lt;/sup&gt; to 10)</td>
<td>2 (0 to 5)</td>
</tr>
</tbody>
</table>

<sup>a</sup> The average age for non-cases; n=158 (age 69±14) was not significantly different to that seen in cases.

<sup>b</sup> A minus sign indicates the case was asymptomatic or presymptomatic and developed symptoms after testing positive for SARS-CoV-2 by RT-PCR.

<sup>c</sup> One patient who had tested negative at the time of discharge, was found to be positive on follow-up testing in the community. This patient only reported symptoms 5 days after RT-PCR positivity. This patient did not undergo a minimum of once per 8-hour shift symptom/sign monitoring as per admitted patients and there was a significant potential for recall/ascertainment bias given the length of time between discharge and interview by Public Health.
Figure 1. Breakdown of COVID-19 symptoms/signs during an acute care outbreak

Breakdown of COVID-19 symptoms/signs by case type (HCW, patient or visitor). “Any” indicates those symptoms that are reported as present, either alone, or in combination with other symptoms including GI and/or expanded symptom categories. See Figure S1 for cases that had “only” symptoms in each of the major categories.

Core influenza-like-illness (ILI) symptoms include new/worse or unexplained cough, fever/chills/rigors, shortness of breath, difficulty breathing, sore throat/painful swallowing or runny nose/nasal congestion

Core gastrointestinal (GI) symptoms include new/worse or unexplained vomiting or diarrhea

COVID-19 expanded symptoms include new/worse or unexplained headache, muscle/joint pain, fatigue/extreme exhaustion, nausea/sudden loss of appetite, loss of/change to sense of smell or taste, conjunctivitis/red eye/conjunctival edema, altered mental status, and any additional COVID-19 symptoms at clinician’s discretion e.g. COVID-19 toes or other cutaneous manifestations.
Figure S1. Breakdown of all COVID-19 symptoms/signs during an acute care outbreak

Breakdown of COVID-19 symptoms/signs by case type (HCW, patient or visitor).

“Any” indicates those symptoms that are reported as present, either alone, or in combination with other symptoms.

“Only” indicates those symptoms that are reported alone and not in combination with any other symptoms.

F/C/R indicates fever/chills/rigors.

A total of 81.4% (70/86) of cases had either cough or runny nose and 14% (12/86) of cases had both cough and runny nose.
Communicable Disease (Respiratory) Initial Screening

All sections must be fully assessed and completed.

☐ Unable to assess patient’s symptoms due to patient’s physical condition. Implement Contact & Droplet Precautions, and contact Most Responsible Health Practitioner (MRHP) to order COVID-19 and other labs as indicated.

**Part 1 - Symptom Set Assessment (review all symptom sets)**

<table>
<thead>
<tr>
<th>Actions Required</th>
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<tbody>
<tr>
<td>☐ COVID-19 Core Influenza-like Illness (ILI) Symptoms - New/worse OR unexplained:</td>
</tr>
<tr>
<td>- Cough</td>
</tr>
<tr>
<td>- Fever/Chills/Rigors <strong>Adult</strong>: higher than 37.8°C; <strong>Pediatrics</strong>: 38°C or higher</td>
</tr>
<tr>
<td>- <strong>If sole symptom, should be reviewed with other symptoms, history, physical exam, etc.</strong></td>
</tr>
<tr>
<td>- Shortness of breath, Difficulty breathing, Sore throat/Painful swallowing, Runny nose/Nasal congestion</td>
</tr>
<tr>
<td>☐ COVID-19 Gastrointestinal (GI) Symptoms - New/worse AND unexplained:</td>
</tr>
<tr>
<td>- 3 or more episodes of vomiting and/or diarrhea in a 24hr period</td>
</tr>
<tr>
<td>☐ Seasonal ILI Symptoms</td>
</tr>
<tr>
<td>- <strong>Adults</strong>: New or changed Cough AND Fever AND any of the following: Sore throat, Joint pain, Muscle ache, Extreme exhaustion/Weakness</td>
</tr>
<tr>
<td>- <strong>Pediatrics</strong>: Cough OR Sneezing OR Runny Nose</td>
</tr>
<tr>
<td>☐ Cough AND any other Pertussis Symptoms</td>
</tr>
<tr>
<td>- Paroxysms, Inspiratory ‘whoop’ cough ending in gagging/vomiting</td>
</tr>
<tr>
<td>- <strong>Neonates</strong>: Apnea</td>
</tr>
<tr>
<td>☐ Cough AND any Tuberculosis (TB) Symptoms</td>
</tr>
<tr>
<td>- Hemoptyisis, Night sweats, Unintentional weight loss, or history of TB</td>
</tr>
<tr>
<td>☐ Fever, Rash AND International travel in last month</td>
</tr>
<tr>
<td>☐ Fever, Rash AND potential Measles Exposure</td>
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**Part 2 - Expanded Symptoms**

<table>
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<th>Actions Required</th>
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<tbody>
<tr>
<td>☐ COVID-19 Expanded Symptoms: New/worse AND unexplained:</td>
</tr>
<tr>
<td>- Headache, Muscle/Joint pain, Fatigue/Extreme exhaustion, Nausea/Sudden loss of appetite, Loss of/Change to sense of smell or taste, Conjunctivitis/Red eye/Conjunctival edema, Altered mental status, any additional COVID-19 symptoms at clinician’s discretion</td>
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</table>

**Part 3 - Risk Factors**

<table>
<thead>
<tr>
<th>Actions Required</th>
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<tbody>
<tr>
<td>☐ Close contact* with a confirmed or probable case of COVID-19 within 14 days before illness onset</td>
</tr>
<tr>
<td>☐ Associated with any healthcare unit/facility, congregate living or other (e.g., workplace or social gathering) <strong>COVID-19 outbreak/cluster</strong></td>
</tr>
<tr>
<td>☐ Positive COVID-19 test within the last 14 days</td>
</tr>
<tr>
<td>☐ Close contact* with a person with acute respiratory illness who has travelled anywhere outside of Canada in the 14 days before their illness</td>
</tr>
<tr>
<td>☐ Travelled anywhere outside of Canada in the last 14 days</td>
</tr>
<tr>
<td>☐ Had laboratory exposure to biological material known to contain COVID-19 virus</td>
</tr>
</tbody>
</table>

*A close contact is someone who:
- Provided care for the individual, including healthcare workers, family members or other caregivers, or who had other similar close physical contact with the person without consistent and appropriate use of personal protective equipment, OR
- Lived with or otherwise had close prolonged contact (within 2 metres) with the person while the person was infectious, OR
- Had direct contact with infectious bodily fluids of the person (e.g., was coughed or sneezed on) while not wearing recommended personal protective equipment.

Assessed by ____________________________ Date (dd-Mon-yyyy)
Definitions

Outbreak: A COVID-19 outbreak in acute care was defined (according to our local guidelines; these internal documents are available upon request) as follows:

• One (1) or more confirmed\(^1\) hospital-acquired COVID-19 patient case(s)\(^2\) OR
• Two (2) or more confirmed\(^1\) COVID-19 cases in healthcare workers (HCWs) assigned/linked to a unit\(^3\) within a 14 day time period AND where at least one of the HCWs was in the work place during the communicable phase of illness\(^4\) AND/OR it is suspected there has been work site transmission as cause for one or more of the infections.

\(^1\)Confirmed case: A person with laboratory confirmation of infection with SARS-CoV-2 that causes COVID-19. Laboratory confirmation consists of detection of at least one specific gene target by nucleic acid amplification tests (NAAT) at a Provincial Public Health Laboratory where NAAT tests have been validated OR confirmed positive result by National Microbiology Lab (NML) by NAAT.

\(^2\)Hospital acquired: One (1) confirmed case in a patient admitted to hospital at least 7 days before symptom onset and who had a swab test positive when collected \(\geq7\) days after admission; OR a patient admitted to hospital for less than 7 days who is deemed to have a confirmed hospital-acquired infection for any reason. The primary reason for the latter related to the absence of any identified epidemiologic evidence to support a community exposure and the presence of an identified exposure within the hospital setting at least 48 hours after admission.
**Symptomatic:** A symptomatic individual was defined as having at least one symptom/sign from any of the 3 categories of symptoms/signs (File S2)

**Presymptomatic:** A presymptomatic individual was defined as having none of the 3 categories of symptoms/signs at the time of a positive RT-PCR COVID-19 test but developed at least one of these symptoms/signs within 48h.

**Asymptomatic:** An asymptomatic individual was defined as not having any of the 3 categories of symptoms/signs at the time of a positive RT-PCR COVID-19 test and did not report developing any symptoms up to 10 days post initial RT-PCR positivity.

**At-risk patient:** Any patient who was admitted to one of the three linked units providing cardiac care during the risk period, which is considered the time during which the outbreak was active.
Setting, Declaration of the Outbreak, Basic Descriptive Findings and Response

We have incorporated the items as outlined in the SQUIRE 2.0 template (http://www.squire-statement.org/) in the description of our outbreak.

A COVID-19 outbreak was declared on the first of 3 linked cardiac units (two medical wards and a coronary care unit) consisting of 16 rooms with single-beds, 19 rooms with two-beds, and 11 rooms with four-beds, at an 1100-bed tertiary healthcare facility in Calgary, Canada. The first identified case occurred in a cardiac patient with a prolonged hospitalization who developed a new onset of unexplained fever with a background of congestive heart failure and was found to be RT-PCR positive for SARS-CoV-2.

A detailed investigation and response was concomitantly launched which included the following:

- detailed contact tracing, serial RT-PCR testing and appropriate isolation, quarantine and placement or work restrictions of patients, staff and visitors as appropriate
- increased frequency of use of the COVID-19 symptom identification and monitoring tool for patient assessment to a minimum of once per 8 hour shift with a written record of the assessment
- detailed tracking of patient and staff movement
- suspension of new admissions to the affected wards
- enhanced and environmental cleaning of the outbreak units

The outbreak settled with the response measures over a 7 week period. The primary focus of this concise report relates to the findings from the use of the standardized COVID-19 symptom identification and monitoring tool and its utility to find symptomatic patients in a COVID-19 unvaccinated population. Standardized Symptom/Sign Monitoring Tool and Data Collection
Patients

A COVID-19 symptom identification and monitoring tool for patient assessment was developed in the spring of 2020 by the Provincial Infection Prevention and Control (IPC) team, with input from other clinical teams, using best available evidence at the time. It was available as both a paper tool, used mostly in ambulatory settings, called Communicable Disease (respiratory) Initial Screening form (File S2) and later as an electronic charting flowsheet in our electronic clinical information system, called the COVID-19 symptom identification and monitoring tool (COVID-19SIMT). This real-time monitoring tool provided a snapshot of a patient’s COVID-19 symptoms/signs and assisted in determining if COVID-19 or other clinically relevant testing or additional precautions (isolation) were indicated.

This comprehensive tool uses a common set of symptoms and signs (n=26, when each symptom/sign is considered separately) which may be associated with COVID-19 and groups them into 3 categories, as follows:

1) COVID-19 core influenza-like-illness (ILI) symptoms which are new/worse or unexplained cough, fever/chills/rigors, shortness of breath, difficulty breathing, sore throat/painful swallowing or runny nose/nasal congestion;

2) COVID-19 gastrointestinal (GI) symptoms including new/worse or unexplained vomiting or diarrhea.

3) COVID-19 expanded symptoms, which include new/worse or unexplained headache, muscle/joint pain, fatigue/extreme exhaustion, nausea/sudden loss of appetite, loss of/change to sense of smell or taste, conjunctivitis/red eye/conjunctival edema, altered mental status, and any
additional COVID-19 symptoms at clinician’s discretion e.g. COVID-19 toes or other cutaneous manifestations.

An additional category of seasonal ILI was also used which was similar to the COVID ILI symptoms but indicated that all of cough, fever and other symptoms occurred together which has been traditionally used for influenza.

All patients were screened at the time of initial presentation to acute care for respiratory communicable diseases, travel, and COVID-19 exposure to quickly identify those who required additional precautions. For all admitted patients, the COVID-19SIMT was completed a minimum of once per 8-hour shift for the duration of the admission, thus providing a means for comprehensive symptom monitoring over time. If any patient had COVID-19 core ILI, core GI or expanded symptoms, contact and droplet precautions were initiated and Infection Prevention and Control and the most responsible health practitioner were notified, and clinical work-up including SARS-CoV-2 RT-PCR testing^8 ordered as applicable. Patient point prevalence RT-PCR testing was completed every 2-5 days from the start of the outbreak and continued for 14 days from the last positive case. Testing was completed on 156/158 at-risk patients on the outbreak units.
**Healthcare Workers (HCWs)**

All healthcare workers (HCWs) were required to complete a Fit-for-Work screening questionnaire twice per shift. This questionnaire listed symptoms, new or worsening (fever, cough, shortness of breath/difficulty breathing, runny nose, sore throat) and risk factors such as travel outside of Canada or close contact (without appropriate PPE) with a confirmed or probable case of COVID-19 or biological material containing COVID-19 within the last 14 days. A HCW was deemed fit for work if they were asymptomatic, as well as having no COVID-19 risk factors. HCWs were required to show their fit for work status on arrival at work and mid-way through their shift.

On-site HCW prevalence testing was arranged and recommended on a serial basis (q5 days) for all HCWs who were core HCWs on the outbreak units (nursing and management staff; n=376) and also physicians, medical students, allied health professionals, lab services and any other HCW (excluding food services) who self-identified as working on the outbreak units during the risk period and continued for 14 days from the identification of the last positive case. Exclusions to on-site prevalence testing included those who were known recent positives (no repeat testing recommended), those with COVID-19 related symptoms and thus not fit for work and those who were quarantined due to an exposure. Any HCWs who was excluded from onsite testing were advised to get testing at Public Health assessment centers. A total of 1011 individual HCWs underwent asymptomatic prevalence testing, with a total of 1497 RT-PCR tests completed. Some healthcare workers were only tested once (n=525) and many were tested multiple times, anywhere from 2-5 tests per person (n=486). Testing was voluntary, and strongly encouraged but was not required. There was high uptake of prevalence testing during this outbreak likely given...
the magnitude of transmission and the fact that this was in the first 6 months of the pandemic in an unvaccinated population.

Workplace Health and Safety WHS contacted HCWs who had a positive RT-PCR for COVID-19 or who had a workplace exposure and conducted a thorough interview to determine attribution (linked to outbreak or community acquired), using an internally created questionnaire that included information on forward and backwards contact tracing and detailed questions about COVID-19 symptoms (core ILI and GI and non-core symptoms, similar to the COVID-19SIMT), hand hygiene, personal protective equipment use and breaches and exact dates of each symptom onset. Standardized criteria, adapted from the Centers for Disease Control and Prevention criteria (Interim U.S. guidance for risk assessment and work restrictions for healthcare personnel with potential exposure to COVID-19 May 29, 2020 [https://stacks.cdc.gov/view/cdc/88618]), were used to assess what constituted unprotected exposure. All COVID-19 positive HCW cases described here were linked to the outbreak.

As per WHS policy and “Return to Work” guidance, if a HCW was asymptomatic based on their completed questionnaire, they were advised to report any subsequent COVID-19 related symptoms to WHS within their isolation period. If they did not contact WHS within 10 days they were deemed to be asymptomatic for the duration of their illness. Public Health conducted community-based exposure investigation for HCWs where applicable.
Visitors

Visitors did not undergo asymptomatic testing. Testing was completed in the community based on the individual being symptomatic or being identified as potentially exposed to a positive case prior to symptom onset. Public Health contacted visitors with a potential link to the outbreak who had a positive RT-PCR for COVID-19. Public Health then contacted the visitor to conduct a review of core ILI, GI and expanded symptoms, using questions similar to the COVID-19SIMT. All visitor cases that tested positive for COVID-19 by RT-PCR and did not have symptoms at the time of initial interview had a follow-up period of at least 10 days.

RT-PCR testing and statistical analysis

Nasopharyngeal swabs, and occasionally throat swabs were collected and tested for SARS-CoV-2 using RT-PCR\textsuperscript{8}.

Statistical analysis was performed using chi square or student’s t as applicable; a p value <0.05 was considered significant.