

COVID-19 Scientific Advisory Group

Rapid Evidence Report

COVID-19 screening in patients without defined COVID-19 symptoms, admitted through emergency departments in three AHS hospitals: Final report of a pilot project

Key Research Question:

What proportion of patients admitted to hospital who were identified as having low risk of COVID-19 using the AHS COVID-19 screening tool test positive for COVID-19?

Context

- SARS-CoV-2, the virus responsible for COVID-19, is thought to be primarily transmitted from symptomatic patients, through respiratory droplet and close contact spread. While seemingly less common, transmission of SARS-CoV-2 is possible from people without classic respiratory symptoms (e.g., asymptomatic / presymptomatic / pauci-symptomatic), although mostly this has been documented in close quarters (e.g., within households). If patients who are asymptomatic / pre-symptomatic and unknowingly positive for SARS-CoV-2 are admitted to hospital, there is concern of transmission to healthcare workers (HCW) and/or other patients.
- In the general population, the proportion with asymptomatic carriage ranges from an estimated 0.35% in Iceland to 1.5% in Northern Italy. In Alberta, the Boyle McCauley Health Centre undertook asymptomatic testing from May 11th to 27th outside the Expo Day Drop-in Centre. Symptoms were carefully assessed. Of 251 asymptomatic people tested, none tested positive (internal report).
- In a report of 16749 hospitalized COVID-19 patients in the UK, 7% of hospitalized patients would not meet an influenza-like illness (ILI) case definition, though the quality of the symptom assessment is uncertain and varies slightly from our case definition below
- There have been examples of inpatient outbreaks of COVID-19, including one at the Montreal Neurological Hospital which resulted in temporary hospital closure. As a result, the McGill University Health Centre has adopted a policy of testing all patients admitted to hospital through the emergency department, including asymptomatic patients, for COVID-19.
- It is unclear whether COVID-19 reverse-transcription polymerase chain reaction (RT-PCR) screening of asymptomatic people at hospital admission would contribute to reducing risk of in-hospital transmission of SARS-CoV-2 under current conditions in Alberta.

Purpose

To evaluate the current prevalence of COVID-19 infection among asymptomatic patients presenting to Emergency Rooms and requiring hospital admission, AHS temporarily expanded the AHS COVID-19 testing strategy (April 9 - May 23, 2020) to all such patients without respiratory symptoms (using a standardized screening tool at admission) at three hospitals: the Royal Alexandra Hospital in Edmonton Zone, the Red Deer Regional Hospital in Central Zone, and the Peter Lougheed Centre in Calgary Zone. These results may have implications for personal protective equipment (PPE) use, testing strategy, assigning appropriate in-hospital precautions including isolation requirements and room assignments, and confidence in the safety of acute care services.

Methods

Setting: As part of the pandemic response, all patients admitted to hospital via ED in Alberta who had symptoms according to the AHS symptom assessment protocol (Table 1) were tested for COVID-19. Although the list is limited to the six core symptoms typically associated with COVID-19, we cannot exclude that exposure history and other symptoms from the expanded symptom list (e.g., gastrointestinal symptoms or loss of taste or smell) may have also been considered to inform testing as new evidence emerged during the study period. In three geographically distinct referral hospitals, this quality improvement project expanded the AHS COVID-19 testing

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algorithm (Table 1) to all patients without these symptoms who were hospitalized through the three site emergency departments. Starting on April 9th, nasopharyngeal or throat swabs were collected for SARS-CoV-2 reverse-transcription polymerase chain reaction (RT-PCR) prior to transfer to an inpatient unit. These asymptomatic patients were not routinely put on contact and droplet precautions as per usual process, unless the risk screening tool indicated an increased risk of COVID-19 (Table 2). However, AHS policy during this period required the use of medical masks in addition to the usual careful hand hygiene and other preventive practices for care of all patients.

Table 1: Alberta Health Services COVID-19 Screening Tool: Symptom Screening Questions - used to determine the need for testing (outside the context of this pilot) during this study period

Do you have the symptoms below?	Please Circle	
• Fever (greater than 38 degrees Celsius)	Yes	No
• Cough	Yes	No
• Shortness of breath	Yes	No
• Difficulty breathing	Yes	No
• Sore throat	Yes	No
• Runny nose	Yes	No

Table 2. Alberta Health Services Risk Assessment: Screening Questions – used to determine the need for isolation, but not specifically to guide testing

	Please Circle	
Have you returned to Canada from outside the country (including USA) in the past 14 days?	Yes	No
Do you live with or have had close contact* (within 2 meters/6 feet) with a person with an influenza-like illness (ILI) who has travelled outside of Canada within the last 14 days before their illness?	Yes	No
Do you live with or have had close contact* (within 2 meters/6 feet) with someone who is ill with fever and/or cough and ILI symptoms?	Yes	No
Have you had close contact* (within 2 meters/6 feet) with a confirmed or probable case of COVID-19?	Yes	No
Have had laboratory exposure to biological material known to contain COVID-19 virus	Yes	No

****Close contact** is an individuals that provided care for the case, including healthcare workers, family members or other caregivers, or who had other similar close physical contact without consistent and appropriate use of personal protective equipment (PPE), **OR** lived with or otherwise had close prolonged contact (within two meters/six feet) with a person while the case was ill, **OR** had direct contact with infectious body fluids of a person (e.g. was coughed or sneezed on) while not wearing recommended PPE.*

If "NO" to all of the above, the patient is considered low risk

Procedures: Staff conducted an evaluation using the AHS screening tool in use at the time (Table 1) to ensure patients had no COVID-19 symptoms and collected specimens, with a study number on the ordering form to enable ProVLab (Alberta Precision Laboratory, APL) to track these samples. ProVLab performed SARS-CoV-2 RT-PCR on each sample. Data was provided in aggregate form without identifiers; we received information about patient age, sex, location of test order, and test result.

Outcome measure: Proportion of asymptomatic patients testing positive for COVID-19 upon hospital admission from the Emergency Room.

Statistical methods: We used frequencies, mean and standard deviation (SD) for sample description. We used the methods proposed by Wilson to estimate the 95% confidence intervals (CI) of proportions, because standard methods for CI estimation that take a multiple of the standard error either side of the estimated quantity are sensitive to extreme values of these quantities. Accordingly, we did sample size estimation using a margin of error approach, assuming an alpha error of 0.05 and a power 80%. We estimated that we needed to test at least 800 participants to estimate a prevalence of 1% with a margin of error of 0.7 (from 0.3% to 2%). We estimated that a sample of 1,500 participants would reduce this margin of error to 0.5-1.8%. To provide context for these results, we summarized the risk of COVID-19 infection in those admitted to the same three hospitals via emergency department during the study who were symptomatic (fever, cough, shortness of breath, sore throat). We also summarized the incidence of daily cases in Alberta for the zones including the study sites (i.e., three zone-specific epidemic curves). We estimated the reproductive number using Bayesian methodology, to identify point(s) in time when it remained consistently below 1 (indicating the outbreak was under control).

Results

Epidemic context: Following the declaration of the health state of public health emergency (March 17) approximately half of the hospital admissions at the three study sites occurred via emergency department access (data not shown). Figure 1 shows the total number of daily new cases of COVID-19 and the number of Albertans who were tested in these three zones (Calgary, Central and Edmonton). The study period encompassed Alberta's initial epidemic curve, with peak active cases per 100,000 of 71.4 (on April 30, 2020), and 14.7 and 14.6 at the beginning and end of the study respectively. The Calgary Zone accounted for most of the cases. The time-dependent reproductive number remained below 1 after April 30, 2020 (Figure 2).

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Figure 1. Daily cases (solid line) and tests (dashed line) in the three zones where the pilot hospitals were based

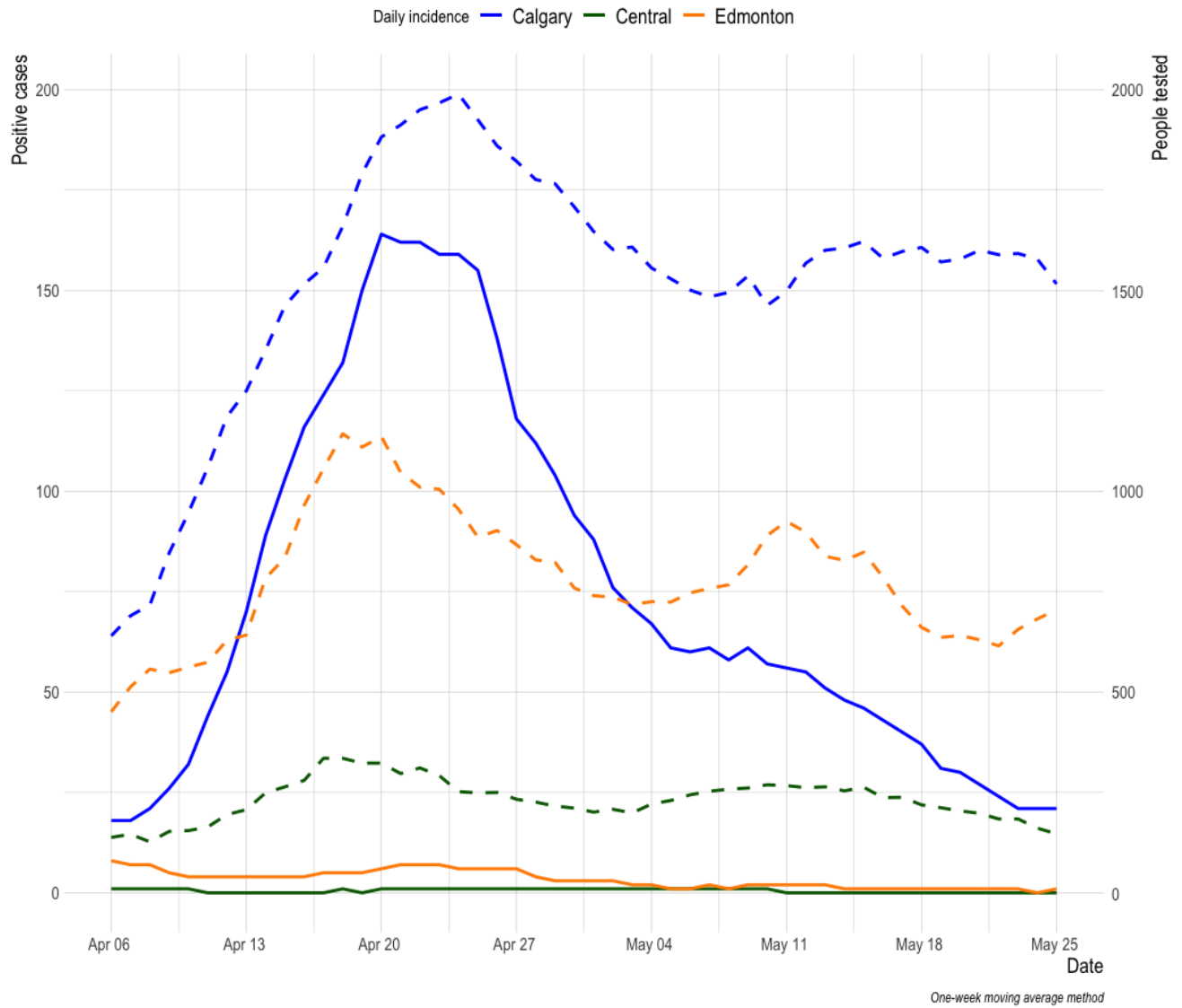
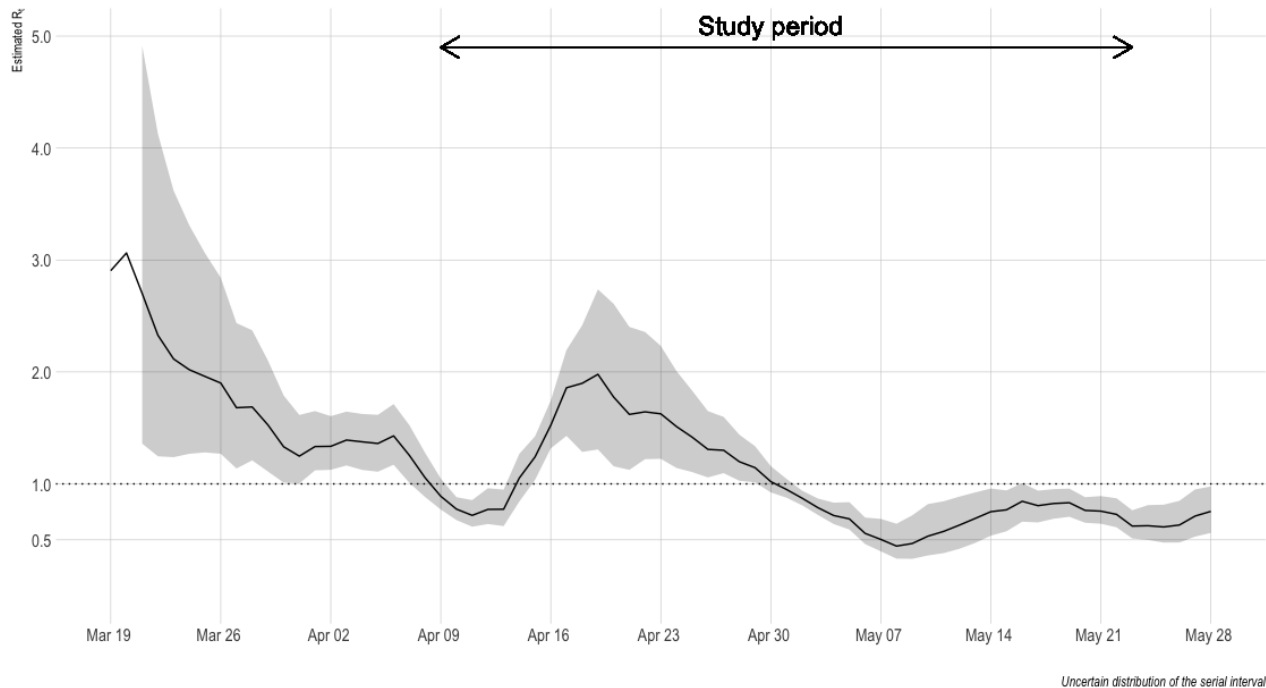


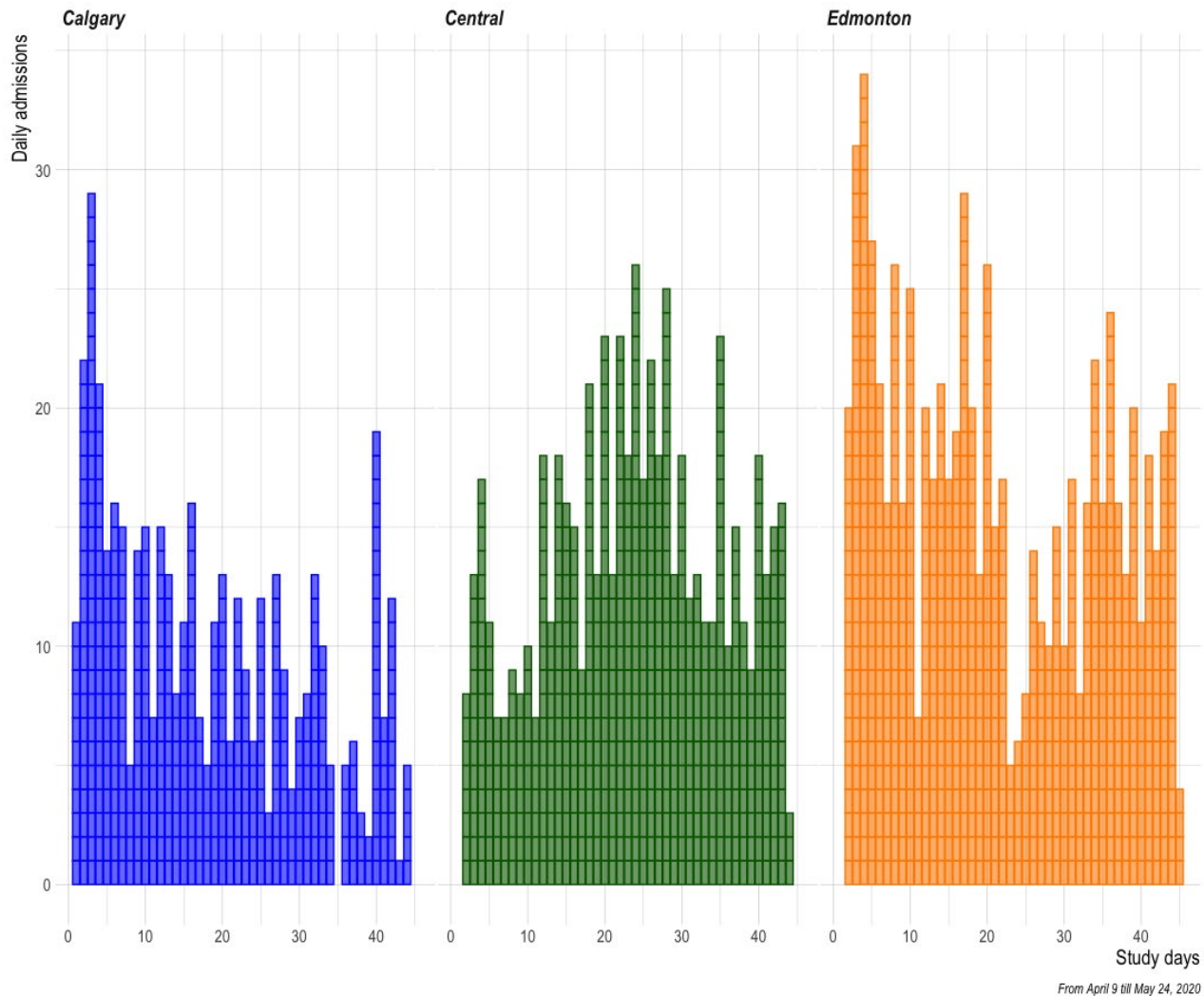
Figure 2. Time-dependent reproduction number



Cohort description: Between April 9th and May 23rd, 2020, 3,304 people were hospitalized through the emergency department in the three study sites. Of these, 1814 people were asymptomatic and formed the cohort for this quality improvement study. Figure 3 shows the distribution of study participants who were admitted daily by site over the study period. Overall, 614 people were admitted at the Red Deer Regional Hospital (34%); 445 at the Peter Lougheed Centre (24%); and 755 at the Royal Alexandra Hospital (42%). On average, 40 asymptomatic people were admitted each day (SD 12; median 39, range 4-73). Results were available within the same day of testing in 16%, within one day in 75%, or within two days of testing in 98%. The mean [SD] age of the study participants was 55 years [22] and 51% were men, with no difference in these characteristics across study sites.

Outcomes: None of the asymptomatic patients tested were positive for COVID-19. By comparison, over the same time period, of the patients admitted from the ED who had symptoms (N=1561; mean age [SD] 47 [19] years; 51% men), 71 were positive (4.5%; 95% CI from 3.6 to 5.7%). Of these, 68 were from the Calgary Zone hospital (7.5%; 6-9.5%).

Figure 3. Distribution of study participants who were admitted daily through the emergency department by site



Discussion

In this study, we found that none of the 1814 consecutive people who were admitted to one of the three EDs in Alberta without symptoms consistent with SARS-CoV-2 infection, had a positive RT-PCR swab. Conversely, 4.5% tested for symptoms in the same ED settings were positive on testing, being as high as 7.5% at the hospital within the Calgary Zone. These findings suggest that current admission processes, including assessment of symptoms are effective at identifying patients who should be tested (and isolated) in the context of hospital admission.

The government of Alberta implemented a rapid response to the COVID-19 outbreak. Within three weeks of detecting the first positive case in the province on March 5, 2020, aggressive public health measures were implemented, including physical distancing and hand and respiratory hygiene recommendations, closure of schools and many non-essential services, and recommendations for working from home where possible. Patients presenting to hospital were screened for core symptoms of COVID-19, although we cannot exclude that exposure history and other symptoms may have also been considered as new evidence emerged during the pandemic. We conducted our study during a timeframe when localized outbreaks were identified in many long-term care and designated supporting living facilities, and others in workplaces, shelters and the community, including the two largest outbreaks in meat packing plants with over 1500 cases within the Calgary zone.

Significant asymptomatic transmission (including pre-symptomatic transmission) of SARS-CoV-2 could reduce the effectiveness of control measures (isolation, use of PPE only for symptomatic persons, and parameters of contact tracing) that are informed by symptom onset and identification. Concerns regarding asymptomatic transmission are driven by the observation that there can be high levels of virus detectable shortly before and at the time of symptom development, cross sectional prevalence studies showing potentially high proportions of people in specified groups are asymptomatic at testing, and consequent modelling studies suggesting the possibility of considerable spread from these asymptomatic and presymptomatic people. However, epidemiologic studies to date have suggested a much smaller role of asymptomatic transmission than presymptomatic transmission, and existing data suggest a much lower likelihood of transmission per contact without symptoms present. Ongoing research is required – see <https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-rapid-response-asymptomatic-transmission.pdf>.

The debate around the likelihood of asymptomatic transmission has created concerns for HCWs. Our data support current recommendations, which endorse continuous masking in patient care areas but support risk based use of full droplet and contact precautions (medical mask, gown, gloves, and faceshield).

Some potential concerns have been raised around screening asymptomatic patients (see <https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-sag-priority-groups-for-asymptomatic-testing-rapid-review.pdf>). One pragmatic issue is whether patients require isolation until after test results are returned negative. However, in this project, patients were not isolated because they were deemed to be at low risk. This had the potential to cause confusion among HCWs about the role of contact and droplet precautions as the usual pattern of “isolate until result” was not followed. However, educational support was available and issues were not observed. One other possible concern is screening for patients at low risk/ low expected prevalence can magnify the relative number of false positive tests (though this is unlikely with RT-PCR testing), and consume scarce health care resources, including testing supplies.

In summary, in a setting of ongoing low level community transmission of COVID-19, RT-PCR testing of patients at hospital admission from Emergency Rooms found no cases in those screened as asymptomatic. However, 4.5% of admitted ED patients with any ILI symptoms were COVID-19 positive. This suggests that careful assessment of symptoms during the admission process is effective at identifying patients who should be tested (and isolated) in the context of hospital admission. Given the state of the current pandemic in Alberta (a low reproductive number and low daily case numbers), screening people without symptoms who are admitted to hospital through the emergency department and who are at low risk is not supported. This recommendation may need to be re-evaluated should higher levels of community transmission be encountered as relaxation of social distancing and other control measures occurs.

Authorship

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