Commentary

Routine surveillance of asymptomatic healthcare personnel for severe acute respiratory coronavirus virus 2 (SARS-CoV-2): Not a prevention strategy

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As capacity for severe acute respiratory coronavirus virus 2 (SARS-CoV-2) diagnostics has expanded, both with assay types (nucleic acid amplification tests, NAATs, antigen tests, and serology) and specimen collection options (nasopharyngeal, NP; oropharyngeal, OP; saliva; mid-turbinate, MT; anterior nares, AN), interest in the use of routine, serial screening of asymptomatic individuals in a variety of settings has expanded. Notably, the use of asymptomatic surveillance in higher education1 and professional2 and nonprofessional athletics3 has become commonplace, but transmission in these settings has also been linked to lapses in implementation of basic infection prevention practices such as masking and physical distancing.4,5 Given the considerable interest in asymptomatic surveillance in areas outside of healthcare, the question of the utility of routine screening among healthcare personnel (HCP) in acute-care facilities has been raised.

In this focused review, we describe the reported risk of acquisition of infection after HCP exposures to occultly infected patients, the risk acquisition of infection by patients exposed to occultly infected HCP, and the prevalence of asymptomatic infection among HCP in settings where screening has been implemented. We also assess the potential role or routine surveillance of asymptomatic HCP to reduce the risk of nosocomial transmission from HCP-to-HCP and HCP-to-patient. We report on the early experience of acute-care facilities that have offered screening of asymptomatic HCP outside confirmed exposures, and we conclude with considerations for facilities considering offering screening, either “on demand” or as part of routine surveillance.

Risk of HCP infection after exposure to occultly infected patients

Multiple infection prevention measures in healthcare facilities have been widely implemented, including universal masking of HCP, patients, and visitors, screening for symptoms and exposures and appropriate isolation of patients and visitors, testing of symptomatic patients as well as targeted testing of asymptomatic patients (ie, after known exposures, prior to or upon admission to a healthcare facility, and prior to specific high-risk procedures) as well as appropriate isolation and use of personal protective equipment (PPE) by HCP for patients with suspected or confirmed COVID-19.7,8 In this setting, the risk of transmission from occultly infected patients appears to be low. This assessment is based on several published investigations of exposures to HCP (Table 1) demonstrating association between universal masking and decreasing incidence of infection.8 In addition, seroprevalence studies have generally failed to demonstrate an association between caring for patients with suspected or known COVID-19 and HCP infections, but they have shown relationships between household contacts9 and lack of universal mask use when caring for patients.10 Several healthcare facility clusters of HCP infection, however, have been linked to HCP-to-HCP transmission tied to eating, drinking, carpooling, and other social events during which infection prevention measures were not followed.12,14

Risk of patient infection after exposure to occultly infected HCP

At least 1 study has systematically approached the risk to exposed patients from occultly infected HCP, estimated at 0.4%. Baker et al15 identified exposed patients between March and June 2020. After the study had begun, based on changes in public health guidance, all exposed patients were referred for testing regardless of symptom status. During this time, 238 exposed patients were identified, some with >1 exposure, for 253 exposures by 60 HCP. In 87 exposures, neither patient nor HCP were wearing face masks; in 166 exposures, only the HCP was wearing a face mask. Testing for SARS-CoV-2 by PCR was performed in 92 of 253 exposures, of which 2 resulted positive. The first exposure included unmasked face-to-face interaction for 30 minutes in the outpatient setting, and the second patient was unmasked for 10 minutes with a masked infected HCP, but this patient was also identified as the close contact of a household case, and the infection was attributed to the household.

Prevalence of asymptomatic infection among HCP

Some academic health centers have offered testing to asymptomatic HCPs without known exposures (ie, for indications other
| Publication          | Date, Country           | Brief Description of Occultly Infected Patient and Exposure                                                                 | Details Regarding PPE                                      | HCP Exposed, Level of Risk of Exposure | No. of Subsequent Infections | Details/Limitations                                      | Rate   |
|----------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------|------------------------------|-----------------------------------------------------------|--------|
| Ng et al.19          | February 2020, Singapore| Patient with occult COVID-19 admitted to hospital; developed respiratory distress on HD 2, intubated by emergency airway team; difficult intubation requiring use of video laryngoscope and airway bougie; mechanical ventilation ×3 d; NP positive for SARS-CoV-2 upon extubation | 35 HCP wore surgical masks; 6 wore N95 respirators        | 41 HCP with exposure to AGP for at least 10 min <2 m from patient. | 0                            | All HCP isolated for 2 weeks during which they had daily symptom monitoring, twice daily temperature measurements; NP swabs processed by PCR on first day of home isolation (day 1, 2, 4, or 5 after last exposure) and on day 14 | 0.0%   |
| Burke et al.20       | February 2020, United States | Contact tracing of 12 patients with travel-related COVID-19, including 222 HCP with close contact | Not described.                                        | 222 HCP with exposure to AGP for at least 10 min <2 m from patient. | 0                            | Active symptom monitoring during exposure window; only symptomatic exposed individuals were tested for SARS-CoV-2 by PCR. The numbers of HCP who developed symptoms and were tested are not specified. Threshold for testing in HCP might have been lower than for other exposed individuals | 0.0%   |
| Heinzerling et al.21 | February 2020, United States | Patient managed on standard precautions for 4 days during which the patient underwent multiple AGPs, including nebulizer treatments, bilevel positive airway pressure, endotracheal intubation, and bronchoscopy; identified as SARS-CoV-2 after transfer to another facility (see Bays et al22 for exposure investigation of this patient at the second hospital) | HCP stratified as high, medium, and low risk per CDC; risk stratification provided for 43 who developed symptoms and were tested: high (n=5), medium (n=36), and low (n=2). Among 3 diagnosed with COVID-19, 2 had high risk (frequent close contact during BiPAP, intubation with no facemask, respirator, gown or gloves) and 1 had medium risk exposures (close contact for 2 h wearing a face mask inconsistently; wearing gloves, no eye protection) | 121 HCP with exposure to AGP for at least 10 min <2 m from patient. | 3                            | Active symptom monitoring during the exposure window; only symptomatic exposed individuals were tested for SARS-CoV-2 by PCR. | 2.5%   |
| Bays et al.22        | February and March 2020, United States | Describes exposure investigation related to 2 occultly infected patients. Patient 1 was transferred on from a community hospital (community hospital exposure is described in Heinzerling et al21) to hospital B. Patient 2 was transferred from another community hospital to hospital B and was on standard precautions for 14 days prior to suspicion for COVID-19 during which the patient was intubated and had bronchoscopy performed. | Patient 1 exposures included high (n=15), medium (n=73), and low (n=59) risk. Patient 2 exposures included high (n=20), medium (n=59), and low (n=66) risk. | 147 HCP with exposure to AGP for at least 10 min <2 m from patient. | 0                            | Active symptom monitoring during the exposure window; only symptomatic exposed HCP were tested for SARS-CoV-2 by PCR. Active symptom monitoring during the exposure window; symptomatic and a subset of asymptomatic exposed HCP were tested for SARS-CoV-2 by PCR. Of 5 confirmed cases, 4 were present for intubation without adequate PPE, the fifth had direct contact for several days without PPE and during a break in the vent circuit. Two possible cases were among staff who had direct patient contact during AGPs without adequate PPE. | 2.4%   |
| Study                     | Date/Location | Description                                                                 | Close Contact Definition                                                                 | Active Contact Monitoring | HCP Tested For SARS-CoV-2 | Rate |
|--------------------------|---------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------|---------------------------|------|
| Ghinai et al.            | February 2020, United States | Person-to-person spread in household between 2 patients and report of exposures from those two patients within community and healthcare setting | Not described however, healthcare exposures from patient 2 are noted in non-hospitalized settings because the patient was appropriately isolated upon admission. | 75                         | 0                          | 0.0% |
| Cheng et al.             | January–March 2020, Taiwan   | Prospective case study of confirmed COVID-19 patients and their close contacts; 698 close contacts were identified in healthcare settings. | Close contact defined as contacting the index case within 2 m without appropriate PPE; no minimum time requirement. Appropriate PPE depended on the exposure setting; during AGPs, N95 required. | 698                        | 6                          | 0.9% |
| Baker et al.             | March 2020, United States   | Patient admitted to hospital and on Standard Precautions through HD 13 at which point he developed acute respiratory failure; determination made that he was likely infected at the time of admission. The patient was not wearing a mask; on HD7, a new universal masking policy went into effect and HCP work surgical masks. | Close contacts defined as ≥10 cumulative minutes of face-to-face contact within 2 m. Median cumulative time with patient was 45 m (range, 10–720 min) | 43                         | 2                          | 4.7% |
| Average                  |               |                                                                             |                                                                                          | 282                        | 18                         | 1.2% |

Note. HD, hospital day; NP, nasopharyngeal; PCR, polymerase chain reaction; HCP, healthcare personnel; AGP, aerosol-generating procedure.

Superscripted notes:
1. Hospital A in Heinzerling et al is described in detail in Bays et al, where hospital B is also described. Data presented for Heinzerling include only those from hospital A. Data included from Bays et al pertains to hospital B contact tracing investigation (investigation 1A and 2).
2. Close contact defined by CDC at the time: "Examples of close contact with a patient or with infectious material could include spending prolonged time within 6 feet of the patient, conducting or being present during an aerosol-generating procedure, or direct contact with the patient’s secretions or excretions."
3. Exposures related to patient 2 are included in this table because Patient 1 was described in Burke et al; 75 unique HCP contacts are included (personal communication from R Burke to E Shenoy, August 19, 2020).
than those recommended at this time). We are not aware at this time of any such practices that are mandatory, or that require repeated testing. A limited review of existing programs and results are provided (Table 2). The overall prevalence among this population is uniformly low and approximates that of institutes of higher education that have implemented routine serial screening. The Massachusetts Department of Public Health, which tracks the 7-day weighted average of tests by molecular methods, notes a higher education that have implemented routine serial screening.

More importantly, in the healthcare setting when adhering from asymptomatic individuals is less than for those with symptoms.17 The HCP infection risk is likely higher in community and household settings than in healthcare settings; thus, the identification of occultly infected HCP on reduced transmission in the household setting.

The impact of identifying those cases on nosocomial infection is not clear. Although asymptomatic individuals do transmit infection, available literature suggests that the secondary attack rate from asymptomatic individuals is less than for those with symptoms.15 More importantly, in the healthcare setting when adherence to infection prevention protocols are in place, the risk of transmission to patients and other HCP appears low. The effect of identifying occultly infected HCP on reduced transmission in the community or household setting is likely higher because of the types of interactions in households, and household settings have been shown to have the highest rates of secondary transmission.18 The HCP infection risk is likely higher in community and household settings than in healthcare settings; thus, the identification of asymptomatic HCP may have its greatest effect in limiting transmission in the household setting.

Outside a potential impact on reducing transmission, there may be noninfection prevention benefits to offering HCP testing, including HCP satisfaction through ease of access and some measure of reassurance. This reassurance of a negative test, however, is short-lived and runs a risk of reducing compliance with necessary infection control procedures.

Potential disadvantages of asymptomatic screening

Will HCP who test negative for SARS-CoV-2 modify their behaviors in a way that could increase risk of transmission, by engaging in more risky behaviors, such as eating or drinking in close proximity with nonhousehold members? Although we are not aware of evidence to support this change in behavior during the current pandemic, observations of lack of compliance with eye protection in our own institutions in settings in which inpatients are all tested for SARS-CoV-2 on admission suggest that HCP are assessing risk of transmission from patients and altering their behavior accordingly (ie, not wearing eye protection when the patient tested negative despite the existing policy to wear eye protection universally).

Even in such a low-prevalence population, the risk of false-positive results, which has generally been very low in nucleic acid amplification tests (NAATs) but higher with some antigen tests, must also be considered. Facilities will need to decide in advance whether all positive results will be considered to be true infections, or whether additional assessment of each case is required to confirm or refute active infection, taking into account the impact on return-to-work status and exposure investigations. We are unaware of data on testing of asymptomatic HCP in which positive tests were confirmed as “true” positives by follow-up serologic tests.

Practical considerations

Any healthcare facility considering asymptomatic HCP screening either as voluntary or mandatory programs must be aware of practical considerations, such as the frequency of testing, the type of assay, the specimen type, and pooling strategies, all of which can affect the sensitivity of the assay and the timing of detection. Observed self-collection may be an option depending on the specimen type and may introduce efficiencies in testing cohorts of HCP at the same time, with appropriate infection control procedures.
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prevention protocols in place. Unobserved self-collection should be undertaken with caution given the possibility of poor sample collection and false-negative results. In low-prevalence populations, false-positive results may be a concern, and facilities may consider protocols to follow-up positive screening tests with confirmatory or other tests. Facilities may consider whether to offer testing to all HCP or specific groups; however, caution should be taken when focusing on those HCP considered at “higher risk of infection” due to direct patient care because the most likely source of infection in all HCP is community exposure. Thus focusing on HCP with higher risk of unrecognized community exposures may be considered. Some facilities may alternatively undertake surveillance among HCP in whom infection would pose a greater risk to patients based on the types of interactions or patient populations with whom they interact. This strategy should also be considered with caution because the risk to exposed patients when infection prevention measures are in place (ie, universal masking of HCP, daily symptom monitoring, and masking of patients whenever possible) is low.

In addition to the cost of establishing and maintaining a testing program, the additional resources that will be required for contact tracing to identify potential exposures to other HCP or patients due to lapses in infection prevention protocols must be considered. These include staffing and other support from infection prevention programs and occupational health staff. The demand for testing may exceed budgeted resources.

In summary, the low risk of nosocomial transmission from patient to HCP and from HCP to patient, as well as the low prevalence of asymptomatic SARS-CoV-2 infection among HCP suggests that current infection prevention measures in place are effective. The addition of routine asymptomatic surveillance to decrease transmission in healthcare facilities should not be pursued as a primary infection prevention strategy, and institutions that consider offering such screening will need to consider the many practical implications. With increasing community prevalence across much of the United States, reinforcing the known, effective infection prevention strategies is of paramount importance. Healthcare does not operate in a bubble and routine screening of asymptomatic HCP will not create one.

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