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Concise Communication

Impact of universal admission testing for severe acute respiratory coronavirus 2 (SARS-CoV-2) in era of the omicron variant

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Abstract

In this prospective study, universal admission testing for severe acute respiratory coronavirus virus 2 (SARS-CoV-2) averted transmission in shared patient rooms especially since the emergence of the SARS-CoV-2 omicron variant when the yield in identifying infectious asymptomatic cases more than doubled. This change may be due to the higher rate of asymptomatic infection with the omicron variant, the broader community prevalence during the omicron era, or both.

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The risk of transmission of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) is highest from 1 to 3 days prior to and immediately following the onset of symptoms, when transmission occurs from asymptomatic and presymptomatic infected patients.[1] The Centers for Disease Control and Prevention recommends, in addition to symptom screening, SARS-CoV-2 testing of patients without signs or symptoms of coronavirus disease 2019 (COVID-19) depending on local guidance and availability of testing.[2]

A drawback of asymptomatic SARS-CoV-2 testing is the detection of recovered positive cases given that viral RNA may persist for months following infection.[3] Facilities that implemented and evaluated routine admission testing early in the COVID-19 pandemic generally identified low numbers of infectious cases and concerns regarding unnecessary isolation and costs during periods of low community prevalence has limited widespread adoption.[4,5]

The value of universal admission testing in the era of the SARS-CoV-2 omicron variant is even less clear. We hypothesized that, given its broader transmission and higher rate of asymptomatic infection, routine admission testing during the omicron era may identify more asymptomatic infectious cases and avert in-hospital transmission.

Methods

We performed a 19-month prospective study of universal admission testing comparing the yield and impact before and after the emergence of the SARS-CoV-2 omicron variant. Our hospital implemented routine SARS-CoV-2 admission testing on October 22, 2020, to augment our usual syndromic surveillance. The study period began on November 1, 2020, to allow for implementation of the new practice. Midturbinate swabs were obtained by trained nursing staff and were processed using a real-time polymerase chain reaction (RT-PCR) test that detects SARS-CoV-2 *E* and *UTR* genes.[6] Symptomatic patients were always assigned to a private room, defined as a single room or patient space separated by walls or partitions, pending SARS-CoV-2 testing. Due to limited private rooms in our facility (41% of all beds), asymptomatic patients were admitted to the first available room while SARS-CoV-2 test results were pending. Patients with positive test results were moved to private rooms. In shared rooms, the distance between the heads of the 2 beds was at least 2 m, with a minimum of 3–4 air changes per hour.

All SARS-CoV-2–positive patients who remained asymptomatic were retested within 48 hours and were prospectively reviewed to determine infectivity. An infectious asymptomatic case was defined as a patient with a cycle threshold (Ct) value <28.0 from initial or repeated testing or new onset of symptoms consistent with COVID-19 infection within 48 hours after initial testing or the previous 10 days.[7] Cases with Ct value ≥28.0 and incomplete follow-up were also considered infectious in the absence of being able to prove otherwise. A noninfectious case was defined as an asymptomatic patient with documented COVID-19 >10 days to 3 months prior or with a Ct value ≥28.0 who remained asymptomatic and for whom the confirmatory swab was negative or with Ct value persistently ≥28.0. A contact was defined as a roommate of an infectious case for any length of time. All contacts were placed in transmission-based precautions in private rooms for 10 days, where they underwent daily syndromic surveillance with testing on days 5 and 8 or at the onset of new symptoms.

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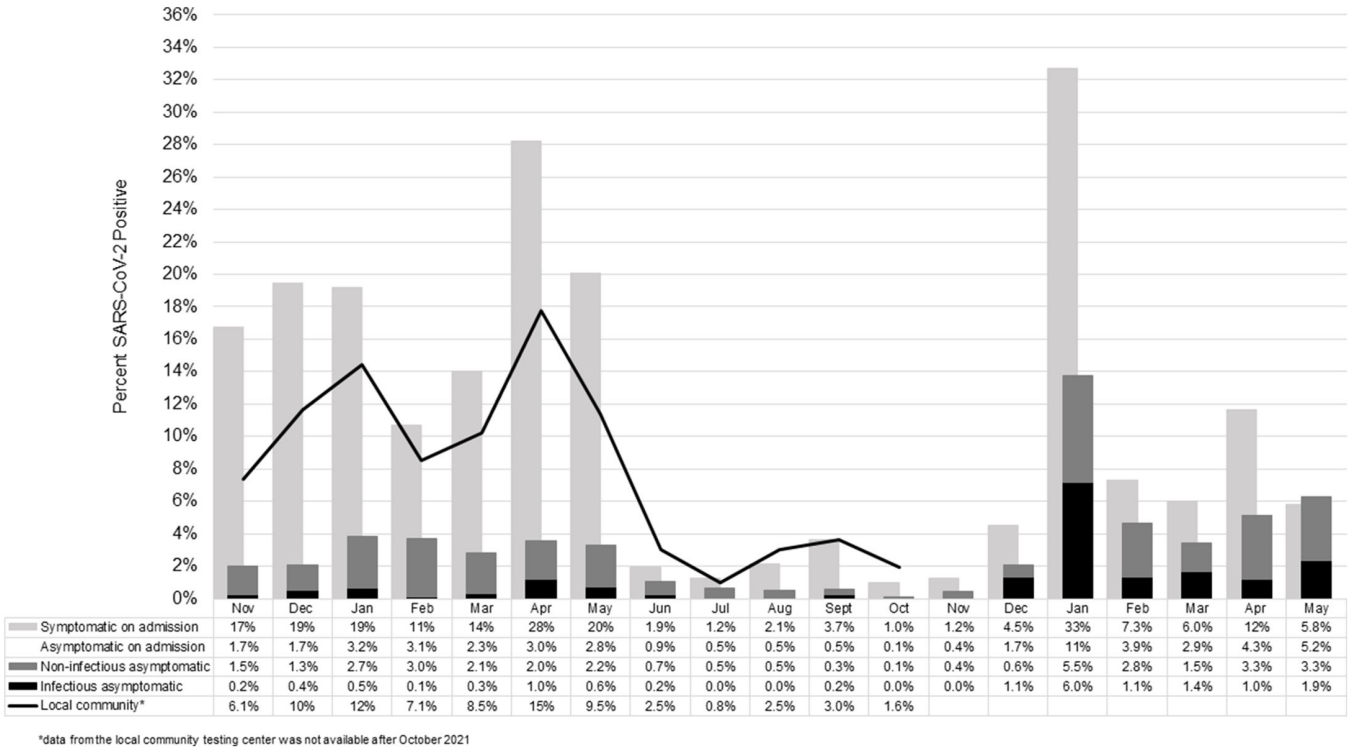

	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Symptomatic on admission	17%	19%	19%	11%	14%	28%	20%	1.9%	1.2%	2.1%	3.7%	1.0%	1.2%	4.5%	33%	7.3%	6.0%	12%	5.8%
Asymptomatic on admission	1.7%	1.7%	3.2%	3.1%	2.3%	3.0%	2.8%	0.9%	0.5%	0.5%	0.5%	0.1%	0.4%	1.7%	11%	3.9%	2.9%	4.3%	5.2%
Non-infectious asymptomatic	1.5%	1.3%	2.7%	3.0%	2.1%	2.0%	2.2%	0.7%	0.5%	0.5%	0.3%	0.1%	0.4%	0.6%	5.5%	2.8%	1.5%	3.3%	3.3%
Infectious asymptomatic	0.2%	0.4%	0.5%	0.1%	0.3%	1.0%	0.6%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%	1.1%	6.0%	1.1%	1.4%	1.0%	1.9%
Local community*	6.1%	10%	12%	7.1%	8.5%	15%	9.5%	2.5%	0.8%	2.5%	3.0%	1.6%							

*data from the local community testing center was not available after October 2021

Fig. 1. Monthly percent positivity of SARS-CoV-2 testing at time of acute-care admission for symptomatic and asymptomatic patients, and relationship with percent positivity in the local community.

We calculated the relative risk (RR) and χ^2 value for the comparison of the positivity rate among tested admitted patients. We calculated the proportion who were determined to be infectious and the secondary attack rate (SAR) among contacts following exposure to an asymptomatic infectious case both before and after the emergence of the SARS-CoV-2 omicron variant, defined as January 1, 2022, until May 31, 2022, (the end of the study period), which is referred to as the omicron era. A sensitivity analysis was performed excluding those contacts lacking a minimum of 5 days of follow-up. The monthly positivity rate was compared to that of symptomatic patients and local community testing center, and the number needed to test (NNT) to detect an asymptomatic infectious patient was determined. Research ethics review was not required because the study met criteria for exemption as a quality improvement project that was not human-subject research.

Results

In total, 28,603 patients were tested for SARS-CoV-2 on admission, including 8,748 (31%) with symptoms compatible with COVID-19 and 19,855 (69%) who were tested as part of asymptomatic admission screening. The overall positivity rate was 5.4% (1,540 of 28,603) with a higher positivity rate of 12% (1,042 of 8,748) among symptomatic patients compared to asymptomatic testing at 2.5% (498 of 19,855; RR, 4.7; 95% CI, 4.3–5.3; $P < .001$). Among 498 asymptomatic cases identified through universal admission testing, 157 (32%) were determined to be infectious, with a median Ct value of 24.3 (IQR, 19.3–30.4). The asymptomatic positivity rate was 1.5% (205 of 13,617) before the emergence of the omicron variant and was 4.7% (293 of 6,238) during the omicron era (RR, 3.1; 95% CI, 2.6–3.7; $P < .001$). The the proportion determined to be infectious was 17% (34 of 205) before omicron versus 42% (123 of 293) during the omicron era (RR, 2.5; 95% CI, 1.8–3.5; $P < .001$).

Figure 1 depicts the monthly percent positivity of symptomatic and asymptomatic admission screening compared to the community. Prior to the emergence of the SARS-CoV-2 omicron variant, the overall NNT to identify a single infectious case via universal admission testing was 401 (monthly range, 100–945) and decreased to 51 (monthly range, 17–103) during the omicron era.

Among asymptomatic patients determined to be infectious, 105 (67%) of 157 were admitted directly to a private room: 78 (74%) pending SARS-CoV-2 testing results and 27 (26%) following positive results. Those admitted temporarily to a shared room (52 of 157, 33%) generated 74 contacts with median exposure of 12 hours and 51 minutes (IQR, 10 hours and 43 minutes to 18 hours and 24 minutes). Of these, 38 (51%) of 74 completed 10-day follow-up while 48 (65%) of 74 completed ≥5-day follow-up prior to discharge.

Figure 2 summarizes the outcomes of contacts before and after the omicron variant emerged. The SAR among all contacts was 4.1% (3 of 74) overall, 0% (0 of 17) before the omicron variant emerged, and 5.3% (3 of 57) during the omicron era. In the sensitivity analysis, the SAR was 6.3% (3 of 48) overall, 0% (0 of 13) before the omicron variant emerged, and 8.6% (3 of 35) during the omicron era.

Discussion

The use of universal admission testing for SARS-CoV-2 averted transmission in shared patient rooms, especially during the omicron era, when the yield in identifying infectious asymptomatic cases more than doubled.

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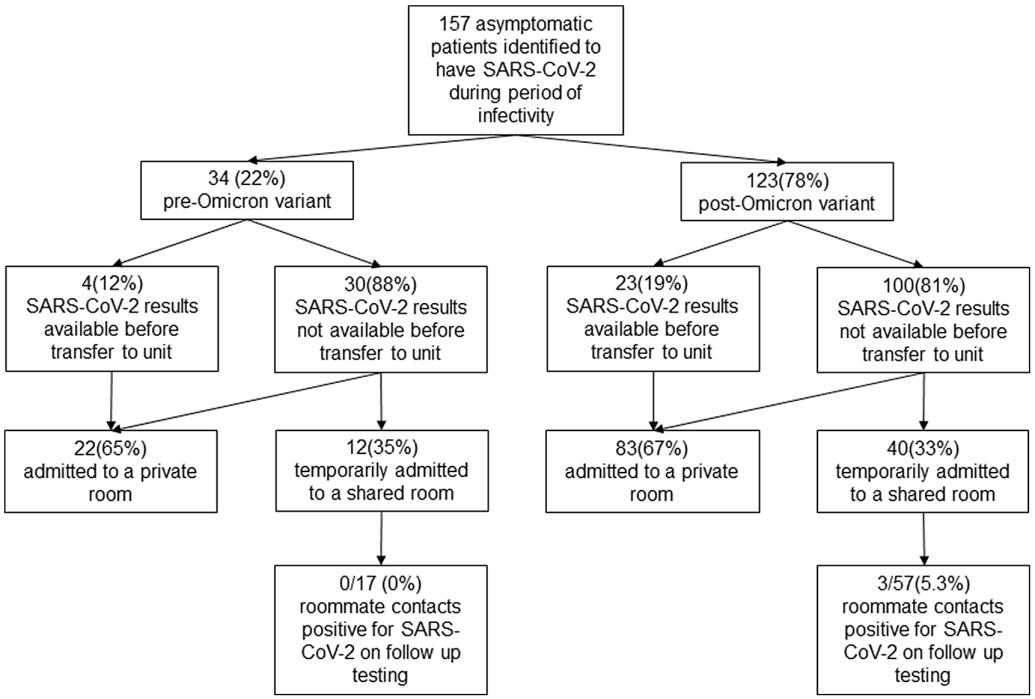

Fig. 2. Follow-up with infectious asymptomatic infectious patients and exposed roommates identified through SARS-CoV-2 admission screening prior to and during the omicron era.

The Infectious Diseases Society of America currently recommends against universal admission testing when prevalence is <2% and in favor of this testing when prevalence reaches ≥10%.[8] Our results before the omicron variant emerged are consistent with those of prior studies, and they support these recommendations given that we identified extremely few asymptomatic infectious cases during periods of low prevalence and more cases during periods of high prevalence (Fig. 1).[4,5] Our findings suggest that universal admission testing has been more valuable during the omicron era and should be maintained for the time being. This change may be due to the higher rate of asymptomatic infection with the omicron variant, the broader community prevalence during this period, or both.[9]

The value of detection of asymptomatic infectious cases on admission likely depends on the composition of private rooms available. In our facility with only 41% private rooms, admission SARS-CoV-2 testing identified 27 infectious asymptomatic patients prior to transfer and 23 of these cases occurred after the omicron variant emerged. Based on shared rooms of at least 2 beds, this testing prevented 54 roommate exposures, in addition to minimizing exposure times of 74 contacts. Considering a SAR of 39% in prior roommate studies, we estimate that admission testing averted a minimum of 0.24 transmissions per month before the omicron variant emerged and 3.0 transmissions per month during the omicron era.[10]

Our study has several limitations. It involved a single center, although the study period spanned 19 months when community prevalence varied. A control group was not available; however, the SAR suggest that transmissions were averted, including the SAR of the sensitivity analysis. The Ct values in the infectious case definition were integrated with prospectively collected clinical and epidemiological information, but the exact cutoffs may vary with other laboratories. Finally, admission testing does not capture patients who are incubating on admission. Further studies should assess the impact of postadmission testing strategies.

Universal admission testing for SARS-CoV-2 averted inpatient transmission from asymptomatic patients, especially during the omicron era.

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Conflicts of interest. Dr. Leis has received payment for expert testimony as requested by hospitals of the Ontario Hospital Association, Ministry of Attorney General of Ontario, and Seneca College.

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